



Delivering distance education on plant genetic resources

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Edith Hesse, Elizabeth Goldberg and Fabiola Amariles**



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An evaluation of the collaborative association between CIAT, Bioversity International, UNC and REDCAPA on conducting a distance-education course on the *ex situ* conservation of plant genetic resources

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REDCAPA (Network of Institutions Dedicated to Teaching Agricultural and Rural Development Policies for Latin America and the Caribbean) is a non-profit independent association of universities and research institutions that are dedicated to the study and teaching of topics related to the agricultural and rural sector of Latin America and the Caribbean (LAC). Officially constituted in 1993, it now brings together dozens of institutions of different LAC countries, with European and U.S. universities and institutions as collaborators. REDCAPA is legally registered in Brazil and maintains a complete platform for distance education through the Internet, which is used by its member institutions (specifically their professors) to offer blended learning courses throughout Latin America. www.redcapa.org.br

Biodiversity International is an independent international scientific organization that seeks to improve the wellbeing of present and future generations of people by enhancing conservation and the deployment of agricultural biodiversity on farms and in forests. It is one of 15 centres supported by the Consultative Group on International Agricultural Research (CGIAR), an association of public and private members who support efforts to mobilize

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ORGANIZATION OF THE DOCUMENT

This report describes the activities of a collaborative association between the International Center for Tropical Agriculture (CIAT), Bioversity International (formerly the International Plant Genetic Resources Institute (IPGRI)), the Universidad Nacional de Colombia (UNC), and the Network of Institutions Dedicated to Teaching Agricultural and Rural Development Policies for Latin America and the Caribbean (REDCAPA). The association aimed to conduct a distance-education course on the *ex situ* conservation of plant genetic resources.

The aim of this report is to document the association's activities and analyse them to extract the lessons learned in the process, thereby orienting this initiative's future activities and serving as a point of reference for others.

The report comprises the main text, which summarizes the activities, and seven appendices with supporting information. The report was prepared with contributions from several people who participated in the association's activities.

I. INTRODUCTION AND BACKGROUND

Plant genetic resources, the basis of subsistence for humanity, are vital for the development of countries and for the current and future benefit of communities. They can be conserved within or outside their natural habitats or in a combination of both. Outside their natural habitats, they are maintained in genebanks and collections, where they move through different stages and procedures that require personnel trained in a variety of skills.

Latin America has 230 genebanks and germplasm collections, established in the last 30 years, which conserve about 200,000 samples of the region's most important native and introduced crops. Many of these genebanks do not have the capacity to fulfil the three key functions of a bank, which are to conserve the material, regenerate it and distribute it for use. Their lack of capacity is usually attributed to insufficient funding but could also be due to insufficient staff or the fact that genebank staff may not be properly trained to carry out conservation tasks.

The International Center for Tropical Agriculture (CIAT) in Cali, Colombia; Bioversity International, with headquarters in Rome, Italy and a regional office for the Americas in Cali, Colombia; and the Universidad Nacional de Colombia (UNC) in Palmira, Colombia, have been involved in the conservation of plant genetic resources and have conducted, either individually or together, face-to-face courses on this theme for several years.

CIAT maintains in-trust, global genebanks for cassava, rice, common beans and forages and has been training genebank curators to manage germplasm collections for many years. Bioversity is the world's largest international research organization dedicated solely to the conservation and use of agricultural biodiversity. It has published widely on the tools, methods and science of conservation and use of genetic resources and good practices for genebank management in particular. Bioversity has also conducted extensive training for genebank managers and published learning modules on this topic. UNC offers formal degree training in conservation of plant genetic resources at undergraduate and postgraduate levels. CIAT and Bioversity participated in the creation of a Master's degree in Plant Genetic Resources at UNC in 1992 and have supported its development since then.

Although these activities have been successful, demand for more training is increasing. Requests have come from partners in national

organizations in many countries in the region, through personal communication, written requests as well as in international meetings and fora. At the same time, many of these partners cannot afford to maintain a broad programme of face-to-face training.

New information and communication technologies have made it easier to reach a wider audience through distance education, or e-learning. These new learning technologies provide an alternative and more economic method for institutional strengthening in Latin American countries. The region has relatively good Internet connectivity and is also a significant supplier of distance education through the Network of Institutions Dedicated to Teaching Agricultural and Rural Development Policies for Latin America and the Caribbean (REDCAPA). REDCAPA has several years of experience in distance education throughout the region. These conditions make reaching ever-growing audiences possible and, through e-learning, permit the training of personnel working in genebanks.

CIAT, Bioversity and UNC decided to associate with REDCAPA and take advantage of their complementary experiences and strengths to enter the new field of virtual training of technical personnel. To meet the demand for training in plant genetic resources in Latin America, the group chose, as its first initiative, to conduct a pilot e-learning course on the *ex situ* conservation of plant genetic resources.

This report describes how a collaborative association for distance learning between the four organizations was formed and developed. In particular, the report describes the pilot e-learning course on the *ex situ* conservation of plant genetic resources and the results obtained. The report also contains results of different evaluation studies on the association and its activities, together with lessons learned for the benefit of partners and others who wish to take advantage of this experiment in learning.

II. ESTABLISHING THE COLLABORATIVE ASSOCIATION

CIAT, Bioversity and UNC began discussions on an e-learning initiative on conservation of plant genetic resources in 2003. While there was interest in continuing to offer face-to-face training in the subject, the partners had limited resources to do so. They expressed their interest in exploring distance education as an alternative, particularly e-learning, and indicated their concerns as well as their potential contributions on the basis of their resources, experience and strengths.

The three organizations agreed that they needed a partner to supply the platform and services for distance education and invited REDCAPA to join the partnership. REDCAPA, with vast experience delivering distance education Latin America, was interested and offered the partners a course on the characteristics of e-learning. It also described what its contributions to the association would be and the services they could offer at cost.

To formalize the multi-institutional collaboration, the four partners agreed to sign a memorandum of understanding that would serve as a framework for joint activities and a reference point for later evaluations. The agreement, which was signed at the end of 2003, is included in *Appendix 1*.

The objective of the agreement was to establish a collaborative association that would offer computer-assisted distance training on the *ex situ* conservation of plant genetic resources to personnel employed by genebanks, botanic gardens and arboreta, and to other people involved in the use of germplasm, including postgraduate students of plant genetic resources in Latin America.

This objective was to be achieved through 10 activities, the main one being the development and delivery of an e-learning course on the *ex situ* conservation of plant genetic resources. The contents of this course were to be developed by agreement between the parties, and the materials adapted from existing learning materials on the course theme. Other activities would include:

- creation of a community of practice among the partners and participants in the activities;
- familiarization of the members of the community of practice with key aspects of adult education and distance education, particularly e-learning;
- tutoring of course participants and their referral to experts on conservation themes;

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- evaluation of the course and its impact on the organizations which sent participants; and
- search for funds to conduct other follow-on courses.

The agreement also stipulated that the activities would be conducted with personnel from the partner organizations and under the supervision of a coordinating committee that would define and coordinate the activities, provide logistic support and document the results. The committee would be comprised of seven members as follows: one from UNC, four from CIAT, one from Bioversity, and one from REDCAPA.

Likewise, the agreement defined the products to be obtained from the association, the intellectual property of the materials produced, the type of contributions (time, knowledge and kind) and fund-raising activities, for example, small grants or scholarships to enable participants with limited resources to attend the course. The agreement also stipulated that when the course was finalized, a report would be prepared on the results.

A legal representative from each partner organization signed the agreement, which was expected to be in force until 31 December 2004.

III. ACTIVITIES OF THE COLLABORATIVE ASSOCIATION

According to the agreement, the collaborative association's main activity was to conduct a pilot e-learning course on *ex situ* conservation of plant genetic resources targeted to personnel employed by genebanks—from curators to support staff and postgraduate students.

The course would be conducted in Spanish and directed to an audience in Latin America and the Caribbean, with the option of covering Spain, Portugal and Portuguese speaking countries in Africa, provided that the requisites of Internet connectivity could be fulfilled and instructions in Spanish followed.

1. Defining course contents and preparing materials

A community of practice was created among staff in the partner organizations to implement and support the association's activities. The community comprised 26 staff members of the four organizations (see Table 1), with expertise in plant genetic resources and germplasm conservation, university lecturing, adult training (both face-to-face and distance) and dissemination of information.

Community members were expected to contribute ideas and feedback on the course content, help develop the training material and serve as tutors or resource persons during the delivery of the course. Because of their location in Brazil, the three representatives of REDCAPA participated through email, while the representatives of the other three organizations participated in both face-to-face meetings and through email.

Once the community of practice was created, the members met to learn about the project and define the course content. They also attended several workshops facilitated by experts in adult learning who were also members of the community of practice. The objective was to familiarize the group with key aspects of adult training (both face-to-face and distance), such as how to develop lessons for distance mode, the use of new information technologies in distance learning and the idiosyncrasies of virtual communication. REDCAPA created a virtual classroom for the course and tested it with community members to familiarize them with the course environment and software (FirstClass®) that would be used to deliver the course.

Table 1. Members of the community of practice, institutional affiliations and areas of contribution.

Name	Affiliation	Area(s) of contribution
Edith Hesse	CIAT-Information Unit	Coordination
Mariano Mejía	CIAT-Information Unit	Bibliographic documentation; Information
Benjamín Pineda	CIAT-Genetic Resources Unit (GRU)	Plant health quality control
Graciela Mafla	CIAT-GRU	<i>In vitro</i> conservation
Vicente Zapata	CIAT	Specialist in adult education
Ma. del Socorro Balcázar	CIAT-GRU	Germplasm health
Norma Cristina Flor	CIAT-GRU	Germplasm health
Alba Marina Torres	CIAT-GRU	Conservation; seed viability
Arsenio Ciprián	CIAT-GRU	Seed production; forages
Orlando Toro	CIAT-GRU	Introduction; production
César Ocampo	CIAT-GRU	Molecular markers
Julio César Roa	CIAT-GRU	Tissue culture
Liliana Mosquera	CIAT	Course logistics
Margarita Baena	Bioversity	Course design, support materials, genebank contacts
Tito Franco	Bioversity	Germplasm documentation and information
Dimary Libreros	Bioversity	Bibliographic documentation; information
Franco Alirio Vallejo	National University of Colombia (NUC)	Characterization/evaluation
Rigoberto Hidalgo	NUC	Conservation procedures and strategies
Carlos Iván Cardozo	NUC	Conservation
Mario García	NUC	Collection; characterization
Manuel Sánchez	NUC	Physiology
Carmen Rosa Bonilla	NUC	Seed production
Hernando Ramírez	NUC	Biotechnology
Wessel Eykman	REDCAPA	Distance education mediated by computer
Nora Presno	REDCAPA	Distance education mediated by computer
Josiana Almeida	REDCAPA	Distance education mediated by computer

The process was participatory. Members of the community of practice had a chance to share their views on training, conservation of plant genetic resources, technical content of the course and how to work in collaborative associations. These interactions revealed the degree of knowledge and experience of the community members and the complementary strengths of the partner organizations.

Participants gained new knowledge from other members of the community. Together they produced a complete and agreed-upon

contents for a course on the *ex situ* conservation of plant genetic resources. The contents were defined on the basis of: the stages germplasm goes through to be conserved *ex situ*; the functions that staff working in a genebank perform in the various stages of conservation; the concepts and information required to perform tasks; and the competencies (skills) and attitudes necessary to perform them. The community also developed a list of learning objectives associated with the intellectual skills and functions to be performed by genebank staff. These contents became the basis for development of the learning materials to deliver the course. *Appendix 2* contains the detailed contents and the list of objectives.

The next step was to prepare learning units with the characteristics suggested by one of the specialists in adult learning. These units had to be developed by specialists in the themes, particularly experts on plant genetic resources and germplasm conservation. The community of practice was divided into groups, each of which was given a theme to develop and a model to use as a guide for constructing lessons. Task groups were supplied with copies of existing learning materials on the topic (The *Módulo de Conservación Ex situ de Recursos Fitogenéticos* [Module on *Ex situ* Conservation of Plant Genetic Resources], published by Bioversity (as IPGRI) in 2000).

However, the plan did not proceed completely as envisioned because some of the community members had other commitments which had to take precedence. As well, the expert in adult learning and development of materials who had proposed the scheme had to attend other matters. This situation created a vacuum in the development of the task, which forced the coordinator to find an alternative approach. Consequently, three community members took on the task of developing the units, following the scheme and contents initially proposed but with adaptations. Two of these members were designated as course tutors and the third was a consultant in adult education.

The materials developed were organized into 19 lessons, distributed in six modules as indicated in Table 2. Some of the existing learning materials that had been contributed to the course were used as a basis. For other themes, new content was developed.

For quality control, the learning materials developed for the course were reviewed and endorsed by Dr Daniel Debouck, Head of the Genetic Resources Unit at CIAT. To complement the units, participants were given a bibliography containing 234 references

Table 2. Final course contents.

Modules	Lessons
1. Basic concepts of plant genetic resources conservation	Plant genetic resources, biodiversity and agrobiodiversity Conservation strategies Minimum requirements for conservation
2. Germplasm acquisition and introduction	Criteria to acquire plant germplasm Procedures to acquire germplasm Introduction of germplasm: regulations to transfer germplasm and quarantine
3. Conservation	A Preliminary germplasm multiplication Germplasm regeneration B Harvest Processing Conditioning and quantification C Checking the biological status of germplasm Seeds Vegetative material D Assessing phytosanitary quality Basic considerations Plant health in the various stages of germplasm management Verification procedures E Conservation Seeds Vegetative material
4. Characterization	Concepts Descriptors Types of characterization Evaluation
5. Genebank management and germplasm utilization	Genebank and collection management Direct and indirect germplasm use
6. Documentation	Concepts Characteristics of a germplasm documentation system Stages in the development of a documentation system Documenting regular procedures in a genebank Data analysis

on the theme of *ex situ* conservation of plant genetic resources, with links to 41 full-text publications in PDF and a glossary of terms related to conservation.

The learning materials were placed in REDCAPA's virtual classroom while the course was developing. To encourage communication between participants, a table of photos, names, electronic addresses, and institutions of all the course participants was added to the virtual classroom.

Copies of the completed materials and associated reference materials were also deposited with the coordinator of the collaborative association. The course materials were developed over nine months, from November 2003 to August 2004.

2. Administrative aspects of course delivery

While the training materials were being developed, the date for the 12-week course was set and the course announced (*Appendix 3*). It was initially promoted through REDCAPA's list of contacts and CIAT's Web page. Because few requests were received, the announcements were sent directly to a list, supplied by Bioversity, of genebanks in Latin America, Spain and Portugal. This call resulted in 108 requests from 12 countries, mainly from people working in genebanks. Table 3 indicates the number of applications received from each country.

Table 3. Number of applicants to the course, classified by country.

Applicants to the course on <i>ex situ</i> conservation	
Country	No. Applicants
Argentina	5
Bolivia	7
Brazil	3
Colombia	25
Costa Rica	6
Ecuador	5
Guatemala	2
Mexico	12
Panama	2
Peru	28
Spain	10
Venezuela	3
Total	108

From the 108 applications, 33 people were selected. Selection was made by consultation among the members of the coordinating committee and based on the following criteria:

- qualifications
- involvement with conservation
- specific jobs in this field
- need for training on the theme
- previous opportunities to receive training specifically on the *ex situ* conservation of plant genetic resources.

Since this was the first e-learning experience for most learners and tutors, REDCAPA advised the selectors to keep the group to a manageable size so that tutors could monitor progress and coach learners.

The candidates accepted for the course were notified of their acceptance and received instructions for registration. REDCAPA handled the registration process. Of the 33 who were accepted, 28 registered. Because the course was a pilot course directed mainly at organizations in developing countries, the collaborative association wanted to encourage participation from these countries by offering scholarships in the form of refunds for registration costs (US\$100) to those who would successfully finish the course. These grants were made possible through contributions from Bioversity, IICA-PROCIANDINO,¹ CLAYUCA,² FLAR³ and the Colombian Ministry of Agriculture. The funds collected covered the costs of the 22 participants who successfully finished the course.

Those who were accepted for the course but did not register were contacted by email during the evaluation of the pilot course to find out why they had changed their mind, why they were interested in the course and if they would be interested in taking the course again should it be offered. No response was obtained.

3. Delivering the course

The course began on 17 August 2004 with 28 students, two tutors and one consultant on adult education. Table 4 shows the distribution by country of the students who started the course.

¹ Inter-American Institute for Cooperation in Agriculture (IICA); Cooperative Program for Innovation in Agricultural Technology for the Andean Region (PROCIANDINO, its Spanish acronym).

² Consortium to Support Cassava Research and Development in Latin America and the Caribbean (CLAYUCA).

³ Latin American Fund for Irrigated Rice (FLAR).

The course, designed as a synchronous course to be delivered in 12 weeks, with deadlines for the students to complete assessment tasks, lasted six months. During the first week participants familiarized themselves with the virtual learning environment and resolved issues related to operating in a virtual campus and access problems. The students practised downloading resources and sending messages or documents to the virtual campus and contacting other participants.

Table 4. Number of students registered in the course, classified by country.

Students who started the course on <i>ex situ</i> conservation	
Country	No. of students
Argentina	1
Bolivia	1
Brazil	1
Colombia	6
Costa Rica	2
Ecuador	1
Guatemala	1
Mexico	4
Peru	8
Spain	2
Venezuela	1
Total	28

After this introduction and tests to verify that all students were connected and knew how to work in the virtual campus, the course began. Tutors placed lessons in the virtual campus for students to download. Students read the material assigned for each theme within a week or 10 days, discussed the material with tutors and other students through messages posted to the virtual campus, and completed tasks assigned at the end of the lessons. The tasks consisted of answering questions, applying information from the lessons to their own work or situation and combining the new information with their previous knowledge and experience.

The original course schedule of 12 weeks was extended because at least half the students could not meet the assignment deadlines. Their employment commitments, including tasks, such as collecting trips or activities in the field, interfered with their course participation which had a fixed time schedule. As a result, the time for each theme was extended to give those students time to complete their tasks and continue. On the positive side, this allowed the group

to remain united, preventing drop-outs, which are usually high in distance-education courses (confirmed by the literature as well as by REDCAPA's experience). The down side was that the course was too long and this had resource implications for the tutors in terms of their own staff time.

Originally, it was planned to include practice sessions in the course, similar to those used in face-to-face courses on *ex situ* conservation (e.g. seed cleaning, characterization, observation of procedures carried out in a genebank). However, because of the difficulties of monitoring in a virtual environment, these practice sessions were replaced by exercises in which the participants had to analyse scenarios related to conservation and resolve them using the knowledge acquired in the course, as well as their own experience if they wished. The students received feedback from the tutors on their assignments.

The students' performance was monitored on the basis of completed assignments and participation in discussions. As the course objective was to update or improve the participants' level of knowledge and to provide opportunities for sharing knowledge with other members of the group, the information from observations by the tutors served as a basis for deciding whether the students had satisfactorily completed the course and could be awarded a certificate. There was no quantitative assessment. A questionnaire was delivered at the end of the course to assess the students' level of satisfaction with the course. This and other evaluations conducted are described in the next section.

Of the 28 students who registered, 22 satisfactorily completed the course (11 women and 11 men). Each received a certificate signed by the four partners of the collaborative association (*Appendix 4*). As well, these students had their registration fees reimbursed through grants made by the organizations mentioned above.

An attempt was made to contact the six students who registered but did not finish the course. The coordinator only provided details for three of them and these students were contacted by email to find out why they had dropped out. Only one replied, indicating that she had to drop the course for a combination of personal reasons, job commitments, problems installing the software and connecting with the virtual classroom, and difficulty in making the registration payment in US dollars (because there were restrictions in her country on foreign currency transactions at the time of the course). She expressed interest in taking the course again and suggested ways to test connectivity before the start of the course.

IV. EVALUATING THE COURSE AND THE COLLABORATIVE ASSOCIATION

To document the results of the course and the experience of the collaborative association, three different and complementary evaluations were made. The course tutors administered an end-of-course workshop evaluation to the students who completed the course to assess their level of satisfaction. Another external evaluation, of the students and their supervisors, was conducted to assess the impact of the course and determine whether distance education offers a viable alternative for plant genetic resources training. A third evaluation was carried out by a member of the coordinating committee to assess the effectiveness of the collaborative association. The results of the three evaluations are summarized below.

1. Course evaluation by the students, administered by the tutors

The tutors administered a questionnaire (*Appendix 5*) to the students who successfully completed the course to assess their level of satisfaction. The questionnaire was intended to assess:

- how much knowledge the students had acquired on the six major themes of the course
- whether any important themes had been omitted
- whether the students had changed their perceptions of *ex situ* conservation of plant genetic resources as a result of participating in the course
- in what way the course had contributed to improving the students' performance in their jobs
- the level of difficulty the students experienced with the training materials used
- if the students believed they had contributed to the learning of their peers and if they had learned from them
- how the students rated the course in general.

All participants rated the course as very useful because it contributed information on key aspects of their work, reinforced their knowledge in other areas and informed them about what colleagues in other countries and organizations were doing. The students rated the training materials positively for both quantity and quality. They also gave a positive score to the tutors and coordinators for their persistence in bringing the course to completion, keeping the students together and encouraging them to complete the course successfully.

Following is a summary of the answers to the evaluation questionnaire:

Table 5. Level of knowledge acquired in the various modules (percentage of answers).

Module	Very high	High	Medium	Low	None
Basic concepts on the conservation of plant genetic resources	30	61	9	0	0
Germplasm acquisition and introduction	26	58	16	0	0
Germplasm conservation	55	39	6	0	0
Germplasm characterization	25	61	14	0	0
Genebank management	55	36	9	0	0
Germplasm documentation	36	59	5	0	0
Average	38	52	10	0	0

a) Level of knowledge acquired in the various modules

The same results are also shown in Figure 1.

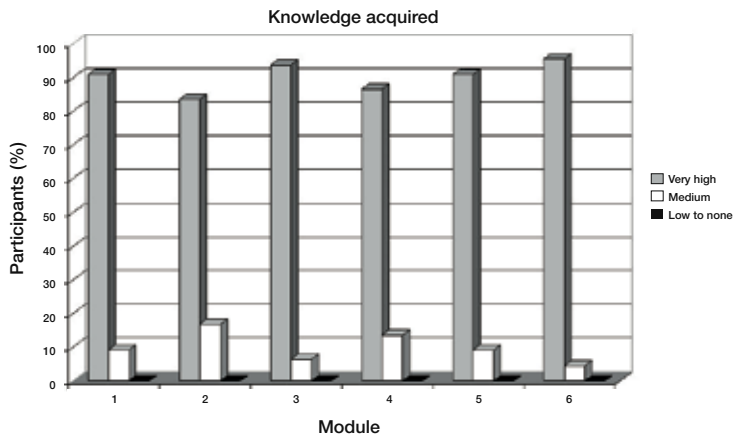


Figure 1. Participants’ perceptions of level of knowledge acquired in the six course modules.

b) Students’ perceptions about completeness of course contents

Seventeen students considered that the course content was complete, while five students considered that topics had been left out (Table 5). Some of the perceived gaps noted by the latter were: measuring or quantifying plant genetic resources; maintaining genetic integrity of original accessions; and ensuring that samples distributed to genebanks are free of transgenic materials. Another

comment was that more in-depth treatment was needed on topics such as statistical methods to document germplasm; recording data in the field; acquiring germplasm; how to deal with recalcitrant and intermediate seeds; how to manage asexual seed and vegetative materials; and means to acquire germplasm.

c) Changes in the perception of *ex situ* conservation of plant genetic resources as a result of participating in the course

Fifteen of 22 (68%) indicated that their perception of *ex situ* conservation had been either significantly or completely changed.

- Completely changed: 6
- Significantly changed: 9
- Moderately changed: 6
- No change: 1.

d) Perception of which course module had contributed (or could possibly contribute) most to student's current work

- Module 1 (fundamentals of plant genetic resources conservation): 5
- Module 2 (germplasm acquisition and introduction): 5
- Module 3 (germplasm conservation): 18
- Module 4 (germplasm characterization): 12
- Module 5 (genebank management): 13
- Module 6 (germplasm documentation): 15.

Students mentioned that all modules, noted in point (a) above, contributed to their knowledge of how to conserve germplasm *ex situ*, that they had never received so much information in a training event on this topic, and that modules 3, 4, 5 and 6 on germplasm conservation, germplasm characterization, genebank management and germplasm documentation, respectively had been particularly important and relevant to their work.

e) Degree of difficulty of course modules (number of answers)

- Module 1 (fundamentals of plant genetic resources conservation): 1
- Module 2 (germplasm acquisition and introduction): 7
- Module 3 (germplasm conservation): 8
- Module 4 (germplasm characterization): 1
- Module 5 (genebank management): 2
- Module 6 (germplasm documentation): 1
- None: 7.

In general, most students did not consider the course modules to be difficult. About one-third of the students thought that Module 2 on germplasm acquisition and introduction and Module 3 on germplasm conservation were more difficult because of the regulations associated with the movement of germplasm (Module 2) and the biological and phytosanitary aspects associated with germplasm conservation (Module 3).

f) Students' perception of significance of their contribution to the learning of their peers

- Very significant: 3
- Moderately significant: 13
- Somewhat significant: 6
- Not significant: 0.

Thirteen (60%) of the students believed that their contribution to the learning of their peers was moderately significant and 1% believed it was very significant. One student mentioned a lack of feedback on how peers perceived his/her contributions.

g) Significance of contribution of other students to student's learning

- Very significant: 15
- Moderately significant: 6
- Somewhat significant: 1
- Not significant: 0.

In contrast, 15 students (68%) considered the contribution of their peers to their own learning was very significant. Overall, students seemed to value the view points and contributions of their peers as well as the chance to learn what is being done in other countries in terms of *ex situ* conservation and genebank management. Sharing professional work experiences was also mentioned as a way to learn and teach.

h) Students' overall rating of usefulness of the course for themselves, their organizations and their countries

- Very useful: 21
- Useful: 1
- Somewhat useful: 0
- Not useful: 0.

Twenty-one students (95%) rated the course as very useful for themselves, their organizations and their countries. The most frequent

comments were that the course had made a significant contribution to the student's country, that it was applicable to the work they do and that they had acquired new knowledge and/or strengthened their existing knowledge. Students felt that the course had been interesting, complete in terms of content, timely and very relevant to their current jobs, made a valuable contribution to the theme of plant genetic resources and that the supporting literature had been very valuable.

The students' comments will lead to improvements in future courses. For example, they suggested a shorter course, reduced volume of learning material to study, more frequent interactions with tutors (in terms of feedback on progress), and the need for hands-on practice sessions.

The students also expressed a desire to continue communicating and exchanging information and opinions with each other on the *ex situ* conservation of plant genetic resources. In response to this request, the coordinating committee created a discussion space in D-groups (<http://www.dgroups.org/groups/cgiar/Ex-situ>). The group is still moderately active. Members post requests for information (particularly regarding germplasm acquisition or taxonomic identification), opportunities for training and funding and announcements of relevant literature to the group. No discussions on issues of germplasm conservation or genebank management have been held.

This evaluation led course tutors to conclude that the course contributed to the training of human resources for the conservation of plant genetic resources, thereby contributing to the strengthening of the genebanks at which the students were employed, and that it promoted the exchange of experiences and knowledge among course participants.

2. External evaluation of the course

To complement the end-of-course evaluation, the coordinating committee considered it was relevant to conduct an external evaluation of the course. This study was carried out by a CIAT specialist on evaluation and impact in consultation with members of the coordinating committee and other personnel from the partner organizations.

The objectives of this evaluation were: to measure whether e-learning constituted a viable and suitable alternative for transmitting technical knowledge to remote audiences; and to determine whether the methodology used in the pilot course was appropriate for future distance-education and online courses.

The evaluation was made qualitatively for four areas of impact⁴:

- Reaction: the students' level of satisfaction with the e-learning experience
- Learning: the degree by which the students increased their knowledge or improved their skills on *ex situ* conservation of plant genetic resources
- Behaviour: the degree to which course participants changed their attitudes towards their work
- Results: the tangible or intangible effects perceived in the organizations where the participants were employed as a result of their training
- Appendix 6 contains a detailed report of this evaluation.

a) Reaction

Overall, most of the participants who completed the course expressed great satisfaction with the results, giving a high rating to the level of knowledge acquired and to the relevance of this knowledge to their work. Among the positive aspects, the quantity and quality of the supporting materials were highlighted as well as the opportunities to exchange knowledge and experiences with other professionals in Latin America who conduct similar work in other organizations.

Perceptions of the *ex situ* conservation of plant genetic resources before and after the course changed significantly according to the responses from 77% of the participants. The evaluator considered that this was a good indicator of the course having accomplished one of its main objectives, which was to help strengthen the human talent involved in conserving plant genetic resources in Latin America.

The contributions made to colleagues (qualified as moderately significant) and received from them (highly significant) suggest that mutual contributions of knowledge among participants was an outstanding aspect of the course, and should be a feature of this type of programme in the future.

Another outcome valued by the participants was the opportunity to continue interacting with their colleagues in the community of practice formed at the end of the course, to strengthen the professional exchange initiated during the course.

⁴ The study followed the methodology recommended by Donald L. Kirkpatrick in Kirkpatrick D.L.1998. Evaluating Training Programs: The Four Levels (2nd ed.). Berrett-Koehler Publishers, Inc., San Francisco, CA, USA.

b) Learning

According to the final evaluation conducted by the participants, most students (90.1%) rated the item 'acquired knowledge' as high to very high. That is, they recognized that the course made a significant contribution to their knowledge of the management of plant genetic resources.

The modules on germplasm conservation and genebank management received the highest rating (very high) from 55% of students. This coincides with the results for the question on the contribution of different themes to the students' work, where the module on germplasm conservation was again rated highly. The e-learning experience offered a new modality of learning for the participants in the pilot project. According to the tutors, the technological challenge of teaching and learning in a virtual environment and giving or receiving feedback through electronic communication was a significant learning experience for both tutors and students.

c) Performance

In order to determine if participants' performance at work had changed as a result of knowledge acquired in the course, a questionnaire was sent to their supervisors. The questions related to the application of new knowledge to daily tasks, sharing of new knowledge with colleagues in the organization, and aspects of performance that had been modified after the course.

According to the evaluator, for a change of performance to occur as a result of participating in a training programme, the following conditions must be met:

- The person wishes to change
- The person must know what to do and what not to do
- The person must work in a suitable environment
- The person must be rewarded for changing.

It was not possible to detect if the participants in the course on *ex situ* conservation of plant genetic resources had adequate working conditions to bring about substantial performance changes. However, the enthusiastic responses of the students to the final evaluation of the course, and the positive appreciation of the supervisors on their post-course performance suggests that some positive changes did occur.

The most remarkable change observed related to decision making in the students' daily tasks (reported by 87% of supervisors). With their newly acquired knowledge, they felt more self-reliant in making

decisions. Notable changes were also detected in work planning and organization (75%) as well as in team work. As indicated in the survey, most students (100%) shared their new knowledge with their colleagues at work, thus improving work efficiency.

As indicated by the evaluator, the attitude of managers and supervisors is key to ensuring the future success of training events such as this course. Institutional support for the professionals who participate in this type of course is fundamental if new knowledge is to be applied to daily work and to benefit not only participants but also work colleagues and, hence, the organization as a whole.

d) Results for the organization

In the evaluation of this course, it was important to measure how much the students' learning contributed (or could contribute) to improving the performance of their organizations, given that this course and future training programmes aim to develop institutional capacity for the conservation of plant genetic resources.

The students' supervisors were asked their opinions on how formal distance-education programmes on *ex situ* conservation of plant genetic resources could contribute to the following objectives:

- Developing institutional capacity for the conservation of plant genetic resources
- Improving national efforts to conserve plant genetic resources
- Strengthening the capacity of personnel responsible for managing plant genetic resources to create as well as to analyse and synthesize information.

Most supervisors considered that such courses could contribute to the stated objectives at a moderate to high level. They suggested that contributions to institutional performance would occur if the individual performance of the participants was improved, attention was given to their working conditions and if their activities were supported.

All (100%) responding supervisors reported that the professionals who participated in the course had taken back to their organizations new work strategies or procedures, applying acquired knowledge, such as:

- Germplasm evaluation
- Revising seed quantity stored, as what was being maintained was minimal
- Joint planning of viability tests with assessment of phytosanitary quality
- Establishment of a centre for agrobiodiversity

- Formation of interdisciplinary teams to study species of interest for genetic resources
- Recommendations to improve the documentation of plant genetic resources

One aspect, indicated as important by students, tutors and supervisors, was the allocation of time for workers participating in distance education courses. Of the supervisors who answered the survey, 43% considered that 30% of the student's work time should be dedicated to the course; 29% thought that course participation should take place only in the student's personal time; 15% indicated that it should take 10% of work time; and 15% proposed that time be distributed proportionately between work and personal time to obtain the greatest commitment of trainees.

Such diversity of opinions results from the distinct policies and practices for training professionals used in the different organizations that manage plant genetic resources in the region. When planning future courses, the availability of time that participants will have must be taken into account and the different expectations that they may bring should be clarified.

A question was also asked about the ideal length of a course of this nature. Of those surveyed, 71% considered six months to be adequate, while the rest (29%) suggested shorter periods (between one and three months).

e) Advantages and disadvantages of distance learning courses

One of the main objectives of this pilot experiment was to evaluate how the distance learning modality, which attempts to broaden cover and reach a greater audience, compares with face-to-face courses that were offered in the past.

The advantages of e-learning courses reported in the surveys included:

- The possibility of combining the course with daily work
- The opportunity to easily interact with people from other regions or countries who have the same academic interests
- Greater exchange of information, in that participants have access to answers from evaluations of other participants
- Access to updated bibliographical information
- Participants can establish their own pace to study the course materials
- Saving resources

The perceived disadvantages included:

- The management of plant genetic resources involves practices that are almost impossible to teach electronically as they require manual management of the species and transmission of knowledge from person to person
- Inequalities exist in technological facilities in different countries, so some students cannot participate fully, e.g. in chats or downloading large files
- The lack of personal contact between instructors and students.

The third element to be evaluated was the collaborative association itself. The coordinating committee thought it would be useful to evaluate the effectiveness of the association before offering a new e-learning course. A survey was conducted with 21 people from the four partner organizations. These people were members of the community of practice that had participated in various activities and stages of the distance-education course.

The survey was developed in consultation with the coordinating committee and two specialists in impact evaluation. Diverse aspects of the establishment, operation and results of the collaborative association were evaluated, including accomplishment of objectives, execution of activities, contributions of the different partners, time dedicated to the association's activities, efficiency in managing the association and the conditions for continuity. The results are summarized below. Appendix 7 contains a detailed report of the evaluation.

3. EVALUATION OF THE COLLABORATIVE ASSOCIATION

a) Respondents' roles in the collaborative association⁵

One-third of the 17 respondents to this question contributed to the contents of the course and participated in the evaluations (Table 6). The second most common role was providing course materials, participating in reviews of these materials or acting as a legal representative for one of the organizations forming the collaborative association. Overall, the answers illustrate the various roles that the respondents performed in the stages and activities of the Association, whether during the initial phase, in the preparation and development

⁵ The tables with results from the survey that are included in this document indicate the number of respondents to the question over the total number of people who answered the survey (i.e. 18). For the number of answers to the question, the percentage is indicated in relation to all answers to the question. Where the questions permitted choosing more than one item in the answer, the number of answers refers to the number of people who marked each option (over a total of 18).

of the course, or after the course, thus contributing to one or several stages or activities according to their area of expertise.

b) Perception of the extent to which the objectives of the collaborative association were met

Of the 18 respondents, 15 (83.3%) thought that the objectives had been met (Table 7). Of this group, eight thought that the objectives were achieved at a level higher than expected. The positive trend across most of the answers indicated consensus that the association's objectives were attained: that is, the association was established and maintained, the course was conducted and the representatives of the collaborating institutions indicated their intention to continue. However, three of the respondents felt that the objectives had been attained at a level below expectations because the activities focused solely on the course without strengthening the collaborative association.

Table 6. Respondents' roles in the collaborative association.

Role	Answers	
	(no.)	(%)
Supplier of course contents	6	35.3
Evaluator	6	35.3
Reviewer of course materials	4	23.5
Official or legal representative of a partner institution in the project	4	23.5
Supplier of course materials	4	23.5
Resource person for educational aspects	4	23.5
Tutor	3	17.6
Other (specify)	3	17.6
• Supplier of technical support	2	11.8
• Supplier of grants	1	5.9
Total	17	
No answers	1	

Table 7. Extent of achievement of objectives of collaborative association.

Perception	Answers	
	(no.)	(%)
Above expectations	8	44.4
As expected	7	38.9
Below expectations	3	16.7
Total	18	

c) Perceptions about how well the association completed its activities

The agreement signed by the members of the collaborative association identified 10 activities (Table 8). Perceptions about how well the association completed these activities varied. Responses appeared to depend on the information that each person had, based on their direct involvement in the activity. Eight of the 10 activities were completed, even if some required adjustments in the process.

Activities perceived as having been completed in the way that was planned were: creation of the virtual classroom; familiarization with e-learning; mentoring of students throughout the course; and evaluation and documentation of the pilot project. Activities perceived as completed but with adjustments were: taking advantage of the community of practice to share knowledge and enhance collaboration; development of course contents and training materials in a consensual way; and evaluation of the impact of the course. The activity perceived as partially completed was the referral of students to experts on themes of conservation. The activity which

Table 8. Perception of achievement of activities by the collaborative association.

Activity	Achieved as originally envisioned	Achieved with adjustments	Partially attained	Not attained
Through a community of practice, share knowledge and take advantage of the strengths of each member to achieve the objectives	(3) 19%	(11) 69%	(2) 12%	(0) 0%
Develop course contents in a consensual manner	(7) 44%	(8) 50%	(1) 6%	(0) 0%
Adapt course materials from existing materials	(4) 27%	(10) 67%	(1) 7%	(0) 0%
Create a virtual classroom to develop the course	(13) 87%	(0) 0%	(0) 0%	(2) 13%
Familiarize members of the community of practice with e-learning procedures	(11) 73%	(4) 27%	(0) 0%	(0) 0%
Accompany the students as tutors or consultants during course delivery	(7) 54%	(6) 46%	(0) 0%	(0) 0%
Refer students to experts on certain themes to expand information from the course	(2) 17%	(2) 17%	(6) 50%	(2) 17%
Evaluate the course and document the experience	(7) 58%	(5) 42%	(0) 0%	(0) 0%
Prepare concept notes to seek funds	(0) 0%	(3) 30%	(1) 10%	(6) 60%
Design and apply a survey to evaluate the impact of the course on the participants' performance	(5) 42%	(6) 50%	(1) 8%	(0) 0%
Total of all answers				16
No answers				2

The highest percentages for each answer are highlighted in bold. The values in parentheses indicate the number of people who ticked this option.

respondents felt had not been completed was the preparation of concept notes to seek for funds.

Of the eight activities perceived as completed in the way originally envisioned or with adjustments, six referred to complex activities that required mobilization of people and continuity, such as the development of training materials and using the community of practice to achieve greater sharing of knowledge and collaboration. The collaborative association was flexible and able to make adjustments as necessary mid-course. In future, however, the association would benefit from better initial planning in terms of the time needed to complete activities, institutional commitments to release human resources to follow through according to time schedules, strong facilitation to keep the community active and united, and good coordination to ensure that members fulfil their tasks in a timely fashion.

Other comments on the question also highlighted the need to keep participants in the initiative better informed about what was happening, especially if they were not directly involved in an activity. As noted above, after the initial brain-storming with the full community of practice, a small task group formed the core activity team to design and deliver the course. Comments indicate that there was insufficient feedback to the full community of practice during the course implementation.

d) Contributions of the various partners

The respondents tended to answer by indicating the contributions they had made, as well as those made by the organization with which they were associated (Table 9). The areas of work with the greatest participation by partners (>40%) were contribution of ideas to establish the collaborative association, ideas for conducting the distance learning course, materials to develop the course, facilitating meetings, providing information resources, developing and applying evaluation surveys and selecting participants for the course. Most of these areas of work related to the early planning stages of the collaborative association and the course when the full community of practice was engaged.

Areas of work with lower frequency of participation relate to course implementation and delivery, an activity that was delegated, perforce, to a small task group. The diversity of contributions to complete the association's activities and achieve its objectives indicates the capacity and complementarity among participating institutions and individuals.

Table 9. Contributions of the different partners.

Contribution	Answers	
	(no.)	(%)
Ideas to develop the e-learning learning course	14	82.4
Ideas to establish the collaborative association	10	58.8
Providing materials to develop the course	10	58.8
Facilitating meetings in which course contents were decided on	8	47.1
Providing information resources (e.g. publications and references) to complement course materials	8	47.1
Developing and conducting surveys to evaluate both the course and the collaborative association	7	41.2
Selecting students for the course	7	41.2
Contacts to establish the collaborative association	6	35.3
Finding or awarding institutional support to develop the collaborative association	6	35.3
Providing information on distance education	6	35.3
Training members of the Community of Practice on aspects of e-learning	6	35.3
Tutoring	6	35.3
Giving advice to students	6	35.3
Contacts to reach the targeted audience	5	29.4
Providing logistic and administrative support to prepare and develop the course	5	29.4
Adapting or developing course materials	5	29.4
Reviewing the lessons developed and giving feedback to the authors	4	23.5
Providing grants to students	3	17.6
Providing technical support to manage the virtual campus	2	11.8
Other (specify)	2	11.8
All answers	17	
No answers	1	

Table 10. Perceptions of the match between partner contributions and organization's capacity.

Perception	Answers	
	(no.)	(%)
Yes, there was correspondence	16	94.1
No, there was no correspondence	1	5.9
Total	17	100
No answers	1	

e) Contributions according to partner's capacity in their area of specialization

In all, 94.1% of respondents agreed that the contributions they made were appropriate and relevant to them or within their capacity to carry out (Table 10). One response to this question indicated that one organization believed it had a role in reviewing the training materials for the course but did not have an opportunity to do so. When planning future activities, the association should identify the comparative advantage of all participants during the planning phase to ensure it takes advantage of all the available expertise.

f) Time invested by the parties in making their contributions

A total of 62.5% of respondents (10 out of 16) indicated that their effective investment of time was within their expectations, while the other 37.5% (6 people) indicated that it was not. The second group were tutors, who participated very closely in the development of course materials, an activity which requires a considerable investment of time, whether for a face-to-face or an e-learning course. The time to develop the course materials far exceeded their initial expectations. Three respondents involved in the development of the learning materials and the delivery of the course reported that they had invested 90–120 working days in these activities. This compared to 20–30 days reported by other respondents whose contributions (including training materials) had been developed before the course. This additional time had not been budgeted for and therefore created a conflict for the tutors in terms of competition with other work requirements.

The responses to this question and the reasons given for investing so much time in some activities suggest that the tasks in question could have been better planned, more evenly distributed among more people and carried out in a more practical way. This point must be taken into account when considering the continuity of the collaborative association. Likewise, the complementary nature of the different roles and responsibilities and how they will all lead to fulfilling the objectives must be made clear to participants from the beginning.

g) Efficiency and effectiveness of collaborative association management

Slightly more than half the respondents indicated that they were empowered to make decisions on the work they had to do and

Table 11. Perceptions of the match between time contributed and respondents' expectations.

Perception	Answers	
	(no.)	(%)
Yes, there was correspondence	10	62.5
No, there was no correspondence	6	37.5
Total	16	100
No answers	2	

Table 12. Indicators that make a collaborative association efficient and effective.

Indicator	Totally agree	Partially agree	Disagree	This aspect was not taken into account
Each participating institution in the collaborative association was clear on the role it should fulfil and the responsibilities involved	(4) 25%	(10) 62%	(2) 12%	(0) 0%
The collaborative association provided sufficient human resources to complete the various tasks	(5) 31%	(10) 62%	(1) 6%	(0) 0%
Decisions were made in a consensual transparent manner throughout the process	(7) 44%	(8) 50%	(0) 0%	(1) 6%
The association had a mechanism for resolving differences of opinion among participants	(4) 25%	(5) 31%	(3) 19%	(4) 25%
All members participated at all times in the association's activities	(1) 7%	(7) 50%	(4) 29%	(2) 14%
The participants had the capacity to make decisions on the assigned tasks	(8) 50%	(7) 44%	(0) 0%	(1) 6%
The various activities were efficiently coordinated	(9) 56%	(6) 38%	(0) 0%	(1) 6%
The collaborative association provided economic resources for accomplishing certain tasks	(2) 13%	(5) 33%	(2) 13%	(6) 40%
The participating institutions in the collaborative association provided sufficient time for fulfilling the assigned tasks	(5) 36%	(6) 43%	(3) 21%	(6) 40%
Communication among partners was fluid and continuous throughout the process	(6) 38%	(9) 56%	(0) 0%	(1) 6%
The directors of the partner institutions supported the personnel involved so they could fulfil their assigned tasks on time and with integrity	(7) 47%	(8) 53%	(0) 0%	(0) 0%
Confidence was maintained among participants throughout the process	(7) 44%	(8) 50%	(0) 0%	(1) 6%
Total of all answers				16
No answers				2

Answers are presented in descending order or percentage, not following the original order of aspects in the questionnaire. The highest percentages are indicated in boldface. The values in parentheses refer to the number of people who ticked this option in their answer.

that the activities had been coordinated efficiently (Table 12). However respondents felt that the management of the collaborative association could be improved in several areas. A significant number of respondents felt there was inadequate attention paid to four indicators: sufficient time for fulfilling assigned tasks (61%); sufficient economic resources (53%); a mechanism for resolving differences (44%); and full participation of the membership at all times (43%).

There was a significant level of 'partial agreement' in another six areas: clear definition of roles and responsibilities (62%); sufficient human resources to conduct the work (62%); fluidity of communication throughout the process (56%); adequate support from institute directors for staff involved (53%); decisions made in a consensual, transparent manner (50%); and confidence of participants maintained (50%).

In their comments, almost 40% of respondents mentioned perceived gaps in the collaborative association. Recurrent themes were the lack of a concrete work plan and timetable, the lack of clear roles and responsibilities and the underestimation of both the complexity of key tasks (such as developing course materials) and the resources (time, human capacity, funds) needed to carry them out.

This would indicate that there were weaknesses in the planning and decision making processes and ability to operate in a consensual way since not all participants were able to follow through with their commitments. The responses also indicate the possible lack of mechanisms for dealing openly with issues and differences of opinion.

h) Continuity of the collaborative association

In general, the respondents (13 out of 18) thought it was feasible and desirable for the collaborative association to continue, but highlighted the need for a series of conditions that were not clearly defined in the original agreement for the pilot experiment. For example:

- A work plan should be developed and the roles of those participating in the various tasks and stages of the work clearly defined, with estimates of costs and time calculated
- A definition of roles in terms of coordination
- Balance in the representation of partners in the association
- Greater consultation during the decision-making process
- More frequent communication of information during the project, particularly with those who were not directly involved in a given task

- Review of lessons learned
- A system for monitoring and evaluating both the students' learning and the development of the collaborative association.

These comments indicate that, given the complexity of the collaborative association's work, the parties must take the time to develop and execute a work plan, including a monitoring and communications plan and a budget, in a joint consensual manner. This plan, and its corresponding timetable, must be attached to the framework agreement that the partner organizations sign for the execution of activities.

V. CONCLUSIONS AND RECOMMENDATIONS FROM LESSONS LEARNED

The experiment described in this report shows that e-learning is a viable alternative for sharing and publicizing scientific knowledge such as that associated with the *ex situ* conservation of plant genetic resources. The number of requests to take the course (108) indicated that a demand exists in genebanks for training that can be met through courses delivered online.

The literature on e-learning indicates that the costs involved in distance-education courses may be significantly less than those for face-to-face courses. However, the experience of this course shows that the investment of time by qualified personnel is high and, moreover, assembling a course like this one requires personnel with diverse skills. Although, unlike face-to-face courses, there may be no costs incurred for transporting, accommodating or maintaining students, the organizers must invest considerable time organizing, coordinating and delivering the courses, developing training materials, mentoring and providing feedback to students and administering the virtual campus. Costs may be saved or recovered by repeating the courses if labour-intensive tasks such as preparing the training materials are not repeated. However, if there is revision and redevelopment of materials, as is likely to occur, these also have to be taken into consideration.

Re the question of whether it is convenient for an organization to take up an e-learning initiative on its own or in association with other organizations, the experience described in this report clearly shows the convenience of collaborating with a number of organizations with complementary strengths to deal with the volume and complexity of the tasks involved. If these are carried out in a collaborative association, then the different parties of the association must become familiar with what it means to work in partnership, where partners have equal voice and vote on decisions.

Many valuable lessons were learned while the collaborative association was operating and from the experience of delivering a pilot distance-education course. Some were positive, while many others called attention to aspects to take into account in the future. Below we enumerate several lessons learned, taken from evaluation and progress reports on the activities, and from discussions held with members of the coordinating committee. The lessons have been arranged according to the developmental stages of the course and the collaborative association.

1. Planning and preparation

- Before conducting an e-course, a work plan should be prepared and agreed upon, perhaps at the institutional level, that specifically details the responsibilities of each partner organization, the contributions that it is expected to offer throughout the process and the estimated time and costs that it must invest.
- If a collaborative course run by several organizations is being contemplated, then an agreement or memorandum of understanding should be signed. This agreement would indicate the objectives and responsibilities of the various parties (the partners) and would have attached a detailed work plan, including an activity timetable and allocation of financial and human resources.
- Agreements must also be made at the appropriate level of authority, so that actual financial and human resource allocations can be committed, and within the appropriate timing of the budgeting cycles of the various partners. The agreement should include the partners' roles and responsibilities, including mechanisms for decision-making; identify where partners have a comparative advantage; address balance of institutional participation; stipulate provisions for intellectual property, settlement of disagreements, and monitoring and evaluation. There should also be a communication plan for sharing decisions and results and other information related to the agreement.
- The collaborative association established must have clearly defined mechanisms for consultations in decision making, communications, resolution of differences between parties, feedback from members and monitoring and evaluation during activities and on termination of the project.
- Products that will result from the various activities must be clearly defined as well as the role of participants in generating them and the criteria to give credit for contributions. Intellectual property of course contents and products and future use of the products should also be discussed and agreed upon in the early stages of the project and the conditions specified in the agreement or memorandum of understanding.
- The work teams for the distance-education courses should include university lecturers or higher education institutions with a vested interest in the subject. This will create opportunities for incorporating the course contents in the curricula of these institutions. Also, universities can facilitate the award of an academic certificate, that is attractive to students, for successful completion of the course.
- The course must be prepared through team work. Team members should have complementary knowledge and skills, including expertise in the course theme, adult training, design of

curriculum and training support materials, and information and communications technology. Facilitation skills are also important for the team to make good progress.

- To promote the participation of professionals from the partner organizations in e-learning initiatives, incentives must be offered and the activities included in their work plans or performance agreements. Efforts should also be made to ensure that the organizations' performance evaluation systems recognize their employees' effort in carrying out these activities and, where possible, time is freed up and they are compensated for their contributions.

2. Developing or implementing the course

- In the initial stage of the course, some time must be dedicated to familiarizing the participants (i.e., tutors and students) with learning and teaching in a virtual environment and with the technological platform on which the course will be run.
- Another preliminary activity that must be carried out is to make the participants introduce themselves and get to know each other in such a way that links are established throughout the course community (including the tutors), and so promote participation and exchange of ideas and information.
- Each course must have a tutor who directs it from start to finish. While tutors or resource persons may be available for specific themes, there must be one person who monitors the course's development the entire time.
- Distance-education courses need practice sessions in the same way that face-to-face courses do. One option is to design tasks or practical exercises in which the participants must apply knowledge acquired from the course in their work environment.
- The drop-out rate of students in distance-education courses is usually high. The most common reasons are: lack of time to fulfil the tasks set by the course; the need for human contact to feel part of the group; and a lack of motivation to continue to the end. It is important to clearly define the duration and intensity of the course (not recommended to be more than 12 weeks); the amount of time that the student needs to invest daily (2 hours maximum) or weekly (10 hours maximum) to maintain the momentum; and the resources the student would need to complete the tasks assigned. It is also important to adjust the volume of content to match the amount of time to be invested.
- Course tutors and administrators must dedicate time, not only to introduce contents and evaluate tasks, but also to mentor and provide constant feedback, to facilitate the students' staying power in the course, encourage their participation, and ensure

the exchange of opinions and continuous communication so that the students feel as if they belong to a community, which helps motivate them to complete the course. Desertion can be reduced by charging a registration fee and offering a discount or reimbursement to those who finish the course satisfactorily.

- The characteristics of the equipment that the students use, quality of bandwidth and their capacity to connect through Internet are key to the students' performance. The course tutors and administrators must be attentive to these characteristics so that they do not limit the students' participation. For example, conducting chats and electronic conferences can be limited by these aspects.

3. End of the course and project

- To finalize the course, it must be evaluated, both in terms of content and administration. This could be done through questionnaires and complemented by telephone interviews. If the course is paid for by the organizations employing the students, then the students' supervisors should be involved in the evaluation or, perhaps, in a later evaluation to determine the impact that the course has had on their employee's professional performance.
- If the course is conducted through a collaboration among a number of entities, then the parties should conduct evaluations, both internal and external, to extract the lessons learned and continually improve the process. The complete process should be documented for reference by the parties and others in such a way that it can serve as a point of reference for ratifying successful aspects of the course and improving those that need further adjustment. This documentation would be made available for incorporation as 'best practice' or at least for learning purposes.

International agricultural research centres may find distance education a practical and efficient way to enhance capacity strengthening for development and to reach larger and more remote audiences. One such option is to conduct this process in a strategic alliance with universities, distance learning providers and public and private agricultural entities with a comparative advantage for education, delivery and content, respectively. As indicated by the report, these opportunities are available when a number of conditions are met, as shown by the lessons learned.

VI APPENDICES

Appendix 1 Establishing a collaborative association

A collaborative association to conduct a distance education course on the *ex situ* conservation of plant genetic resources was established under the following Agreement:

The inter-institutional cooperation agreement to conduct a distance-education course on the *ex situ* conservation of plant genetic resources

Collaborators

1. National University of Colombia–Palmira (NUC)
2. International Center for Tropical Agriculture (CIAT)
3. International Plant Genetic Resources Institute (IPGRI)
4. Network of Institutions Dedicated to Teaching Agricultural and Rural Development Policies for Latin America and the Caribbean (REDCAPA)

The collaborating institutions have agreed to carry out the Agreement as described by the clauses given below.

Clause one: background

Plant genetic resources form the basis of subsistence for humankind. Yet, they are being lost through overexploitation and habitat destruction. Because they are vital for national development and for the current and future benefit of communities, we must conserve them. Plant genetic resources can be conserved within or outside their natural habitats or in any combination of these environments. Outside their natural habitats, they are conserved in genebanks and collections, undergoing different stages and procedures that require trained personnel.

Latin America has 230 genebanks and collections, established during the last 30 years, where about 200,000 samples of the region's most important native and introduced crops are conserved. Many of these genebanks and collections are not able to fulfil the three key functions of a genebank: conserve materials, regenerate them, and distribute them for use. A major limitation lies with the personnel who work in the genebanks: they are insufficient in number and are not adequately trained to carry out the diversity of tasks inherent in conservation.

Research and training institutions, both national and international, like those who sign this agreement, generate important knowledge that reaches their users through various means such as publications, training events, and Internet pages. The collaborating institutions have individually or jointly carried out face-to-face courses on the *ex situ* conservation of plant genetic resources at levels of both continuous and postgraduate education, in which they have used training support materials on the conservation of plant genetic resources developed by IPGRI. Although these activities were successful, these institutions face the need to reach more users to meet national demand but lack the economic means for maintaining a broad programme of face-to-face training.

New technologies of information and communication offer the possibility of reaching a wider audience through distance education, mediated by computer, which constitutes a new and economic modality for strengthening institutional capacity in Latin American countries. Furthermore, Latin America has relatively good connectivity for the use of Internet and an important supplier of distance education—REDCAPA—with several years of experience and the capacity to cover the entire region, which enables those who sign this agreement to take advantage of their joint experience to meet demand by transferring training from real sites to virtual sites.

Clause two: agreement objective

To jointly forge a strategic partnership that offers, by means of computer, distance education on *ex situ* conservation of plant genetic resources to personnel who manage genebanks and collections, botanic gardens, and arboreta (i.e. from curators to technical support personnel).

A secondary audience of this training would comprise professionals who work in projects or programmes that conserve and/or use plant genetic resources, and postgraduate students in plant genetic resources or related areas.

The training, object of this Agreement, will be offered in Spanish to Latin American and Caribbean countries, with the option of also covering Spain, Portugal, and Portuguese speaking countries of Africa (Angola, Cape Verde, Guinea-Bissau, Mozambique, and São Tomé and Príncipe), provided that they can comply with the requirements of Internet connectivity and can follow the training in Spanish.

Clause three: activities

To fulfil this Agreement's objectives, several activities shall be organized, namely:

5. Create a community of practice among the partners and participants in activities, who will share knowledge and take advantage of each member's different strengths in achieving the objectives
6. Develop consensus on the contents of the course
7. Adapt and/or develop materials needed for teaching those contents
8. Create the virtual classroom and other elements of the platform needed to provide the distance education course
9. Familiarize the members of the community of practice with the inherent aspects of adult education, distance education, and particularly the use of information and communication technologies applicable to distance education mediated by computer
10. Supervise the quality of tutors and advise students during course delivery
11. Refer students to experts on themes related to the conservation of plant genetic resources, who can provide further information on aspects not dominated by the students' mentors
12. Evaluate the course and document the experience for later sharing
13. Collaboratively prepare concept notes for submission to the donor community in search of funds to conduct other courses of distance education
14. Design and use a survey to evaluate the immediate impact of the course on the participants' performance in their work environments (genebanks)

Clause four: the coordinating committee and personnel who will participate in the activities

Activities shall be carried out by personnel designated by each institution and managed by the coordinating committee, which consists of the following people:

- Franco Alirio Vallejo, Postgraduate Director, NUC
- Edith Hesse, Head, Information and Documentation Unit, CIAT
- Margarita Baena, specialist in information and training, IPGRI–Americas
- Wessel Eykman, Director, REDCAPA
- Vicente Zapata, senior research fellow, CIAT
- Benjamín Pineda, research associate, Genetic Resources Unit, CIAT
- Mariano Mejía, coordinator of public services and consultant in adult education, Information and Documentation Unit, CIAT.

The coordinating committee shall be in charge of carrying out the following activities: defining objectives, coordinating activities, providing logistical support, and documenting results.

Clause five: outputs of activities

The activities carried out within the framework of this agreement will result in the following:

- A group of at least 25 students with a holistic view of *ex situ* conservation of plant genetic resources that will enable them to effectively and efficiently carry out conservation tasks
- A group of 15 tutors with up-to-date knowledge in *ex situ* conservation and skills for distance education mediated by computer
- A model of a distance education course on *ex situ* conservation of plant genetic resources that can be replicated
- A group of materials for distance education on the basic principles of *ex situ* conservation of plant genetic resources and genebank management
- A report on the execution and evaluation of the course that records what was done and what was achieved.

Clause six: intellectual proprietorship of the training materials

The materials used for this course shall remain in the public domain and shall be freely available to any interested user. The copyright of the materials existing before the course and those used to execute it shall belong to the institution that generated these materials.

The copyright or intellectual rights over new materials developed for the course shall belong to the collaborating entities that developed them jointly and shall be handled as public domain products.

The users of these products shall recognize the origin of the materials and, when using them, shall give due credit to the institutions that developed them.

CIAT shall be in charge of placing the course materials in public repositories for distance education to ensure greater dissemination and use of the same.

Clause seven: duration of the agreement

This agreement shall be in force until 31 December 2004. The agreement shall be extended to fulfil its objectives and/or to broaden its cover to execute new courses until such time that any of the signatory institutions notifies, in writing, the other signatories to the contrary.

Clause eight: contributions of each member and budget

Preparation of the course shall be covered by contributions in time, knowledge, and kind (e.g. training materials and references) from

members of the collaborating institutions, and shall form part of the responsibilities and work plans of these people. During course delivery, the time dedicated to teaching shall also be a contribution in kind from each institution and participant.

A project shall be prepared to seek funds for awarding grants to students from countries or institutions with limited resources. These grants shall be allocated to cover costs of registration and student materials.

Clause nine: reports

At the end of the course, a report shall be generated that shall include the general evaluation of the course. A follow-up survey of the students shall be conducted one year after the course is completed.

In proof of agreement, the following representatives sign on behalf their respective institutions:

(Signature)

María Sara Mejía de Tafur
Vice Rector
National University of
Colombia–Palmira

Date and place of
signature:

(Signature)

Joachim Voss
Director General
CIAT

Date and place of
signature:

(Signature)

Ramón Lastra
Regional Director
IPGRI–Americas

Date and place of
signature:

(Signature)

Wessel Eykman
Director
REDCAPA

Date and place of
signature:

Appendix 2

Course contents and objectives

The course contents and objectives described in the following two matrices were products of discussions by the Community of Practice. The first matrix describes course contents and the second, course objectives

Course on *ex situ* conservation of plant genetic resources: contents analysis (version 5, 10 December 2003)

Stages undergone by germplasm (Personnel)	Functions carried out in the bank	Information needed to carry out each function (contents)	Contents of each entry in the previous column	Desirable mental abilities and skills (competencies), i.e. personnel can:	Attitudes personnel need to carry out each function
I. Introduction/ acquisition (includes quarantine, movement of germplasm, and documentation) [Orlando (rapporteur (r)), Mario]	1. Collect germplasm Exploration Planning	What will be collected, where, and how Quarantine norms and procedures How to plan and conduct a collecting mission Methods for collecting different types of material	Documentation of each activity Biology of species Centres of origin and diversity Regulation of access Quarantine norms Collection format (passport data) Taxonomy of species	Quantify and/or measure existing holdings to then plan collections Manage activity timetables to ensure coverage of the areas to be visited, time for each area, and effectiveness of the same Determine urgencies in terms of gaps (e.g. genetic erosion) Interpret contingencies and make adequate decisions (e.g. no seed, so bring cuttings, seedlings, pollen, and immature seeds for <i>in vitro</i> culture)	Responsibility
	2. Obtain germplasm through donation or exchange	Sources of germplasm Conditions of access Standards and/or regulations Quarantine	Regional and international standards Quarantine Information on the germplasm Quality of germplasm being acquired	Compare holdings with those of other banks Decide on the value of exchanging and/or requesting Visualize advantages and disadvantages, workloads, and other factors, in the event of exchange	
	3. Introduce and manage germplasm Seeds Plant material	Conditioning, temporary storage Review documentation, inspect plant health quality, and place in quarantine if necessary	Information on the species (biological state) Information on how to condition the germplasm Documentation If plant material, know: Regulations Principles of <i>in vitro</i> culture How to identify plant health problems	Recognize and locate passport data and any other information that permits maintaining good documentation Recognize gaps in the holdings and how to fill them Recognize potential uses of crops and be attentive to their conservation and distribution	

	4. Temporary storage	Knowledge of: Type of material (seed, plant material) How to store the materials	Knowledge of conservation technologies	Generate, analyse, and report data within the 'temporary storage' activity	
II. Cleaning (plant material) [Graciela (r), Julio César]	Eliminate pathogens	Know the pathogens that the material can carry and those that must be eliminated Define thermotherapy protocols to eliminate pathogens Know techniques to disinfect and culture meristems	Knowledge of Pathogen and species Tissue culture	Understand the concepts of pathogen eradication Efficiently apply methodologies of meristem culture	Disposition to conduct meticulous work
III. Increase Multiplication Regeneration Characterization Documentation	1. Multiply	Germplasm passport data Material's physiology Biology and taxonomy of the species Knowledge of state of quarantine and plant health (for plant materials) Protocols Propagation technology	Holdings: records, suitable environment for multiplication Botany Taxonomy Reproductive biology Physiology of seed or plant material General norms, species requirements, protocols Sexual = seed Asexual = propagation materials	Analyse entry of new germplasm to the bank Create procedures to maintain genetic composition of the introduced germplasm Create adequate protocols for producing sufficient and viable seed, whether sexual or asexual Efficiently apply cleaning protocols for both sexual and asexual seed carrying pathogens	Resourcefulness and patience
[Rigoberto (r), Arsenio, Manuel, Franco Alirio, César, Tito, Carmen Rosa]	2. Regenerate	Passport data Environment for production Minimum population size Monitoring of quantity and viability	As above More information from results of increase Reproductive biology (information) Characterization (information and access to databases)	Create procedures to maintain the genetic identity of the conserved germplasm Analyse possible environments for the adequate multiplication of conserved germplasm Efficiently apply cleaning protocols for both sexual and asexual seed carrying pathogens Apply agronomic methodologies suitable for the species	Attention to detail

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	3. Characterize	Botany Taxonomy Systematics Genetics Biochemistry Molecular biology Biometrics and databases	Identify descriptors Implement the most suitable biochemical and molecular techniques Characterization Morphological Biochemical Molecular Evaluation Biotic factors Abiotic factors	Understand the species in an integrated way (biology, genetics, evolution, and variability) Apply characterization methodologies according to the species being conserved Analyse results Synthesize results (scientific article, catalogue, bulletin)	Meticulousness, creativity, and resourcefulness
IV. Conditioning Conservation Documentation	1. Pre-dry fruits	Knowledge of: Environmental conditions Fruit characteristics	Infrastructure and tool evaluation	Understand the concept of seed quality Evaluate to determine germplasm flow	Organization and conscientiousness
	2. Extract seeds	Knowledge of the type of material being worked with	Knowledge of fruit structures and seed hardness	Conduct analyses towards developing criteria for separating and selecting seeds for extraction	Speed and efficiency
[Alba Marina (r), Carlos Iván, Dimary, Graciela]	3. Pre-dry seeds	Knowledge of: Seed physiology Drying technology	Knowledge of: Hygroscopicity Moisture contents in balance Tolerance of desiccation	Be creative in developing methodologies	Attention to detail, readiness to make decisions, and willingness to document data
	4. Clean and select seeds	Knowledge of: Physical characteristics of seeds Plant health state	Knowledge of the seed in terms of size, form, colour, and weight	Conduct analyses towards selecting seeds and calibrating equipment	Attention, concentration, and creativity
	5. Temporary seed storage	Knowledge of: Appropriate methodologies and techniques Number of seeds for conservation (sample size) Physiological and sanitary quality	Know conservation protocols Send materials to laboratories for viability and health tests	Conduct analyses towards applying conservation protocols	Responsibility and availability
	6. Dry seeds for storage	As above	As above	Creativity to develop methodologies	As above

	7. Pack seeds	Knowledge of: Types of containers Number of seeds to pack per sample	Adjust to given conditions	Understand the packing process	
	8. Store seeds or plant material for different purposes (e.g. distribution, base collection, monitoring, repatriation, duplication)	Knowledge of : Physiology of the crop or material being conserved The optimal conditions to conserve it	Knowledge of the material's longevity, viability, and health	Conduct analyses towards applying conservation protocols	Responsibility
V. Monitoring the germplasm's biological state [Alba Marina (r), Carlos Iván]	1. Monitor initial germination, vigour, and viability (post-increase) of seed or plant material	Know: Sampling techniques Morphology of seed or plant material Characteristics of the species Physiology of germination Germination protocols Principles of biochemistry	Knowledge of germination technology	Conduct analyses towards making decisions on the materials being evaluated	Attention to detail, patience, and creativity
	2. Periodically monitor germination and vigour	Know: Sampling techniques Seed morphology Characteristics of the species Physiology of germination Germination protocols Internal control (alert)	Knowledge of germination technology	Conduct analyses towards making decisions on the materials being evaluated	Attention to detail, patience, and creativity
	3. Conduct tests for viability (in seeds with latency)	Know: Sample size Seed anatomy Seed physiology	Principles of biochemistry	Capacity to analyse for making decisions with the materials being evaluated	Attention to detail, patience, creativity, and responsibility

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	4. Conduct physical purity tests on those materials requiring them	Know: Sample size Morphology of seeds and associated structures		Understand the concepts of purity	Attention to detail
	5. Conduct tests on moisture content	Know: Sample size Protocols of tests for moisture content	Know equipment and their operation Apply formulas	Understand the protocols for tests	Attention to detail
	6. Report results of tests on viability, purity, and moisture	Know databases		Understand the importance of timely information	Periodically communicate the results
VI. Plant health quality control Documentation [Benjamín (r), Norma, Ma. del Socorro]	1. Verify the quality of health of germplasm being conserved	Types of pathogens associated with the species' planting material Effect of pathogens on the quality of planting material (seeds and plant materials), and implications for germplasm movement Types of pathogen-propagule association (seed and plant materials) Methods for diagnosing (detecting) pathogens	Obligate parasites (fungi, bacteria, phytoplasmas, viruses); facultative parasites (fungi, bacteria, nematodes); saprophytes (fungi, bacteria, nematodes) Physiological and physical deterioration; reduced vigour and germination; storage problems; epiphytes; implications of legal requirements, quarantine, and policy Infection, infestation, and location of pathogens Diagnosis of obligate and facultative parasites	Have a capacity to: Adequately identify materials (analysis) Inspect samples and differentiate normal from abnormal germplasm (judgement, analysis, evaluation) Apply diagnostic procedures (application) Generate, analyse, and report data obtained (understanding, judgement, analysis) Identify new situations, evaluate their importance, and generate information (understanding, synthesis)	Attention, concentration, and responsibility

	2. Documentation	Organize information from results of analyses on germplasm health Management of Information systems Know the requisites (transfer agreements) and information for quarantine	Interpretation and final analysis	Communication skills in receiving and transmitting information	Attention, concentration, and responsibility
	3. Consultation	Conventional or empirical professional training: Introduction Increase Conditioning Germplasm distribution Basic knowledge on the species being handled Specific knowledge on associated diseases and pests	Knowledge on: Crop Biology Reproduction systems Agronomy Pests and diseases	Communication skills in receiving and transmitting information	
VII. Distribution Repatriation Duplication for safety Documentation	1. Process germplasm requests	Review information: In databases (availability and condition) For shipping	Know: The sample size to be sent Plant health requirements of the countries receiving the germplasm	Conduct analyses towards making decisions on rejecting or accepting a request for materials	Attention to detail and responsibility
[Alba Marina (r), Graciela]	2. Prepare shipment of samples	Receive feedback from users Prepare sample to be sent (sexual seed or <i>in vitro</i> plant material)	Receive acceptance of agreements and requirements	Correctly apply the procedures for germplasm exchange	Attention to detail and responsibility

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3. Pack and send samples	Attach necessary documentation (import permit, plant health certificate, passport data) Allot consecutive number Draw up material transfer agreement		Correctly apply the procedures for germplasm exchange	Attention to detail
4. Communicate details of shipment to user	Report details of shipment by express mail	Efficiency in the mail service	Understand the procedures for germplasm exchange	
5. Enter information on shipments into the database	Know how to manage the information system used		Understand the importance of timely information	Attention to detail

Course on *ex situ* conservation of plant genetic resources: objectives of course contents

(version 5, 18 February 2004)

Stage I: Introduction; Germplasm acquisition (Orlando, Mario)

Function	Mental capacity to:	Learning objectives
1	Quantify and/or measure existing holdings to then plan collections	Estimate the genetic variability of a holdings, based on passport data, morphoagronomic characterization, and geographic distribution, to plan collecting missions
1	Manage activity timetables to ensure coverage of the areas to be visited, time for each area, and effectiveness of the same	Using estimates of genetic variability, calculate times and opportunities to ensure the effectiveness of different exploration trips
1	Determine urgencies in terms of gaps (e.g. genetic erosion)	With the compiled information, determine urgencies or gaps in the holdings to fill them with collected germplasm
1	Interpret contingencies and make effective decisions (e.g. no seed, so bring cuttings, seedlings, pollen, immature seeds for <i>in vitro</i> culture)	On not finding materials in the desired form, collect other plant parts that permit reproduction in the bank to obtain the desired propagule
2	Compare holdings with those of other banks	Based on actual holdings and knowledge of what is available in other banks, decide on the materials to request to complete holdings

2	Decide on the value of exchanging and/or requesting Visualize advantages and disadvantages, work loads, and other factors in the event of exchange	In accordance with germplasm inventories and conditions and acquired documentation, plan activities needed to place materials under adequate conservation conditions
3	Recognize and locate passport data and other information that permits maintenance of good documentation Recognize gaps in the holdings and how to fill them	Based on all the procedures for managing the holdings, recognize the location of data and observations in general to maintain good documentation of the holdings
3	Recognize potential uses of crops and be attentive to their conservation and distribution	Accordance to knowledge on the crop and its uses, recognize others and their applicability for conservation and distribution
4	Generate, analyse, and report data within the 'temporary storage' activity	Based on the monitoring of all procedures for managing germplasm, generate, analyse, and report data

Stage II: Cleaning plant materials (Graciela, Julio César)

Function	Mental capacity to:	Learning objectives
Eliminate pathogens	Understand the concepts of pathogen eradication	According to knowledge of the pathogens (fungi, bacteria, and viruses) affecting the crop, apply the appropriate techniques for their elimination
	Efficiently apply methodologies of meristem culture	Identify meristem size, culture medium, and environmental conditions to choose and apply the appropriate methodology

Stage III: Increase, multiplication, regeneration, characterization, documentation (Rigoberto, Arsenio, Manuel, Franco Alirio, César, Tito, Carmen Rosa)

Function	Mental capacity to:	Learning objectives
1. Initial increase and multiplication (Manuel, Arsenio, Carmen Rosa)	Identify and prioritize multiplication plans based on passport data and summaries of previous multiplications	On finalizing this theme, the trainee should be able to plan the needs for initial increase and multiplication, based on the information on existing materials and available information on their molecular and morphological characteristics, and geographical distribution

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2	Verify the identity of the germplasm for multiplication (analysis)	Apply and/or design multiplication procedures that will conserve to the utmost the original genetic composition based on the biology and reproductive physiology of the species
3	Design or apply multiplication procedures for each species (analysis, application)	Apply and/or design protocols suitable for the initial increase and multiplication of sufficient viable germplasm, based on the species' agronomic characteristics
4	Generate information and report on data obtained (understanding, judgement, analysis)	Efficiently apply in multiplication sites the recommended agronomic practices for the successful production of germplasm seeds
2. Regenerate		
(Rigoberto, Franco Alirio)		
2.1	Create procedures to maintain the genetic identity of the conserved germplasm	Based on evaluations of information from initial multiplication and estimates of variability, design methodologies for the field, greenhouse, and/or laboratory to maintain the germplasm genetic identity
2.2	Analyse possible environments for multiplication	Based on knowledge of the species' geographical distribution and results of the initial multiplication, identify the sites suitable for regeneration
2.3	Apply seed-cleaning methodologies	Based on identification of standard protocols for cleaning up pathogens and according to species, maintain germplasm health for later conservation
2.4	Apply agronomic methodologies for the crop	Based on knowledge of species' biology and its adaptation (climate, soil) and results of the initial multiplication, design procedures of agronomic management in the greenhouse and/or laboratory to regenerate the species
3. Characterize		
(Franco Alirio, Rigoberto, César)		
3.1	Understand the species and the concepts of variability	Know the species in an integrated way, based on its biology, taxonomy, systematization, genetics, evolution, diversity, and complete information on existing holdings of materials, that is, all that is needed to carry out appropriate characterization
3.2	Ask good questions on the conserved material	Ask good questions on the conserved germplasm that can be resolved with improved methodologies of characterization, enabling better understanding of the conserved biological material
3.3	Apply methodologies of characterization	Characterize, using methodologies most appropriate to the species, to generate descriptive and/or analysable results
3.4	Analyse results	Analyse the results, using the best statistical and/or biometric tools to generate useful information that would lead to better understanding of the species' variability
3.5	Synthesize results (scientific article, catalogue, bulletin)	Write a scientific report (scientific article, catalogue, bulletin), based on statistical and/or descriptive analyses, thus producing a new contribution towards the better understanding of the conserved germplasm

4. Documentation (Tito, Rigoberto)	Understand: The procedures for multiplying, regenerating, and characterizing germplasm The basic principles of relational databases Crop descriptors	Record, organize, store, and disseminate data derived from multiplying, regenerating, and characterizing the germplasm held by the bank, using computerized database systems
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Stage IV: Conditioning, conservation, documentation (Alba Marina, Carlos Iván, Dimary, Graciela)

Function	Mental capacity to:	Learning objectives
1	Understand the concept of seed quality	Identify intermediate levels of moisture content in seeds that permit their handling without affecting quality
2	Conduct analyses towards developing criteria for separating seeds	Apply criteria to extract and separate seeds in such a way that seeds are obtained without impurities and with minimum physical damage
3 and 6	Be creative in developing drying methodologies	Identify the lowest possible levels of moisture content for each species to reach maximum longevity under conservation
5	Conduct analyses towards selecting seeds and calibrating equipment	Develop selection criteria for each species to ensure sample quality
5 and 8	Conduct analyses towards applying conservation protocols	Conserve seeds, following specific protocols to minimize the number of regenerations
7	Understand the packing process	Isolate seeds in a packet that can maintain the intrinsic conditions already achieved, with minimum deterioration

Stage V: Monitoring the germplasm's biological state (Alba Marina, Carlos Iván)

Function	Mental capacity to:	Learning objectives
1	Conduct analyses towards making decisions on the materials being evaluated	Identify suitable protocols for carrying out tests for germination, vigour, and viability
2	Conduct analyses towards making decisions on the materials being evaluated	Identify suitable protocols for carrying out tests for germination, vigour, and viability
3	Conduct analyses towards making decisions on the materials being evaluated	Identify suitable protocols for carrying out tests for germination, vigour, and viability

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4	Understand the concepts of purity	Identify suitable protocols for carrying out purity tests
5	Understand protocols for tests	Identify suitable protocols for carrying out moisture tests
6	Understand the importance of timely information	Develop the capacity to update test results in a timely and efficient manner

Stage VI: Control of plant health quality; documentation (*Benjamín, Norma, Ma. del Socorro*)

Function	Mental capacity to:	Learning objectives
1	Verify the identity of materials (analysis)	To prevent inconsistencies in results, verify that the materials are duly coded and that they agree with the relevant lists
1	Inspect samples and differentiate normal from abnormal germplasm (judgement, analysis, evaluation)	Visually inspect the materials to confirm their adequate physical condition
1	Apply diagnostic procedures (application)	Apply at least two specific detection methods for pathogens of quarantine interest to verify the germplasm's health
1	Generate, analyse, and report data obtained (comparison, judgement, analysis)	Classify information resulting from applying diagnostic methods to generate the final report
1	Identify new situations, evaluate their importance, and generate information (comparison, synthesis)	Identify new situations during diagnosis, which present frequently, to evaluate their importance

Stage VII: Distribution, repatriation, duplication for safety, documentation (*Alba Marina, Graciela*)

Function	Mental capacity to:	Learning objectives
1	Conduct analyses towards making decisions on rejecting or accepting a request for materials	Identify the availability of germplasm, object of the request
2	Effectively apply the procedures for germplasm exchange	Select the appropriate protocols for exchange
3	Effectively apply the procedures for germplasm exchange	Select the appropriate protocols for exchange
4	Understand the procedures for germplasm exchange	Finalize details for exchange through respective feedback
5	Understand the importance of timely information	Record information on the germplasm exchange in established formats

Appendix 3

Announcing the course

First announcement

The International Center for Tropical Agriculture (CIAT), the National University of Colombia–Palmira, and the International Plant Genetic Resources Institute (IPGRI), with REDCAPA's support, are pleased to announce the organization of the first distance education course on *Ex Situ Conservation of Plant Genetic Resources*. The details of the event are described below:

Title

Ex Situ Conservation of Plant Genetic Resources

Background and rationale

Plant genetic resources form the basis of subsistence for humankind. Yet, they are being lost through overexploitation and habitat destruction. Because they are vital for national development and for the current and future benefit of communities, they must be conserved.

Plant genetic resources can be conserved within or outside their natural habitats or in any combination of these environments. Outside their natural habitats, they are conserved in genebanks and collections, undergoing different stages and procedures that require trained personnel.

Latin America has 230 genebanks and collections, established during the last 30 years, where about 200,000 samples of the region's most important native and introduced crops are conserved. Many of these banks and collections are not able to fulfil the three key functions of a germplasm bank: conserve materials, regenerate them, and distribute them for use.

General objective

- To train personnel who manage plant genetic resources in the principles of *ex situ* conservation and thus strengthen the capacity of Latin American genebanks

Specific objective

- To provide knowledge that permits such personnel to understand how to efficiently manage plant genetic resources

Audience

The course is directed at professionals and technicians who work in the area of *ex situ* conservation of germplasm in banks, botanic gardens, and arboreta. As well as curators and support personnel of genebanks, other participants may be professionals who work in projects or programmes that conserve and/or use plant genetic resources in Latin America and the Caribbean. The course also extends to interested parties in Spain, Portugal, and Portuguese-speaking countries of Africa (Angola, Cape Verde, Guinea-Bissau, Mozambique, and São Tomé and Príncipe), provided they can follow the training in Spanish.

Contents

The course includes the fundamental concepts of *ex situ* conservation and consists of the following modules:

- Introduction and germplasm acquisition
- Increase, multiplication, regeneration, characterization, documentation
- Conditioning, conservation, documentation
- Monitoring the biological state of the germplasm
- Plant health quality control
- Distribution, repatriation, duplication for safety

Organizers

The course was designed collaboratively by the following institutions:

- National University of Colombia–Palmira, Colombia
- International Center for Tropical Agriculture (CIAT), Cali, Colombia
- International Plant Genetic Resources Institute (IPGRI), Regional Office for the Americas, Cali, Colombia
- Network of Institutions Dedicated to Teaching Agricultural and Rural Development Policies for Latin America and the Caribbean (REDCAPA), Rio de Janeiro, Brazil

Tutors

The course will have two permanent tutors, specialists in genetic resources, who will be responsible for managing the event: Rigoberto Hidalgo, National University of Colombia–Palmira and Benjamin Pineda, Genetic Resources Unit, CIAT. It will also have many consultants from CIAT, IPGRI, and the National University, who will be responsible for discussions in different modules, responding to questions, and clarifying doubts.

Time

The course will take 3 months, starting Tuesday, 17 August, and finishing Friday, 5 November 2004.

Registrations

Registration is open until 30 June 2004. Interested parties must communicate with REDCAPA.

Places

Places will be available for between 30 and 40 students

Certificate

At the end of the course, a certificate will be granted to those students who finish the course satisfactorily. The certificate will be issued jointly by the National University of Colombia, CIAT, IPGRI, and REDCAPA.

Costs

The course will cost US\$100. Depending on the availability of funds, at the end of the course, some grants for partially or totally refunding registration costs may be granted to participants who satisfactorily meet all the course's requirements and who significantly participated in the course.

For information on payments, please contact REDCAPA.

Second announcement

The International Center for Tropical Agriculture (CIAT), the National University of Colombia–Palmira, and the International Plant Genetic Resources Institute (IPGRI), with REDCAPA's support are pleased to announce the organization of the first distance education course on *Ex Situ Conservation of Plant Genetic Resources*. The details of the event are described below:

Title

Ex Situ Conservation of Plant Genetic Resources

Background and rationale

Plant genetic resources form the basis of subsistence for humankind. Yet, they are being lost through overexploitation and habitat destruction.

Because they are vital for national development and for the current and future benefit of communities, they must be conserved.

Plant genetic resources can be conserved within or outside their natural habitats or in any combination of these environments. Outside their natural habitats, they are conserved in genebanks and collections, undergoing different stages and procedures that require trained personnel.

Latin America has 230 genebanks and collections, established during the last 30 years, where about 200,000 samples of the region's most important native and introduced crops are conserved. Many of these banks and collections are not able to fulfil the three key functions of a germplasm bank: conserve materials, regenerate them, and distribute them for use.

General objective

- To teach the principles of *ex situ* conservation of plant genetic resources and thus strengthen the capacity of Latin American genebanks to adequately manage the materials they conserve

Specific objective

- To provide, through theory and practice, participants with knowledge and skills for *ex situ* conservation. At the end of the course, the participants are expected to be able to efficiently manage the *ex situ* conservation of the plant genetic resources held in the institution to which they are linked.

Audience

The course is directed at professionals and technicians with broad experience in the area of *ex situ* conservation of germplasm in banks, botanic gardens, and arboreta. As well as curators and support personnel of genebanks, other participants may be professionals who work in projects or programmes that conserve and/or use plant genetic resources in Latin America and the Caribbean. The course also extends to interested parties in Spain, Portugal, and Portuguese-speaking countries of Africa (Angola, Cape Verde, Guinea-Bissau, Mozambique, and São Tomé and Príncipe), provided they can follow the training in Spanish.

Contents

The course combines theory with practice, and includes the fundamental concepts of *ex situ* conservation. It consists of the following modules:

- Introduction and germplasm acquisition
- Increase, multiplication, regeneration, characterization, documentation
- Conditioning, conservation, documentation
- Monitoring the biological state of the germplasm
- Plant health quality control
- Distribution, repatriation, duplication for safety.

Practices will be carried out in the genebanks of the institutions to which the participants are linked or in genebanks centralized in specific places.

Methodology

The course was designed collaboratively by the following institutions:

- National University of Colombia–Palmira, Colombia
- International Center for Tropical Agriculture (CIAT), Cali, Colombia
- International Plant Genetic Resources Institute (IPGRI), Regional Office for the Americas, Cali, Colombia
- Network of Institutions Dedicated to Teaching Agricultural and Rural Development Policies for Latin America and the Caribbean (REDCAPA), Rio de Janeiro, Brazil

Principal tutors

The course will have two permanent tutors, specialists in genetic resources, who will be responsible for managing the event: Rigoberto Hidalgo, National University of Colombia–Palmira and Benjamín Pineda, Genetic Resources Unit, CIAT.

Content consultants

The course will also have many consultants from CIAT, IPGRI, and the National University, who will be responsible for discussions in different modules, responding to questions and doubts, providing clarifications, and leading specific issues as seen by the participants.

Time

The course will take three months, starting Tuesday, 17 August, and finishing Friday, 5 November 2004.

Registration

Registration is open until 30 June 2004. Preference will be given to those candidates working in genebanks.

Places

The course will have places for 30 students.

Final examination

The final examination will be held on 10 November 2004.

Certificate

The certificate will be issued by the National University of Colombia, and endorsed by CIAT, IPGRI, and REDCAPA.

Costs

- The course costs US\$100
- The registration fee will be reimbursed to participants who successfully finish their participation in the course
- Details and information on payments will be sent on registration.

Appendix 4 Example of the certificate awarded to successful participants



The following is a translation of its contents:

REDCAPA CIAT UNC IPGRI

Certificate of Successful Completion

We certify that Nury Patricia Escobar successfully completed all the activities of the professional refresher course on the

“Ex Situ Conservation of Plant Genetic Resources”

Offered by the International Center for Tropical Agriculture (CIAT); the Universidad Nacional de Colombia (Palmira Campus); the International Plant Genetic Resources Institute (IPGRI); and REDCAPA. The course was developed as distance education on the virtual campus of REDCAPA during the months of August 2004 to February 2005, totalling, in all, the equivalent of 45 hours face-to-face training.

Rio de Janeiro, 25 April 2005

Signatures

Dr Nora Presno
Academic Coordinator
REDCAPA

Rigoberto Hidalgo, MSc
Lecturer
Universidad Nacional de Colombia

Dr Benjamín Pineda
Lecturer
Genetic Resources Unit, CIAT

Dr Edith Hesse
Coordinator
CIAT

Appendix 5

Questionnaire used in the course evaluation administered by the tutors

Ex situ conservation of plant genetic resources

CIAT IPGRI UNC REDCAPA

Multi-Institutional Distance-Education Course

17 August 2004–31 January 2005

Final evaluation

1. In the following table, mark with an 'X' the level of knowledge acquired in each module and lesson of the course (5 = very high, 4 = high, 3 = medium, 2 = low, and 1 = none).

Module	Lessons and sub-modules	1	2	3	4	5
Conservation of plant genetic resources: basic concepts	Genetic resources, biodiversity, and agrobiodiversity					
	Why conserve and strategies for conservation					
	Minimum requirements for conservation					
Acquiring and introducing germplasm	Criteria for acquiring plant germplasm					
	Procedures for acquiring plant germplasm					
	Introducing germplasm: transfer regulations and quarantine measures					
Conserving germplasm	Multiplying and regenerating germplasm					
	Harvesting, conditioning, and quantification					
	Verifying the biological state of the germplasm					
	Verifying phytosanitary quality					
	Storing germplasm					
Characterizing germplasm	General concepts of characterization					
	Types of characterization for plant germplasm					
Managing genebanks	General aspects of managing plant genebanks					
Documenting germplasm	Basic aspects of documenting germplasm					

2. On reviewing the themes treated in the course, did you consider that anything was left out? If you answer yes, briefly comment:

YES: ____ NO: ____

3. Qualify your current perception of the ex situ conservation of plant genetic resources against your perception of it before you started the course. Mark with 'X' the corresponding qualification:

- a. _____ Changed completely
 b. _____ Changed significantly
 c. _____ Changed moderately
 d. _____ No change

4. Indicate, marking with an 'X', the module (or modules) that you studied in this course that made or will make a major contribution to the work that you carry out now. Comment briefly on why.

Module 1__ Module 2__ Module 3__ Module 4__ Module 5__ Module 6__

5. Which module (or modules) studied in this course appeared to be the most difficult or complicated to understand? Comment briefly on why.

Module 1__ Module 2__ Module 3__ Module 4__ Module 5__ Module 6__

6. How valuable do you think your contributions were to your colleagues in the course?

- a. _____ Very significant
- b. _____ Moderately significant
- c. _____ Somewhat significant
- d. _____ Not significant

Comment (optional):

7. How valuable do you think the contributions of your colleagues in the course were in terms of your interests?

- a. _____ Very significant
- b. _____ Moderately significant
- c. _____ Somewhat significant
- d. _____ Not significant

Comment (optional):

8. Overall, how would you qualify the usefulness of this course for you, your institution, and your country?

- a. _____ Very useful
- b. _____ Useful
- c. _____ Somewhat useful
- d. _____ Not useful

Comment (optional):

9. Do you have any additional suggestions or comments?

Dear Colleague,

Thank you very much for your answers and comments. Sharing this course has been a valuable experience. We will send the overall results of your performance to you soon.

Cordially,

Benjamín, Rigoberto, and Mariano

Appendix 6 Report on the external evaluation of the course

External evaluation of the course

By Fabiola Amariles E.⁶

Contents

- Introduction
- Course format and organization
- Evaluation
- Advantages and disadvantages of distance learning courses
- Recommendations and lessons learned
- References

Evaluation Committee

- CIAT: Edith Hesse, Mariano Mejía, Benjamín Pineda
- IPGRI: Elizabeth Goldberg, Margarita Baena
- UNC: Rigoberto Hidalgo
- REDCAPA: Nora Presno

Introduction

This pilot course on the *ex situ conservation of plant genetic resources* was offered in the distance-education modality. It was born of the need to share knowledge accumulated by research centres such as CIAT and IPGRI on the management and conservation of plant genetic resources (PGR), as well as of the wide academic experience of the Universidad Nacional in PGR. Leadership was offered by REDCAPA as a platform for distance education through Internet in Latin America.

To a large part, success in adult education depends on the students contributing with their knowledge, experience, and maturity. Hence, this project sought to unite a group of professionals involved in the management of genebanks in Ibero-America. Under the leadership of experienced tutors on the theme, the bases for a distance-education course through computer technology were created. The training materials came partly from the presentational courses previously offered by the participating institutions. The ultimate

⁶ Consultant on the Evaluation of Impact. Centro Internacional de Agricultura Tropical (CIAT, f.amariles@cgiar.org).

goal was to reach wider audiences to help strengthen institutional capacity in PGR in Latin American countries.

This report summarizes the results of an evaluation of this pilot course as a learning experiment.

One objective of the evaluation was to determine if distance training through computer technology constituted a viable and suitable alternative for transmitting knowledge from the centres of the Consultative Group on International Agricultural Research (CGIAR) to distant audiences. Another objective was to ascertain if the methodology used in the pilot course could be recommended for future online courses.

We hope the users of this evaluation will be not only the research centres of the CGIAR system interested in adopting 'methods of computer-supported collaborative learning' (CSCL) to transmit knowledge, but also those entities interested in applying techniques of distance education through computer technology.

The impact of the course was analysed qualitatively on four levels⁷

- Reaction: by measuring the students' level of satisfaction with the new educational system. The future of training programmes depends largely on those being educated having a positive reaction towards their own learning experience. This is the measure of 'consumer satisfaction'.
- Learning: which is defined as the degree to which students increase their knowledge or improve their skills as a result of participating in the training event.
- Performance: that is, the degree to which trainees change their attitudes because of what they learned.
- Results: that is, the tangible or intangible effects on the organization as a result of the trainee's participation in the programme. Some of these effects are directly measurable (e.g. increased production, fewer costs, or increased sales). Others are intangible and are measured according to the perceptions of supervisors and colleagues with respect to the changes observed in the trainees as they carry out their daily tasks.

Likewise, aspects of inter-institutional collaboration were qualitatively analysed. To do so, surveys were conducted with the professionals participating in the course and their supervisors. Course tutors

⁷ Using the methodology recommended by Donald L. Kirkpatrick in *Evaluating Training Programs—The Four Levels*.

and coordinators were also interviewed, as were members of the organizing committee, to qualitatively evaluate not only the course but also various aspects of inter-institutional collaboration.

Course format and organization

The course followed the technological specifications offered by REDCAPA for other similar courses. Training was managed exclusively through the Internet. All study materials (obligatory and elective) and communications between the teachers/tutors and students, and among the participants themselves were developed on REDCAPA's virtual campus in an asynchronous manner, that is, according to the availability of time for accessing lessons by the students within the periods established by the tutors.

Any person with a reasonably good Internet connection could, in principle, follow the course online. As they are deferred, the lessons could be done where and—with certain restrictions—when the person chose, connecting in relatively little time with the Internet (from a few minutes to some hours per week, depending on the form of studying chosen by the participant) and being able to work, for the most part, offline.⁸

The course was carried out over 6 months, from August 2004 to January 2005. A total of 22 professionals participated. The 11 men and 11 women came from Costa Rica (2), Spain (2), Peru (5), Bolivia (1), Colombia (6), Ecuador (1), Mexico (3), Argentina (1), and Guatemala (1).

The course themes were divided into six modules, each with lessons and sub modules to facilitate the students' learning. All the modules, sub modules, and lessons were compiled in a publication that will be made available for future courses and as a bibliographic contribution to the theme of the conservation of PGR.

On finishing each module, the students presented written work on the different lessons learned, relating them to their own work experience in the management of germplasm collections.

Although REDCAPA usually conducts final examinations at the end of their courses in a presentational manner in more than 100 cities of Latin America, they did not do so for this course on the *ex situ* conservation of PGR.

⁸ REDCAPA's Internet page (<http://www.redcapa.org.br/espanol/cursos/cursos.htm>) carries detailed information on 'learning on the network'.

We point out that a remarkable synergy formed between the tutors and students of this course, facilitating this evaluation process. The response to the formulated surveys was excellent, with 100% of students and 50% of supervisors answering.

The interaction between all the participants, still continuing through a discussion group formed during the course, augurs well for conducting future courses in that they will take full advantage of the lessons learned and the teachings from this pilot experiment.

Evaluation

Reaction

On finalizing the course, a survey was carried out on its contents and its exploitation by the students, on their perceptions of the course's modality, and on their interaction with other professionals. The results of this evaluation are described in detail in *Appendix 3*.

Overall, most of the participants who completed the training expressed great satisfaction with the results of the course, giving high qualifications to the level of knowledge acquired, and to the relevance of this new knowledge for their current work. Among the positive aspects, what stands out are the quantity and quality of the supporting materials and the opportunities to exchange knowledge and experiences with other professionals in Latin America who conduct similar work in other institutions.

Perceptions of the *ex situ* conservation of plant genetic resources before and after the course changed significantly according to what 77% of the participants said. This is a good indicator of the course having accomplished one of its principal objectives, which was to help strengthen the human talent involved in conserving PGR in the region.

The contributions made to colleagues (qualified as moderately significant) and received from them (highly significant) suggest that mutual contributions of knowledge among participants was an outstanding aspect of this course, and should be a feature of this type of programme in the future.

Another effect valued by the participants was the possibility of continuing to interact with their colleagues by means of the communication network that had been formed, with the intent of strengthening the professional exchange that had been initiated by the course.

Learning

According to the final evaluation conducted by the participants (*Appendix 3*), most of the students (90.1%) describe the item 'acquired knowledge' as high to very high. That is, they recognized the course as having made a significant contribution to their knowledge on the management of plant genetic resources.

The modules *Conserving Germplasm and Managing Genebanks* received the highest value (very high) from 55% of students. This coincides with the results on the contributions of different themes to the work that students would develop in their institutions, where the module *Conserving Germplasm* was also described as being a major contribution to their work.

The modality of distance education by Internet also offered another type of learning for the participants in this pilot project. According to some of the tutors, confronting the technological challenge of teaching through a virtual medium and being able to give feedback to the students through electronic communication was a significant learning experience.

Tutors and students had to confront new methods of transmitting and receiving knowledge where elements of innovation and creativity were used to exploit to the maximum this experience. In the tutors' opinion, this process, from the determination of the themes for each module to the procedures for motivating the students to participate and fulfil their academic commitments, enriched them enormously and offered them a learning experience that they would like to share with their colleagues in the future.

An example is the way the lessons were constructed for the different modules. "Instead of giving way to the temptation of following the formal guidelines of lesson construction as recommended for distance learning courses, in this course, a practical procedure was used, beginning with the scientific contents and adding practical knowledge that could describe the techniques themselves."⁹

Performance

To determine if changes in the participants' performance could be detected as a result of the knowledge acquired, the supervisors

⁹ Extract from an interview with Rigoberto Hidalgo, tutor for the course on the *ex situ* conservation of PGR.

were surveyed with questions on the application of the new knowledge to daily work tasks, if they shared their knowledge with other colleagues of the organization, and outstanding aspects of the functionaries' performance after the course.

For a change of performance to occur as a result of participating in a training programme, the following conditions must be met:

- That the person wishes to change
- That the person must know what to do and what not to do
- That the person must work in a suitable environment
- That the person must be rewarded for changing

The level of depth of this evaluation does not enable detecting if, in the case of the participants of the course on the *ex situ* conservation of PGR, they received adequate working conditions for substantial change of performance to occur. However, the enthusiastic responses of the professionals to the final survey of the course's evaluation, and the positive appreciation of the supervisors on their post-course performance enabled us to infer that some positive changes did occur.

The most notable change observed referred to decision making by the professionals in their daily tasks (87%). With the newly acquired knowledge, the people felt more sure of themselves in making decisions. Notable changes were also detected in the planning and organization of work (75%), which came from information obtained through the survey, which indicated that most of the students (100% answered the survey) shared their new knowledge with their work colleagues and companions. Without doubt, here, the attitude of the professionals improved with respect to team work, thus improving work efficiency.

The attitude of the supervisors and managers is key to ensuring the future success of these training events. Institutional support for the professionals who participate in this type of course is fundamental if new knowledge is to be applied to the daily work and to benefit, not only the participants, but also their work colleagues, supervisors, and companions, and, hence, the institution.

Results for the organization

In the evaluation of this course, it became important to measure the degree of contribution of learning by the professionals in the institution's performance, given that its objectives and future training programmes seek to develop institutional capacities in the conservation of PGR in the region.

The supervisors were asked their opinions on what would be the contributions of formal distance-education programmes on the *ex situ* conservation of PGR for the following objectives:

- Developing institutional capacities in the conservation of PGR
- Improving national efforts to conserve PGR
- Strengthening the capacity of personnel responsible for managing PGR to create, analyse, and synthesize

Most supervisors considered that these courses contributed to the objectives mentioned above at moderate to high levels. They suggested that such contributions to institutional performance would occur by improving the individual performance of the participants. That is, attention must be given to the conditions under which the professionals conduct their work and the support that they receive in their activities.

All (100%) responding supervisors reported that the functionaries who participated in the course on the *ex situ* conservation of PGR had taken back to their institutions new work strategies or procedures, applying acquired knowledge, such as:

- Germplasm evaluation
- Revising the quantity of seeds that must be conserved in storage, as what was used was already minimal
- Joint planning of viability tests to determine phytosanitary quality
- Establishment of a centre for agrobiodiversity
- Formation of interdisciplinary teams to study species of interest for genetic resources
- Recommendations for improving the documentation of plant genetic resources.

One aspect, indicated as important by students, tutors and supervisors, was the distribution of time, both work and personal, for courses for participating professionals. Of the supervisors who answered the survey, 43% considered that 30% of the professional's work time should be dedicated to the courses; 29% thought that course participation should take place only in the professional's personal time; 15% indicated that it should take 10% of work time; and 15% proposed that time be distributed proportionately between work and personal time to obtain the functionary's greatest commitment.

Such diversity of opinions results from the distinct policies and practices for training professionals used by the different institutions that manage plant genetic resources in the region. On planning future courses, the availability of time that participants will have

must be taken into account and the different expectations that they may bring should be clarified.

The question was also asked on the ideal period for a course of this nature. Of those surveyed, 71% considered 6 months to be an adequate period. The others (29%) suggested shorter periods, between 1 and 3 months.

Aspects of inter-institutional collaboration

The success of this pilot experiment can doubtlessly be attributed to the participation and joint effort of all the institutions involved. Each contributed its strengths and experience, and significant efforts—all necessary elements for the course's successful achievement. The benefits, in terms of learning, are also distributed in the same way.

Advantages and disadvantages of distance learning courses

A principal objective of this pilot experiment with a distance learning course through computer technology was to evaluate how this modality, which attempts to broaden cover and reach more distant audiences, compares with the presentational courses that were offered in the past.

The advantages of distance learning courses reported in the surveys included:

- The possibility of combining the course with daily work
- The facility of interacting with people from other regions or countries and having the same academic interest, which would be difficult in presentational courses
- Greater exchange of information, in that participants have access to answers from evaluations of other participants
- Access to updated bibliographical information
- Participants can establish their own work rhythm
- Saving resources

The disadvantages include:

- The management of PGR involves practices that are almost impossible to teach electronically as they require manual management of the species and transmission of knowledge from person to person
- Inequalities exist between technological facilities from one country to another, so that some students could not fully participate, as in the case of chats or downloads of large files
- The lack of personal contact between instructor and students.

Recommendations and lessons learned

On the basis of this pilot experiment, tutors and students offered a series of recommendations for future courses:

1. There must be a full-time tutor in charge of the course
2. The course's duration should be fixed with sufficient anticipation, and the contents must be adjusted so that the course does not exceed the 3 months established
3. Ideally, the course should have 8–12 lessons, maximum
4. Serious limitations existed in conducting chats, electronic conferences, and other Internet events because of the different facilities for using computer tools in different countries
5. The system for feedback from tutors is fundamental to this type of course, and special attention should be paid to this
6. Close contact should be maintained with the students
7. The photographs provided by the coordinators helped the participants considerably to 'reduce the distance' that electronic communication could generate
8. From the course's beginning, the 'ice' between participants should be broken to maximize the sharing of knowledge that each person can contribute to his or her colleagues
9. The class should know beforehand what the course's expectations are and the participation that each is expected to provide. The requirements that students and tutors should meet should be highly specific.
10. With some minor adjustments, particularly in relation to the depth of certain modules and lessons, this distance learning course could be repeated

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Appendix 7

Report on the evaluation of the collaborative association

**Survey to evaluate the collaborative association
CIAT–IPGRI–Universidad Nacional–REDCAPA,
which offers distance education through computer
technology¹⁰**

Introduction

CIAT, IPGRI, UNC and REDCAPA came together in 2003 to create a collaborative association. The goal was to explore the potential of distance education through computer technology for training in plant genetic resources. The specific theme would be the *ex situ* conservation of germplasm.

The reasons motivating this association were the capacity and experience of the first three institutions in offering presentational training in plant genetic resources, the need to reach wider audiences, the limitations of economic resources to do so, and the opportunity of trying out new information technologies in the service of distance education. Consequently, the first three institutions sought a partner with the experience and capacity to provide a platform and distance education services through computer technology. The partner they found was REDCAPA. The four members of the collaborative association thereupon decided to carry out a joint pilot experiment, with the end product being a distance learning course on the *ex situ* conservation of plant genetic resources.

The results of the course were evaluated through a survey of the students and another survey of their immediate superiors. Because the partner institutions were dealing with a new experience and, given the interest and demand of the targeted audience in terms of number of applicants, the coordinating committee of the collaborative association considered it pertinent to also evaluate the association. This evaluation was to be carried out through an electronic survey to a group of people from the institutions making up the collaborative association, who participated in various ways and at different times in the development of the association's activities. Below, we describe the survey and its results.

¹⁰ Conducted by Margarita Baena, Capacity Development Specialist, International Plant Genetic Resources Institute (IPGRI; e-mail: m.baena@cgiar.org).

Methodology

The survey, administered through the online questionnaire service *SurveyMonkey* (www.surveymonkey.com), consisted of an introduction to the respondents, indicating the survey's goal, who was administering it, how the results were going to be used, a question on the roles of the respondents in the collaborative association, seven questions on various aspects of the association's functioning, from the attainment of objectives to the association's possible continuity, foreseen or not in the agreement signed by the institutions, and a section of acknowledgements and closure. The entire questionnaire appears at the end of this Appendix.

The questionnaire was developed in consultation with members of the coordinating committee and structured according to objectives, results, and activities of the agreement on collaboration that the partner institutions had signed. The list of people who were invited to respond to the survey was also developed in consultation with committee members. The list contained 21 people from the four partner institutions, distributed as follows: nine from CIAT, five from IPGRI, four from the National University, and three from REDCAPA. Before sending the survey to the complete list, two tests were carried out to ensure that all functioned correctly.

The respondents received an invitation by electronic mail to answer the survey. One week later, those who answered received another message in which they were thanked and the invitation was re-sent to those who had not answered. Two weeks after the first invitation was sent and 18 of the 21 had answered, the survey was closed to analyse the results. The respondents were distributed as follows: eight from CIAT, four from IPGRI, four from the National University, and two from REDCAPA. This was equivalent to 85.7% of possible respondents.

Results and analysis

Respondents' roles¹¹

The roles of the respondents in the collaborative association are listed as follows:

¹¹ The tables with results from the survey that are included in this document indicate the number of respondents to the question over the total number of people who answered the survey (i.e. 18). For the number of answers to the question, the percentage is indicated in relation to all answers to the question. Where the questions permitted choosing more than one item in the answer, the number of answers refers to the number of people who marked each option (over a total of 18).

Role	Answers	
	(no.)	(%)
Supplier of course contents	6	35.3
Evaluator	6	35.3
Reviewer of course materials	4	23.5
Official or legal representative of a partner institution in the project	4	23.5
Supplier of course materials	4	23.5
Resource person for educational aspects	4	23.5
Tutor	3	17.6
Other (specify)	3	17.6
Supplier of technical support	2	11.8
Supplier of grants	1	5.9
Total	17	
No answers	1	

One third of the 17 respondents to this question contributed to the course's contents and participated in the evaluations. The second most frequent role was that of providing course materials, participating in reviews of these materials, or acting as legal representatives of one of the institutions forming the collaborative association. Overall, the answers illustrated the various roles that the respondents performed in the Association's different stages and activities, whether in the initial activities, preparation and development of the course, or later activities of the course, thus contributing to one or several stages or activities according to their area of expertise.

Fulfilling the objectives of the collaborative association

Perceptions on whether the collaborative association's objectives were attained:

Perception	Answers	
	(no.)	(%)
Better than expected	8	44.4
As expected	7	38.9
Poorer than expected	3	16.7
Total	18	

Of the 18 respondents, 15 (83.3%) thought that the objectives were attained. Of this group, 8 thought that these were attained at a level higher than expected. The positive trend of most of the answers indicated consensus on the Association's objectives being attained, that is, the Association was established and maintained, the course conducted, and the representatives of the collaborating institutions had indicated their intention of continuing. However, 3 of the respondents felt that the objectives were attained at a level below that expected because the activities focused on doing the course, and not on strengthening the collaborative association. This should be taken into account in the collaborative association's future work.

Completing the activities of the collaborative association

Perceptions on the fulfilment of activities for the collaborative association are shown below.

Perception	Attained as originally envisioned	Attained, but with adjustments	Partially attained	Not attained
Through a community of practice, share knowledge and take advantage of the strengths of each member in achieving the objectives	(3) 19%	(11) 69%	(2) 12%	(0) 0%
Course contents were developed in a consensual manner	(7) 44%	(8) 50%	(1) 6%	(0) 0%
Course materials were adapted from existing materials	(4) 27%	(10) 67%	(1) 7%	(0) 0%
Create a virtual classroom to develop the course	(13) 87%	(0) 0%	(0) 0%	(2) 13%
Familiarize the members of the community of practice with aspects inherent to distance education through computer technology	(11) 73%	(4) 27%	(0) 0%	(0) 0%
Accompany the students in the capacity of tutor or consultant during the course's development	(7) 54%	(6) 46%	(0) 0%	(0) 0%
Refer students to experts on certain themes to broaden information from the course	(2) 17%	(2) 17%	(6) 50%	(2) 17%
Evaluate the course and document the experiment	(7) 58%	(5) 42%	(0) 0%	(0) 0%
Prepare concept notes to seek funds	(0) 0%	(3) 30%	(1) 10%	(6) 60%
Design and apply a survey to evaluate the impact of the course on the participants' performance	(5) 42%	(6) 50%	(1) 8%	(0) 0%
Total of all answers				16
No answers				2

The highest percentages for each answer are highlighted in boldface. The values in parentheses indicate the number of people who ticked this option.

The perceptions of the way in which the 10 activities, as stipulated in the agreement signed by the members of the collaborative association, were fulfilled were variable. They appeared to depend on the direct information obtained on the activity that each respondent had when answering, as those who added comments to their answers pointed out. Eight of the 10 activities were completed, even though, for some, adjustments had to be made to the process.

Those activities perceived as having been completed according to what was envisioned related to the:

- Creation of the virtual classroom
- Familiarization with distance education through computer technology
- Accompaniment of students throughout the course
- The evaluation and documentation of the experiment.

Those activities perceived as completed but with adjustments referred to:

- Taking advantage of the community of practice
- The consensual development of course contents and materials
- The evaluation of the course's impact.

The activity perceived as partially completed was the referral of students to experts on themes of conservation.

The activity seen as being unfulfilled was the preparation of concept notes for seeking funds.

Of the eight activities perceived as fulfilled in the way originally envisioned or with adjustments, six referred to complex activities that required mobilization of people and continuity such as the development of materials and taking advantage of the community of practice. This is something that the collaborative association must take into account for the future, as activities need to be better planned in terms of the time needed to complete them, facilitation to keep the community active and united, and ensuring that its members fulfil their tasks in a timely fashion. Comments on the question also highlighted the need to keep the participants in the initiative informed about what was happening, especially if they were not directly involved in an activity.

The partners' contributions

The contributions of the different partners were determined as follows:

Contribution	Answers	
	(no.)	(%)
Ideas for developing the distance learning course	14	82.4
Ideas for establishing the collaborative association	10	58.8
Materials for developing the distance learning course	10	58.8
Facilitating meetings in which course contents were decided on	8	47.1
Information resources (e.g. publications and references) to complement course materials	8	47.1
Developing and conducting surveys to evaluate both the course and the collaborative association	7	41.2
Selecting students for the course	7	41.2
Contacts for establishing the collaborative association	6	35.3
Finding or awarding institutional support to develop the collaborative association	6	35.3
Information on distance education	6	35.3
Training members of the community of practice on aspects of distance education through computer technology	6	35.3
Tutoring	6	35.3
Consultancies for students	6	35.3
Contacts for reaching the targeted audience	5	29.4
Logistic and administrative support in preparing and developing the course	5	29.4
Adapting or developing course materials	5	29.4
Reviewing the lessons developed and giving feedback to the authors	4	23.5
Student grants	3	17.6
Technical support in managing the virtual campus	2	11.8
Other (specify)	2	11.8
All answers	17	
No answers	1	

The respondents tended to answer by indicating the contributions that the persons surveyed made, as well as those made by the institutions with which they were associated. The highest percentages (>40%) recorded were for items on ideas for conducting a distance learning course, materials for developing the course, ideas for establishing the collaborative association, facilitating meetings, information resources, developing and applying evaluation surveys, and selection of participants for the course.

Coincidence of answers apparently indicated those items for which contributions were perceived as coming from the various participating institutions. The lower percentages for the other items indicated that certain contributions were from specific people or institutions. Although most contributions were for the course as a central activity of the collaborative association, the diversity of contributions to develop the association's activities and attain its objectives indicated the capacities and complementarity among institutions and persons that form the collaborative association.

Contributions according to institution

Perceptions on the correspondence between the contributions of the partners and the institution's capacity were as follows:

Perception	Answers	
	(no.)	(%)
Yes, there was correspondence	16	94.1
No, there was no correspondence	1	5.9
Total	17	100
No answers	1	

In all, 94.1% of respondents agreed that the contributions they made were those that corresponded to them or were within their capacity to do. One response to this question indicated that one institution had wanted to have a role in reviewing course materials but apparently did not receive them. This, perhaps, should be taken into account when planning future activities so that the capacity of participants is taken advantage of to the maximum when developing tasks.

The time the parties invested in making their contributions

Perceptions on the correspondence between the time dedicated to making the contributions and the expectations of the respondents were as follows:

Perception	Answers	
	(no.)	(%)
Yes, there was correspondence	10	62.5
No, there was no correspondence	6	37.5
Total	16	100
No answers	2	

A total of 62.5% of respondents (10 out of 16) indicated that their effective investment of time was within their expectations, whereas 37.5% (6 people) indicated that it was not. The latter respondents were tutors and participated very closely in the development of course materials, an activity that, in itself, requires considerable investment of time, whether for a presentational or distance learning course. This group tended to value their contributions more than those who invested less time because their contributions (support materials, references, contact lists) had been developed previously during the formation of the collaborative association.

The responses to this question and the reasons given for investing so much time in some activities suggest that the tasks in question could have been better planned, distributed among more people, and carried out in a more practical way. This point must be taken into account when considering the continuity of the collaborative association so that activities are duly planned and distributed more evenly among more people. Likewise, it must be made clear to the parties from the beginning how the different contributions will lead to fulfilling the objectives, regardless of whether they are developed before or during the time the collaborative association is in force.

Efficiency in managing the collaborative association

The different aspects that make a collaborative association efficient were qualified as follows:

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Aspect	Totally agree	Partially agree	Disagree	This aspect was not taken into account
1. Each participating institution in the collaborative association was clear on the role it should fulfil and the responsibilities involved	(4) 25%	(10) 62%	(2) 12%	(0) 0%
2. The collaborative association provided sufficient human resources to complete the various tasks	(5) 31%	(10) 62%	(1) 6%	(0) 0%
3. The collaborative association provided economic resources for accomplishing certain tasks	(2) 13%	(5) 33%	(2) 13%	(6) 40%
4. The participating institutions in the collaborative association provided sufficient time for fulfilling the assigned tasks	(5) 36%	(6) 43%	(3) 21%	(6) 40%
5. The directors of the partner institutions supported the personnel involved so they could fulfil their assigned tasks in time and with integrity	(7) 47%	(8) 53%	(0) 0%	(0) 0%
6. Decisions were made in a consensual transparent manner throughout the process	(7) 44%	(8) 50%	(0) 0%	(1) 6%
7. The association had a mechanism for resolving differences of opinion among participants	(4) 25%	(5) 31%	(3) 19%	(4) 25%
8. Communication among partners was fluid and continuous throughout the process	(6) 38%	(9) 56%	(0) 0%	(1) 6%
9. The directors of the institutions involved maintained continuous communication with the participants in the collaborative association	(3) 20%	(8) 53%	(3) 20%	(1) 7%
10. All members participated at all times in the association's activities	(1) 7%	(7) 50%	(4) 29%	(2) 14%
11. Throughout the process, confidence was maintained among the participants	(7) 44%	(8) 50%	(0) 0%	(1) 6%
12. The participants had the capacity to make decisions on the assigned tasks	(8) 50%	(7) 44%	(0) 0%	(1) 6%
13. The various activities were efficiently coordinated	(9) 56%	(6) 38%	(0) 0%	(1) 6%
Total of all answers				16
No answers				2

The highest percentages are indicated in boldface. The values in parentheses refer to the number of persons who ticked this option in their answer.

Most of the respondents indicated that they had an adequate level of training to make decisions on the work that they had been assigned and that the various activities had been coordinated efficiently. However, eight indicators revealed that the collaborative association's management could be improved. These indicators included the clear definition of roles and responsibilities, sufficient human resources to conduct the work, adequate management of

support, and fluidity of communication throughout the process. For two indicators (availability of economic resources and time assigned to carry out activities), there was significant disagreement.

In the comments, almost 40% of respondents mentioned gaps they perceived in the collaborative association, apparently a product of the experience being new to all. Recurrent aspects were the lack of a concrete work plan and timetable, the lack of determining who should carry out certain tasks, the underestimation of both the complexity of key tasks (such as developing course materials) and the time needed to carry them out.

Continuity of the collaborative association

- In general, the respondents (13 out of 18) saw as feasible and desirable that the collaborative association should continue, but highlighted the need for a series of conditions that were not envisioned or clearly defined in the agreement that was signed for the pilot experiment. For example:
- A work plan should have been made and the roles of those participating in the various tasks and stages of the work clearly defined, with estimates of costs and time calculated
- A definition of roles in terms of coordination
- Balance in the representation of partners in the association
- Greater consultation during the process for decision making
- Review of lessons learned
- More frequent communication of information during the project's life, particularly with those who were not directly involved in given stages or tasks
- A system for monitoring and evaluating the students' learning and the development of the collaborative association.

These comments indicated that, given the complexity of the collaborative association's work, the parties must take the time to compile the tasks and procedures for a work plan to be developed and executed in a joint consensual manner. This plan and its corresponding timetable must be attached to the framework agreement that the institutions sign for the execution of activities.

Conclusions and recommendations from lessons learned

Although it had appeared simple for four institutions to join together to offer a distance learning course on a specific theme, the survey clearly revealed the complexity of a work such as that which the members of the evaluated collaborative association pushed to carry out. Although aspects for improvement were pointed out, the collaborative association clearly had a richness and diversity of contributions to offer to attain its objectives.

The continuity of this association and the success that it will have in the future will depend on how the collaborative association is managed, on the capacity of the partners to fulfil the commitments they acquire, and on how they organize themselves, whether on an individual or collective basis. The association's objectives continue in force, as do the wishes of the parties to continue working together.

The results of the survey indicate that the lessons learned in the process or the areas needing work are as follows:

- To strengthen the collaborative association as it conducts distance learning courses.
- To plan activities in detail, that is, being clear in terms of participants, roles, time needed, and resources needed or available; products to expect from the activities and the responsibility for their development; and dates for delivery or execution.
- To facilitate processes for the community participating in the project in such a way that it remains active, motivated, and united; encourage the members to complete the assigned tasks in due fashion and in a timely way, and resolve disagreements that may arise among parties during the development of activities.
- To assign responsibilities in an equitable manner, taking maximum advantage of the capacities of the different partners. In this aspect, two things should be taken into account: the participants' capacity to conduct the diverse tasks, and the possibility of assigning a task to various people with relevant experience within the collaborating institutions. This way, the load does not become onerous for those responsible for the activities and synergy can be achieved among the collaborating organizations.
- To define mechanisms for monitoring tasks and the collaborative association, and the roles of different partners in the coordination and evaluation of activities.
- To define criteria for valuing the contributions in terms of attaining the objectives to prevent the investment of time distorting perceptions.
- To define mechanisms for consultation to make decisions, for communicating with different parties throughout the development of activities, and for resolving differences among parties.
- To define clearly the outcomes of different activities, as well as the criteria for assigning credits to participants for their contributions. By the same token, define the intellectual proprietorship of the contents, products, and later use of the products.
- Finally, the parties would be best advised to review the agreement that they had signed and update it according to the survey's results, the lessons learned, and the activities that they decide to do together.

Questionnaire to evaluate the collaborative association to conduct a distance learning course on the *ex situ* conservation of plant genetic resources

Introduction

This survey aims to evaluate various aspects of the collaborative association between CIAT, IPGRI, the National University, and REDCAPA to conduct a distance learning course on the *ex situ* conservation of plant genetic resources, which was carried out from August 2004 to January 2005. To extract lessons learned from the process and suggest new directions for action in conducting future courses, we would be grateful if you would collaborate by responding to the following questionnaire. Please feel free to respond according to what you know.

The survey results will form part of the final report of the collaborative association.

Cordially,
Coordinating Committee

Respondent's role in the collaborative association

1. Different people participated in creating the collaborative association and developing its activities. Please indicate what your role was in this collaborative association. You may choose more than one option.

<input type="checkbox"/>	Official or legal representative of a partner institution in the project
<input type="checkbox"/>	Supplier of course contents
<input type="checkbox"/>	Supplier of course materials
<input type="checkbox"/>	Reviewer of course materials
<input type="checkbox"/>	Tutor
<input type="checkbox"/>	Evaluator
<input type="checkbox"/>	Supplier of technical support
<input type="checkbox"/>	Supplier of grants
<input type="checkbox"/>	Resource person for educational aspects
<input type="checkbox"/>	Other (specify)

Objectives of the collaborative association

2. The objectives of this collaborative association, according to the Agreement signed by CIAT, IPGRI, the National University, and REDCAPA, were to establish, conjointly, a strategic alliance, and to offer distance training through computer technology on the *ex situ*

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conservation of plant genetic resources to personnel who manage genebanks and collections, botanic gardens, and arboreta (from curators to technical support personnel). Do you consider that these objectives were accomplished?

<input type="checkbox"/>	At the level expected
<input type="checkbox"/>	At a level higher than was expected
<input type="checkbox"/>	At a level lower than was expected
<input type="checkbox"/>	Comments

Activities of the collaborative association

3. According to the agreement signed by the partners, the objectives would be accomplished by carrying out the activities described below. Please indicate against each activity how you perceive its having been accomplished. If you have comments, please add them in the space indicated below the questions.

Activity	Accomplished as initially envisioned	Accomplished, but with adjustments in the process	Partially accomplished	Not accomplished
Through a community of practice, share knowledge and take advantage of the strengths of each member in achieving the objectives				
Course contents were developed in a consensual manner				
Course materials were adapted from existing materials				
Create a virtual classroom to develop the course				
Familiarize the members of the community of practice with aspects inherent to distance education through computer technology				
Accompany the students in the capacity of tutor or consultant during the course's development				
Refer students to experts on certain themes to broaden information from the course				
Evaluate the course and document the experiment				
Prepare concept notes to seek funds				
Design and apply a survey to evaluate the impact of the course on the participants' performance				

4. Comments on the previous questions:

The partners' contributions

Below, identify the contributions that you or the institution that you represent made towards developing the collaborative association's activities:

- | | |
|--------------------------|---|
| <input type="checkbox"/> | 1. Ideas for establishing the collaborative association |
| <input type="checkbox"/> | 2. Contacts for establishing the collaborative association |
| <input type="checkbox"/> | 3. Finding or awarding institutional support to develop the collaborative association |
| <input type="checkbox"/> | 4. Ideas for developing the distance learning course |
| <input type="checkbox"/> | 5. Materials for developing the distance learning course |
| <input type="checkbox"/> | 6. Information on distance education |
| <input type="checkbox"/> | 7. Training members of the Community of Practice on aspects of distance education through computer technology |
| <input type="checkbox"/> | 8. Facilitating meetings in which course contents were decided on |
| <input type="checkbox"/> | 9. Contacts for reaching the targeted audience |
| <input type="checkbox"/> | 10. Information resources (e.g., publications and references) to complement course materials |
| <input type="checkbox"/> | 11. Student grants |
| <input type="checkbox"/> | 12. Tutoring |
| <input type="checkbox"/> | 13. Consultancies for students |
| <input type="checkbox"/> | 14. Technical support in managing the virtual campus |
| <input type="checkbox"/> | 15. Logistic and administrative support in preparing and developing the course |
| <input type="checkbox"/> | 16. Adapting or developing course materials |
| <input type="checkbox"/> | 17. Developing and conducting surveys to evaluate both the course and the collaborative association |
| <input type="checkbox"/> | 18. Reviewing the lessons developed and giving feedback to the authors |
| <input type="checkbox"/> | 19. Selecting the students for the course |
| <input type="checkbox"/> | 20. Other (specify) |

6. Do you consider that these contributions were within what was envisioned for the institution that you represent?

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No
<input type="checkbox"/>	Comments

7. Was the time that you effectively dedicated to making the contributions within the limits you had expected? Include in your comments an estimate in working days of the time you invested in making your contributions.

	Yes
	No
	Comments

Efficiency in managing the collaborative association

8. Below we list a series of aspects that contribute to the effectiveness of a collaborative association. Please indicate if these aspects were present in the various stages of developing the association. If you would like to broaden your answer, please do so in the section for comments after the question.

Aspect	Totally agree	Partially agree	Do not agree	This aspect was not taken into account
Each participating institution of the collaborative association was clear on the role that it should fulfil and the responsibilities involved				
The collaborative association provided sufficient human resources to complete the various tasks				
The collaborative association provided economic resources for accomplishing certain tasks				
The participating institutions in the collaborative association provided sufficient time for fulfilling the assigned tasks				
The directors of the partner institutions supported the personnel involved so they could fulfil their assigned tasks in time and with integrity				
Decisions were made in a consensual and transparent manner throughout the process				
The association had a mechanism for resolving differences of opinion among participants				
Communication among partners was fluid and continuous throughout the process				
The directors of the institutions involved maintained continuous communication with the participants in the collaborative association				
All members participated at all times in the association's activities				
Throughout the process, confidence was maintained among the participants				
The participants had the capacity to make decisions on the assigned tasks				
The various activities were efficiently coordinated				

9. Comments on the previous questions

Continuity of the collaborative association

10. If the agreement were renewed to continue developing conjointly activities for distance education, what do you believe should be done differently?

End of questionnaire

Thank you for your collaboration.

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operate under the name
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