

Biodiversity and Economically Important Species in the Tropical Andes – A research collaboration between Bolivia, Ecuador and Denmark (BEISA)

Annual Report – 2005

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BEISA annual report (2005)

1. Dansk resumé

BEISA (Biodiversitet og Økonomisk Vigtige Arter i tropisk Andes – et forskningssamarbejde mellem Bolivia, Ecuador og Danmark, www.beisa.dk) er et ENRECA-projekt der omfatter fire universiteter med en aktiv interesse for økonomisk vigtige planter fra den centrale Andes region. BEISA er ledet af professor Henrik Balslev, Afdeling for Systematisk Botanik ved Biologisk Institut på Århus Universitet, og lokale projekt partnere er San Andrés Universitet i La Paz, Bolivia, det Katolske Universitet i Quito, Ecuador, og det Nationale Universitet i Loja, Ecuador. BEISA styrker Bolivias og Ecuadors kapacitet indenfor biodiversitet forskning og uddannelse. Unge lovende forskere bliver uddannet til at udføre selvstændig forskning på internationalt niveau. De bliver også trænet i at søge eksisterende biodiversitet viden i Web baserede databaser, og i at udbrede kendskabet til deres landes naturressourcer vha. moderne IT. Deres erfaringer vil hjælpe deres hjemlande til at udnytte, anvende og forvalte naturligt forekommende planter med økonomisk potentiale til gavn for egne borgere, og muliggøre, at nationale institutioner kan deltage i regionale og internationale bestræbelser på at bevare og forvalte Andes landenes biodiversitet. Den første 3-års fase af BEISA begyndte den 1. oktober, 2003, og gennem 2005 (i lighed med i 2004) blev det store flertal af de planlagte aktiviteter gennemført i overensstemmelse med årets arbejdsplan. På de enkelte partner institutioner var de vigtigste aktiviteter følgende: 1). På San Andrés universitetet i La Paz at detaljeplanlægge og påbegynde et nyt biologi curriculum, der vil give kandidater bedre forudsætninger for at forvalte Bolivias naturressourcer, samt at begynde et forskningsprogram fokuseret på bolivianske planter af økonomisk betydning for den landets befolkning. 2). i herbariet i Quito at registrere Ecuador's økonomisk værdifulde planter i en national database med detaljeret information om hver enkelt arts anvendelse, 3). på universitetet i Loja af afslutte et feltarbejde fokuseret på betydning og anvendelse af produkter ekstraheret fra planter i det sydlige Ecuador, og efterfølgende at analysere, vurdere, og beskrive dette studiums resultater, og 4). på universitet i Århus at træne fire bolivianske studenter i biodiversitets forskning og informatik. Alle 4 indsamlede i begyndelsen af 2005 felt-data i Bolivia, Peru og Ecuador, og analyserede efterfølgende indsamlede materialer i Århus, hvorpå at de skrev deres M.Sc. afhandlinger og forsvarede disse med succes i November-December. BEISA har således gennemført et betydelig forskningsindsats i 2005. Kun få resultater er dog foreløbig publiceret, men mange bidrag forberedes og vil være klare til publicering i 2006.

1. Summary in English

BEISA (Biodiversity and Economically Important Species in the Tropical Andes – A research collaboration between Bolivia, Ecuador and Denmark, www.beisa.dk) is a research collaboration framework aiming to enhance and improve biodiversity research and education at four partner institutions: the Institute of Ecology at the San Andrés University in Bolivia, the Catholic University of Ecuador in Quito, the National University of Loja, and the Biological Institute of the University of Aarhus. Each of these institutions has research interests regarding useful plants of the central Andean region. BEISA upgrades teaching and research regarding the rich biodiversity found in Bolivia and Ecuador. Young promising researchers are trained to an international level enabling them to carry out research regarding their home countries' biodiversity, as well as search, apply and disseminate knowledge found in information facilities and at institutions in the developed countries. Their capacities will help their home countries to exploit, apply and manage biodiversity for the well-being of their citizens, and enable national institutions to participate in regional and international projects and efforts aimed to improve the conservation and management of the regions biodiversity. The first three-year-phase of BEISA commenced on October 1, 2003, and during 2005 the project was executed in accordance with the projects annual plan. At the individual partner institutions the principal activities were the following: 1) at the San Andrés University in La Paz to prepare and implement a newly designed biology curriculum, aiming to improve the candidates capacity to manage natural resources, and to commence a new economic botany research program. 2) in the herbarium in Quito to record the uses of native Ecuadorian plants in a national data-base that will include detailed information regarding the specific uses of each species, 3) at the University of Loja to finish a field-survey of non-timber products extracted from dry and pre-montane forests in southern Ecuador, and to analyze, evaluate and describe the resulting data, and 4) at the University of Aarhus to educate four Bolivian M.Sc. students in biodiversity research and informatics'. During early 2005 all four recollected research-data in the tropical Andean region, and subsequently they processed their materials in Aarhus, wrote their M.Sc. dissertations, and defended their M.Sc. degrees with success in late 2005. BEISA has consequently during 2005 effectuated an active field research program, but until now few of the results have been published. However, many contributions currently in preparation will be ready for publication during 2006.

Key works: Biodiversity, Native flora, Etnobotany, Useful plants, Extraction, Non-timber forest products (NTFP's), research capacity, curriculum development, and sustainable development.

2. Background

The BEISA project (Biodiversity and Economically Important Species in the Tropical Andes – A research collaboration between Bolivia, Ecuador and Denmark) started on October 1, 2003 and its first phase will continue until Sept. 30, 2006. This first phase is envisioned as the first of four consecutive 3-year long project phases. The first project activity was an Inception Workshop in La Paz, Bolivia, December 8-12, 2003, attended by key project participants from the four partner institutions. The objectives were to adapt project activities to a reduced budget, and to discuss and plan the coordination and implementation of the project. Based on the discussions and conclusions during the Inception Workshop an *Amendment to the Project Document* was elaborated (dated March 4, 2004). It included a revised budget, a new log frame, and a detailed working plan for the three years, and co-operation agreements between the Danish partner and each of the local partners defining procedures and obligations according to the DANIDA standards. The Amendment is the document that guides the implementation, and summarizes (on page 6) the main activities over the three years as “student course work and planning of the research program in 2004, field research in 2005, and processing of results and publication in 2006”. BEISA has three principal objectives: 1) to improve university education and biodiversity research, 2) to document and make biodiversity information available taking advantage of modern IT, and 3) to investigate economically important species and ensure that results will serve to protect, use and manage the local flora and fauna. In the present first project phase seven outputs (results) will contribute to these objectives. During an evaluation and planning workshop held in La Paz, January 16-20, 2006, the project partners discussed the execution of the project. The overall conclusion was that the project has advanced as envisioned; and more specifically that the activities supporting the mentioned seven outputs in general have been implemented according to the work-plans. In the present annual report the implementation of the individual activities during 2005 is described, and there also appear accounts for 2005, budget for 2006, and the work-plan that will guide the implementation of BEISA during 2006. Compared to the original work plan the changes are moderate. Objectives, outputs, indicators and assumptions found in the project log frame (in the *Amendment to the Project Document*) are maintained, implying that we not have elaborated a new log frame.

As **Appendix A** appears a list of the abbreviations applied throughout the BEISA annual report for the projects key persons as well as for various projects and institutions.

3. Achievement of objectives

Number of students who have initiated an M.Sc. and Ph.D.

In 2004 four Bolivian and one Ecuadorian student commenced their M.Sc. degree studies at the University of Aarhus, and in 2005 one Ecuadorian and two Bolivian students commenced local M.Sc. studies. In addition, during 2004 and 2005 three Bolivian and six Ecuadorian students commenced studies for their first local degree (licenciatura) financed by BEISA. Below and throughout the present report the staff members and students participating in BEISA are referred to with abbreviations appearing in Appendix A.

Number of students who have graduated with an M.Sc. and Ph.D.

Four Bolivian students received their M.Sc. degrees at the University of Aarhus, presenting the following thesis works:

- CM: A revision of *Elaeagia* Weddel (Rubiaceae)
- AS: The palm community in a terra firme tropical rainforest in the Bolivian Amazon and factors structuring its beta diversity
- NP: Factors determining the knowledge and use of palms in the western Amazon
- AC: Useful plants and traditional knowledge in the Tucumano-Boliviano forest

The enrolled Ecuadorian M.Sc. student (LT) was envisioned to write her M.Sc. thesis at the University of Aarhus during 2006, but she has obtained a Ph.D. scholarship from the Danish Council for Development Research (RUF), and January 2006 she commences a Ph.D. study at the Faculty of Science, University of Aarhus, to be finished in late 2008.

In Loja, Ecuador, two forestry students defended their first local degree (licenciatura); and at the University of Chuquisaca, Sucre, Bolivia, one agronomy student got this degree. The titles of these works are the following:

- ML/PC: Composición florística, estructura, endemismo y etnobotánica del bosque nativa el Colorado en el Cantón Puyango, Provincia de Loja. Ecuador.
- MP: Diversidad florística de bosque secundario en el bosque tucumano boliviano. Sucre, Bolivia.

List of publications 2005 (including reports, peer-reviewed journals, proceedings, presentations). Since BEISA research commenced in 2004, and most of the research has been executed during 2005, few project results have until now been published. However, BEISA researchers also continue to publish regarding subjects they have studied since before BEISA started, and those of the latter contributions that deal with biodiversity in the tropical Andean region have also been included in present list. There has also been given a number of presentations at symposia and seminars. In the present list BEISA authors' (persons whom also appear in Appendix A) have been emphasized with bold:

Publications

- Bjorholm, S., J.-C. Svenning, F. Skov & **H. Balslev**. Environmental and spatial controls of palm (Arecaceae) species richness across the Americas. *Global Ecology and Biogeography* 14: 423-429.
- Boll, T., J.-C., Svenning J. Vormisto, S. Normand, C. Grández & **H. Balslev**. Spatial distribution and environmental preferences of the piassaba palm *Aphandra natalia* (Arecaceae) along the Pastaza and Urituyacu rivers in Peru. *Forest Ecology and Management* 213: 175-183.
- Kvist, L.P.**, Skog, L.E., Clark, J.L. & Dunn, R.W. Biological Extinction in Ecuador exemplified by the Gesneriaceae. Pp. 117-168 en Lozano, P., Bussman, R. & Navarrete, H. (eds.), *Memorias del II Congreso de Conservación de la Biodiversidad de los Andes y Amazonía y IV Congreso Ecuatoriano de Botánica*. FunBotanica, Loja Ecuador.
- Lozano, P., Bussman, R. & **Navarrete, H.** (eds.), *Memorias del II Congreso de Conservación de la Biodiversidad de los Andes y Amazonía y IV Congreso Ecuatoriano de Botánica*. FunBotanica, Loja: Ecuador.
- Lozano, P., Delgado, T. & **Aguirre, Z.** Endemismo una herramienta para la conservación. Parque Nacional Podocarpus, un caso de estudio. Pp. 169-186 en Lozano, P., Bussman, R. & Navarrete, H. (eds.), *Memorias del II Congreso de Conservación de la Biodiversidad de los Andes y Amazonía y IV Congreso Ecuatoriano de Botánica*. FunBotanica, Loja: Ecuador.
- Moraes R., M.** The genus *Syagrus* in Bolivia. *The Palm Journal* 179: 17-18.
- Moraes R., M.** ¿Cómo redactar un artículo científico? Red de Educadores y Profesionales de la Conservación, Carrera de Biología, Universidad Mayor de San Andrés, La Paz. 50 pp.
- Oré, I., Delgado, O., Mejía, K., Sørensen, M. & **Kvist, L.P.** El cultivo de Chuin. Una alternativa para la seguridad alimentaria y recuperación de suelos degradados en la Amazonía Peruana. KVL/ UNAP/ IIAP, Perú. 40 pp.
- Sánchez, O. & Aguirre, Z.** Caracterización de la vegetación forrajera en los periodos secos y lluvioso en los bosques secos de Mácara y Zapotilla, Provincia de Loja. *Bosques ... latitud cero. La revista forestal y agroforestal del Ecuador* 1: 5-8.
- Torres, L. de la** El uso Secoya de las plantas desde una perspectiva etnoecológica. Pp. 33-41 en Yépez, P. et al. (eds.), *Al Inicio del Sendero: Estudios Etnobotánicos Secoya*. Ed. Arboleda. Quito: Ecuador.
- Sklenár, P. & **H. Balslev**. Superpáramo plant species diversity and phytogeography in Ecuador. *Flora* 200: 416-433.

Proceedings (abstracts)

- Aguirre, Z.** Los bosques secos del sur del Ecuador. P. 23 en *Memorias de V. Congreso Ecuatoriano de Botánica*. 14 a 17 Noviembre, Loja, Ecuador.

- Carretero, A., Borchsenius, F., Balslev, H. & Kvist, L.P.** Uso del bosque Tucumano-Boliviano por comunidades rurales en Bolivia. P. 113 en Memorias de V. Congreso Ecuatoriano de Botánica. 14 a 17 Noviembre, Loja, Ecuador.
- Granda, V., Guamán, S. & Aguirre, Z.** Composición florística, estructura, endemismo y etnobotánica del bosque seco “Algodonal” en el Cantón Macará, Provincia de Loja. P. 35 en Memorias de V. Congreso Ecuatoriano de Botánica. 14 a 17 Noviembre, Loja, Ecuador.
- Kvist, L.P.** Identificación y evaluación de plantas usadas para malaria y leishmaniasis en Loreto, Perú. P. 110 en Memorias de V. Congreso Ecuatoriano de Botánica. 14 a 17 Noviembre, Loja, Ecuador.
- León, M. & Cueva, P.** Composición florística, estructura, endemismo y etnobotánica del bosque nativa “El Colorado” en el cantón Puyango, Provincia de Loja. P. 114 en Memorias de V. Congreso Ecuatoriano de Botánica. 14 a 17 Noviembre, Loja, Ecuador.
- Sánchez, O., Aguirre, Z. & Gutiérrez, L.** Caracterización de la vegetación forrajero en los periodos seco y lluvioso en los bosques secos de Zapotilla y Macará, Provincia de Loja. P. 42 en Memorias de V. Congreso Ecuatoriano de Botánica. 14 a 17 Noviembre, Loja, Ecuador.
- Sánchez, O., Kvist, L.P. & Aguirre, Z.** Productos maderables y no maderables de los bosques secos de la provincia de Loja. P. 68 en Memorias de V. Congreso Ecuatoriano de Botánica. 14 a 17 Noviembre, Loja, Ecuador.

Oral Presentations

- Aguirre, Z.** Los bosques secos del sur del Ecuador. V. Congreso Ecuatoriano de Botánica. 14-17 Nov., Ecuador.
- Aguirre, Z.** Posibilidades de manejo del bosque seco en el sur occidente del Ecuador. Simposio Internacional de manejo de bosque seco, Agosto 19, Zapotilla, Ecuador.
- Carretero, A.,** Uso del bosque Tucumano-Boliviano por comunidades rurales en Bolivia. V. Congreso Ecuatoriano de Botánica. 14-17 Nov., Ecuador.
- Granda, V.** Composición florística, estructura, endemismo y etnobotánica del bosque seco “Algodonal” en el Cantón Macará, Provincia de Loja. V. Congreso Ecuatoriano de Botánica. 14-17 Nov., Ecuador.
- Kvist, L.P.** Identificación y evaluación de plantas usadas para malaria y leishmaniasis en Loreto, Perú. V. Congreso Ecuatoriano de Botánica. 14-17 Nov., Ecuador.
- León, M.** Composición florística, estructura, endemismo y etnobotánica del bosque nativa “El Colorado” en el cantón Puyando, Provincia de Loja. V. Congreso Ecuatoriano de Botánica. 14-17 Nov., Ecuador.
- Navarrete, H.** The importance of scientific studies for the understanding and management of environmental studies. Ecosystem Services and Biodiversity in Developing Countries Conference, Rened/Copenhagen. August 17.-18.

Sánchez, O., Productos maderables y no maderables de los bosques secos de la provincia de Loja. V. Congreso Ecuatoriano de Botánica. 14-17 Nov., Ecuador.

Posters:

Presented at “The Palms – An International Symposium on the Biology of the Palm Family”, The Linnean Society of London & The Royal Botanic Gardens, Kew, 6-8 April:

Local knowledge of tropical rainforest palms in the Pastaza fan in the western Amazon basin (**Balslev, H., Paniagua, N., Moraes, M.**, Grandez, C. & A. Byg).

Diversity and economic potentials of Bolivian palms (**Moraes, M.**).

Budget expenditure: Denmark and partner countries (Annex 10, form 1 and 2)

The expenditures realized by BEISA during 2005 appear in Appendix D (Annex 10 – form 1) distributed at project partners and budgetary lines. It appears in that on December 31, 2005, a total of approximately DKK 222.100 remained, distributed at UMSA, La Paz (dkk. 92.700) and AAU, Aarhus (dkk 129.400). The 2006 budget (Appendix C) shows how it is anticipated to spend these resources in 2006, and specific uses are discussed under the heading “Revised budget and log frame” (at page 18).

Other capacity building

In 2004 BEISA were instrumental in establishing a Bolivia group networking Danish researchers interested in natural resource research in Bolivia. During 2005 the activities mainly involved Danish EnReCa projects/initiatives active in or planning projects in Bolivia. The collaboration with the FOMABO- (Forest Management in Bolivia) ENRECA-project, headed by professor Finn Helles, at the Forest and Landscape institute of RVAU continued. MM has been invited to be part of the Scientific Commission of the FoMaBo project, and during 2005 were held two co-organized workshops assisted by staff and students from the Bolivian project partners of BEISA (UMSA in La Paz) and FoMaBo (UMSS in Cochabamba and UAGRM in Santa Cruz). In March MM directed a two-day workshop at UMSS on “Evaluation of Scientific Publications”, and in July was held a three-day workshop at UMSA dealing with “Fundraising for Research Projects”. Among the teachers of the latter event was Dr. Renato Valencia from PUCE in Ecuador.

The Academic Commission at UMSA found the second event so interesting, that MM was invited to coordinate a postgraduate course on “Mechanisms of fundraising for scientific projects”. This was funded by Asdi/SAREC, under a collaboration program with different Bolivian universities including UMSA, and is dictated from September 2005 until February 2006. As part of this course RN was again invited to La Paz, where he gave three classes on Science & Technology indicators in November.

The described co-organized courses have resulted in efforts to formalize an EnReCa-collaboration regarding training of Bolivian researchers in project identification, fundraising, research planning, and scientific writing and publication. In February MM and FoMaBo coordinator NH presented these ideas at the Danish embassy in La Paz. In Copenhagen these issue was discussed during meetings between LPK and NH, and Niels Christian Kyvsgard and Marten Sørensen also participated in these discussions. The former head the “Improvement of smallholder livestock” EnReCa project collaborating with Universities in Cochabamba, Oruro and Potosí, and the latter has applied for funding for the “AndesCrop” EnReCa-project that will integrate various Bolivian universities as well as other institutions and organizations. The EnReCa-projects hope to establish a cycle of courses that may give staff and students from the Bolivian partner institutions (and others) expertise to become active researchers; irrespective of the specific scientific focus of their research. We refer to this initiative as the “Bolivian researcher school”.

During 2005 BEISA has expanded relations with the Agronomy department at the San Francisco University in Sucre, Bolivia. One of the four Bolivian candidates (AC) who has recieved a M.Sc. degree Aarhus, comes from the herbarium of this institution (but has referred to UMSA during the first BEISA phase). In August 2005 the Danish BEISA coordinator (LK) visited Sucre, and in early November the dean from their agronomy department (Iván Arciénega) visited the University in Aarhus. A specific result of this collaboration has been that one Sucre student (MP) undertook fieldwork in Chuquisaca together with AC. This project and his participation were financed by the DANIDA sectoral program in Bolivia.

Description of the dissemination of results to users at all levels

BEISA has a home page (www.beisa.dk) which gives a general description and is envisioned to become a fast and efficient outlet for results, and a dynamic link between project participants, and users that want to access data produced by the BEISA. The partner-institutions are also improving their home pages in order to disseminate BEISA results, as well as other biodiversity data.

4. Fulfillment of outputs and main activities

Here we summarize the advances regarding the activities scheduled to be executed according to the 2005 work plan (found in the 2004 annual report, and appearing as column 2005 in the present work plan, see Appendix B). The individual activities figure below the results (outputs) they contribute to in the BEISA log-frame (found in the *Amendment to the Project Document*). Compared to the log frame, the descriptions of the activities have been abbreviated, and do not include tasks completed in 2003/2004 or planned for 2006. Neither refers the discussion specifically to all “2005 tasks”.

Output 1.1. Project partners and particularly UMSA, La Paz, have improved their capacity of teaching and research regarding sustainable use and management of native flora and fauna, improving and expanding courses and curricula, and actively soliciting funding from national and international institutions and organizations.

Activity 1: Workshops/meetings to coordinate, plan and evaluate BEISA.

Fulfillment: There were no planned workshops in 2005, but in August the Danish-BEISA coordinator visited Bolivia and Ecuador, and in November again Ecuador. Some objectives of these visits were to coordinate between the project partners, evaluate the project implementation and to begin discussing and adjusting activities to be implemented in 2006.

Activity 2: Appraise the qualifications needed by biology candidates from UMSA, and evaluate the current curriculum, and develop a new improved curriculum;

Fulfillment: The general structure of the new curriculum was approved in December 2004, and the detail planning continued through 2005. It was originally envisioned to launch the new curriculum from the second semester of 2005. Due to that many students first have to finish their “old curriculum” studies; this was postponed until the first semester of 2006.

Activity 3: Improve existing courses, and develop new courses particularly concerning Economic Botany; Natural Products Chemistry; and, Management of Natural Resources.

Fulfillment: Professors at UMSA, the Ecuadorian partner institutions and in Aarhus have exchanged experiences and materials regarding existing courses dealing with similar topic, e.g. plant geography and systematic botany. UMSA prepares the following new courses dealing with economic botany and the management of natural resources:

Economic Botany I

Conservation and Management of Natural Areas

Economic Botany II

Ecological Foundations for Management and Sustainability

These courses will be taught during 2006 (see working plan for 2006 in Appendix B). However, during 2005 the detail planning and the elaboration of/search for support materials for these new courses have been dominant activities at UMSA. In addition, the Danish BEISA-coordinator LK has continued to elaborate reading materials for the Economic Botany courses; and Jose Luis Castro and Patricia Mollinedo are planning a small course introducing Natural Products Chemistry (originally envisioned as a component of the Economic botany I course, but it will probably be

dictated as a separate course two-week course in May/June 2006). The latter's are Bolivian chemists from the Chemical Institute at UMSA. In February 2006 they will complete their PhD's at the Lund University in Sweden.

The elaboration of teaching materials for the Biology career at UMSA is also supported by other institutions. MM participates in a Network of Conservation Educators and Practitioners led by the Center for Biodiversity and Conservation of the American Museum of Natural History (New York). The goal is to produce educational materials and training for Bolivian universities; an initiative funded by USAID. Besides, in 2005 an application presented to the MacArthur Foundation was approved, and will support the elaboration of biology conservation modules from 2006 to 2009.

In Ecuador UNL has integrated economic botany as a topic within an existing course; and PUCE has compiled data and materials that will serve a new course.

Activity 4: Strengthen the capacity to negotiate projects including funding from third parties.

Fulfillment: This activity has partly been executed in collaboration with the FoMaBo-EnReCa project (see *Other capacity building*). A workshop focused at "Fundraising for Research" was co-organized, and subsequently from late 2005 to early 2006 UMSA offered a course regarding this issue. RV from PUCE taught parts of both courses, and LT and PM equally from PUCE participated in the first event. These events deal with institutional contacts and networks. However, the envisioned analysis of these issues has been postponed until early 2006. PUCE also maintains and expands their research activities by means of funding received as donations from third parties, and elaborates and distributes materials to this end. Part of the staff recording the useful plants of Ecuador into the database is financed by such donations. In the future this may also be an option for UMSA.

Output 1.2: Bolivian and Ecuadorian undergraduate students from the participating institutions have been trained to their first degree in biodiversity management and utilization at their home-universities (supported by/financed by BEISA).

Activity 1: Train students for their first degree (licenciatura) and for Master degrees in Bolivia and Ecuador.

Fulfillment: Three students have defended their first degree in 2005, and another six are expected to defend their degrees in 2006. Another three students have begun studies for local M.Sc. degrees. Below the students from the individual partner institutions are discussed separately, as well as one student at the University of Chuquisaca in Sucre, Bolivia.

UMSA. Three biology students (GA, NT, RH) commenced (licenciatura) thesis-projects in February, April, and July, respectively. GA studies medicinal plants used by the Tsimane indigenous group in Rurrenabaque in the Beni department. She analyzes categories of medicinal applications, transfer of traditional knowledge between generations and gender issues regarding these plants. Her thesis will be defended in February 2006. NT investigates the palm *Parajubaea torallyi* being endemic for the Chuquisaca department. Specific issues are its population structure and density and uses for agriculture and domestic animals. She presents her thesis in April 2006. RH compares the uses of plants in two communities located in Tucumano-Boliviano forest in the western Santa Cruz department near Vallegrande. Specific issues are plant use categories and the conservation of plant resources, and he will finish his thesis in July 2006. Another two Students (MD and XC) was in February 2005 enrolled in a local two-year M.Sc.-program on Ecology and Conservation. They have advanced according to their schedules, and they presented in December the research proposals that should give them their M.Sc. degrees in late 2006. MD will study economic valuation of natural resources for management purposes, and XC will compare cultural practices in relation to environmental impacts and economic and social issues.

UNL. During 2004 and 2005 six forestry students have undertaken licenciatura thesis-research as part of this BEISA project, and the first two of them (ML/PC) received their degrees in December 2005, and the remaining four will defend in early/mid 2006. They have established permanent one-hectare forest sample plots in four places in the Loja province in southwestern Ecuador. In each place the floristic composition and the silvicultural characteristics of the forests have been described, and they have interviewed local people recording the potential uses of the plants, and compared the knowledge of men and women and age-groups. ML and PC undertook their study in a steep, pre-montane forest (El Colorado in the Puyango municipality), JE and LM in a less hilly but also humid pre-montane forest (El Limo in the Alamor municipality), and SG and VG in two dry forests (El Ceibo and Algodonal in the Zapotillo and Macará municipalities, respectively). In addition, OS has begun a local M.Sc. study with BEISA support. For his thesis work he will analyze data gathered during his present work as BEISA-UNL field research assistant.

PUCE. A student (JS) working with the useful plant data-base project plan a licenciatura project focused at plants used to treat leishmaniasis in Ecuador.

HSB (Chuquisaca University, Sucre). The Danida Enviromental Program financed that MP conducted fieldwork together with AC, studying the floristic

composición de pre-montane forests in Chuquisaca, Bolivia. For this work he received his (licenciatura) degree at the University of Chuquisaca.

Output 1.3: Bolivian and Ecuadorian graduate students from the participating institutions have been trained to M.Sc. and Ph.D. level in Denmark.

Activities 2 and 3: Five M.Sc. candidates educated in biodiversity research and management. Gathering of data in home countries in early 2004, and subsequently processing of results, and writing and defense of thesis works in Aarhus.

Fulfillment: The students spend 2004 undertaken coursework in Aarhus, and finished their last course in mid/late January 2005. All courses were approved implying that each of them have completed 60 ECTS of course-work. Subsequently, they spend the early part of 2005 recollecting information for their thesis studies in the tropical Andean countries, and they then they returned to Denmark (except LT who according to her plans spend 2005 gathering data in her home country Ecuador). In Aarhus the four Bolivian students processed and analyzed their data, and wrote and defended their thesis works, here briefly described for each of them:

Carla Maldonado (CM): A revision of the genus *Elaeagia* (Rubiaceae). Supervisor: Finn Borchsenius (FB). Defense: November 25. Grade: 10.

CM has studied the taxonomy and phylogeny of the genus *Elaeagia* belonging to the coffee family (Rubiaceae). *Elaeagia* is used in the Andean region to produce lackerware articles. It comprises trees predominantly distributed in tropical Andean montane forests. From January to March she searched and collected materials of *Elaeagia* in Bolivia, Peru and Ecuador. In Aarhus she delimited and described 9 species of *Elaeagia*, and undertook a phylogenetic analysis of the genus.

Adriana Sanjinez (AS): The palm community in a terra firme tropical rain forest in the Bolivian Amazon and factors structuring its beta diversity. Supervisors: Henrik Balslev (HB) and Jens-Christian Svenning. Defense: December 23. Grade: 11.

AS has studied palm communities in the lowland rainforests of the Madidi National Park in Bolivia. She conducted field work from February to June; accompanied by HB in April-May 2005. Along 25 transects were registered nearly 20.000 palm individuals representing 24 species. In Aarhus the diversity and abundance of the palm communities were analyzed in relation to environmental factors as well as the intensity of human impacts.

Narel Paniagua (NP): Factors determining the knowledge and use of palms in the western Amazon. Supervisors: Henrik Balslev (HB) and Jens-Christian Svenning. Defense: Dec. 19. Grade: 11.

NP has investigated the economic, social and cultural importance of palm resources in two regions in the western Amazon basin; the Pastaza fan in northeastern Peru, and the Madidi region in northeastern Bolivia. She conducted field work in Peru in May 2004 and in Bolivia from February to June 2005 (and in both places HB has participated). The relative importance of 38 palm species was evaluated, as well as patterns of informant's knowledge.

Alain Carretero (AC): Useful plants and traditional knowledge in the Tucumano-Boliviano forest. Supervisor: Finn Borchsenius (FB). Defense: Dec. 21. Grade: 11.

AC has studied four non-indigenous farming communities located in two sites in the Chuquisaca province of Bolivia. He investigated their use of plant resources from humid montane (Tucumano-Boliviano) forest, and estimated the relative value people assigned to the different plants, and the factors impacting people's traditional plant knowledge. The most important social and geographic factors were birth place, gender, age, and relative isolation of communities.

Lucia de la Torres (LT): The title of the Ph.D. that she commences in January 2006 is "Determinants of plant use diversity among cultural groups in Ecuador" (implying that she no longer will be financed by BEISA). During 2005 she directed and supervised six co-workers at PUCE compiling and organizing the existing comprehensive but dispersed information concerning the uses of native plants in Ecuador. She also helped to design the database for this book, and planned the *Catalogue of useful Ecuadorian plants* book.

Output 1.4: The infrastructure and management of natural history reference collections in the collaborating institutions have improved; particularly the Bolivian Fauna collection (*Colección Boliviana de Fauna*) at UMSA, La Paz.

Activity 1: Identify and priority infrastructure needs in the fauna collection.

Fulfillment: This activity has not been executed because in 2006 the fauna collection will be moved to another building shared with the Faculty of Natural Sciences at UMSA. After the movement DKK 40.000 allocated to the fauna collection will finally be spend.

Output 2.1: The IT-infrastructure of the participating institutions has been upgraded, and researchers and technicians have been trained, e.g. enabling IT-based reference collection management.

Activity 1: Identify needs and install IT-infrastructure for management of biodiversity data including reference collections at participating institutions.

Fulfillment: At PUCE a new database with ethnobotanical information has been developed. The structure of this database is shared with UMSA (installed during the training course held by LT and PM en La Paz). At UMSA the IT-infrastructure was upgraded with a new computer, and the installation of printer and scanner equipment, and the Filemaker database program.

Activity 2: Train Students and herbarium staff in the use of IT to process and analyze biodiversity data.

Fulfillment: In Denmark the four Bolivian M.Sc. students took the course in Biodiversity Informatics (mentioned above) and subsequently they all applied databases in order to analyze their thesis data. At PUCE five students contracted by the “catalogue of useful plants project” have been trained in the management of herbarium specimens, ethnobotanical data, the use of databases and an advanced digital camera. LT, who also have taken the Biodiversity Informatics course, have continued developing her skills to process and analyze biodiversity data, and during 2005 PM have been integrated in the group as responsible for database development. LT and PM demonstrated their IT-capacities in late June – early July organizing and dictating a training course at UMSA in La Paz. They also helped UMSA to install the frame of the PUCE ethnobotanical database, and to pass information compiled in an older local database to the new database. The participants in the course were herbarium technicians and pre-graduate students, GA and Erika Blacutt.

Output 2.2. Project partners have been connected to global biodiversity data facility networks, and local users have been trained, facilitating their participation and integration as equal partners in this global biodiversity database facility.

Activity 1: Promote the application and the integration with international biodiversity IT-facilities.

Fulfillment: At PUCE the new web site is ready but not yet available on the internet (due to internal administrative procedures which first must be defined). The site applies the software “Fact Sheet fusion”, and presents the relevant information including a digital photo of each species. Ultimately it will include all useful Ecuadorian species recorded during the preparation of the “Catalogue of Ecuadorian useful plants”. PUCE promotes the databases developed for the project and the herbarium, among other Ecuadorian institutions working with biodiversity including university museums and botanical gardens. The intention is to integrate their information in the same system. In Bolivia the national herbarium at UMSA has become member of the IABIN network, and actively consolidates their floristic database and internet capacities in order to take advantage of this opportunity. During the International Palm Symposium in Kew in April 2005, MM organized a meeting discussing exchange of biodiversity information in the Andean region. HB and FB attended this event.

Output 2.3: Research results are published to a broad spectrum of end-users; and both locally, nationally and internationally, taking advantage of modern IT for the elaboration and distribution of relevant results and information, e.g. user-friendly identification and documentation materials.

Activity 1: Publication of scientific papers as well as popular contributions.

Fulfillment: Throughout 2005 BEISA researchers and students have worked on many publications, including three books, which will be published in 2006. This includes a book edited by MM and BØ with approximately 30 chapters regarding economically important plants in the Central Andes (Bolivia, Peru and Ecuador) written mostly by BEISA project participants, and with invited contributions from experts and colleagues who are not directly involved in BEISA. Early in the year the content, subjects and authors of the book chapters were defined, and from July authors have submitted contributions which currently are edited until publication in mid-2006. The comprehensive “Catalogue of useful plants in Ecuador” will also be published in mid-2006. Its format is ready and 18 authors prepare chapters analyzing and systemizing different aspects and categories of plant uses in Ecuador. The third book, surveying ethnobotanical data found the herbarium in Quito, Ecuador, should have been published in 2005, but have been delayed until early 2006. In addition, several publications were prepared for international scientific journals, and for the proceedings from the symposium held in Loja, Ecuador, in November 2005.

Activity 2: Develop user-friendly documentation of biodiversity via internet accessible data-bases, etc.

Fulfillment: PUCE held in august a three day course in the use of a program (LUCID) allowing elaboration and presentation of taxonomic keys. All PUCE-BEISA researchers and students attended the course. The instructors came from the University of Queensland.

Activity 3: Target documentation concerning plant resources to rural end-users.

Fulfillment: Based on the thesis research carried out during 2005 and finalized with the defense of the four MSc thesis at Aarhus University, the results obtained will be written up in a format suitable for rural end user – this will happen during 2006.

Output 3.1: Researchers have collaborated with local people/ communities, identifying economically important plants in the tropical Andes, and investigating the uses, values and management of individual species or groups of plants, as well as the combined

socio-economic importance of species providing non-timber forest products (NTFP) to local people.

Activity 1: Inventory of economically important plant taxa in Ecuador and Bolivia.

Fulfillment: Throughout the year staff and contracted students have continued to enter Ecuadorian ethnobotanical information into the database at the QCA herbarium at PUCE in Quito; in late 2005 this summed to 14000 records registered from the literature and another 9000 records taken from herbarium sheets. In 2006 this information become available in the book “Catalogue of Ecuadorian Useful Plants” and via the new herbarium Web-site (see above). At UMSA the frame of the PUCE data-base was installed, and the first data regarding the uses of Bolivian plants, particularly palms, were registered. Data from an existing data-base were also integrated (see above), and it served for a literature database.

Activity 2: Applications of plants for selected, specific purposes.

Fulfillment: A study of LK with co-workers from DFUNI and Peru of anti-parasitic plants in Loreto, Peru, has been finished and will be published in 2006. In Bolivia GA has studied the medicinal plants used by the Chimane ethnic group.

Activity 3: Studies of selected economically important plant species.

Fulfillment: Bolivian students (discussed above) have undertaken the following studies complying with this activity: the uses and the ecology of palm communities near the Madidi National Park (AS, NP), the uses and management of the palm *Parajubaea torallyi* (NT), and the revision of the Rubiaceae genus *Elaeagia* (CM).

Activity 4: Studies of non-timber forest products in selected communities. Evaluate present importance as well as potential uses and economic values.

Fulfillment: The on-going studies have mainly investigated the distribution of knowledge regarding useful plants within local populations, including the factors affecting people’s knowledge, and the transfer of this knowledge between population segments and generations. Less emphasize has been given to economic evaluation and quantification of extracted products. In Loja in southern Ecuador BEISA-UNL (OS and ZA) continued their study of forest products from dry and pre-montane forests. January to June were spend finishing the fieldwork in the pre-montane forests, July to October recording and processing the gathered data, and November and December preparing publications for the BEISA book regarding Andean ethnobotany (see above) and the proceedings from the Botanical Symposium held November 14-17 in Loja. LK visited Loja in November attending the symposium and writing publications together with OS and ZA. In Chuquisaca, Bolivia, AC analyzed the distribution of plant-knowledge in relatively isolated vs. more easily accessible communities, and the ongoing study of RH also compares uses of plant

between two communities. The plant medicinal study of the Chimane ethnic group (mentioned above) also deals with these aspects.

Activity 5: Elaborate, evaluate and improve methodologies to investigate interactions between human communities and plant resources.

Fulfillment: In Loja Ecuador commences quantitative studies of useful plants (starting with a visit of LK in Loja in 2004) resulting in six (licenciatura) thesis projects from 2004 to 2006 (three financed by BEISA mentioned above and three financed by other sources), as well as the BEISA-UNL study of useful plants in the dry forests executed by OS and ZA. Bolivian M.Sc. student AC visited in March Loja, Ecuador, learning ethnobotanical field methodologies in the field with OS. Subsequently, he improved the methodology during his own field work in Tucumano-Boliviana forest in Chuquisaca, Bolivia, and presented these efforts in his thesis (mentioned above). Another Bolivian M.Sc. student (NP) applied and improved ethnoecological field methodologies near the Madidi National Park of Bolivia, and HB also contributed to these efforts, both in the field and as advisor of her thesis (mentioned above).

Summary of advances: Overall the activities have advanced according to the plans scheduled in the work plan for 2005. A few activities have been delayed, but most of them will be finished and/or executed in 2006. In particular, at UMSA the implementation of the new biology curriculum has been delayed approximately a half year, implying that courses expected to be taught first in late 2005 instead will be dictated in early 2006, etc.

5. Risks and assumptions

The potential risks mentioned in the original *Project Document* (from March 2003) have not materialized, and the assumptions appearing in the *Amendment to the Project Document* remain valid.

6. Lessons learnt and future perspectives

During 2005 was established the envisioned south-south collaboration between the two Ecuadorian project partners and UMSA in La Paz, Bolivia, e.g. regarding research in non-timber forest products, data-base establishment and other IT-development, efforts to ensure sustainability of research, curriculum development, etc. The general lesson is that experiences from Ecuador can be transferred successfully to Bolivia, but a precondition for this is to focus at specific initiatives and common interests.

7. Revised log frame and budget

A revised work plan is included as Appendix B, while it is estimated as un-necessary to revise the log frame, considering that the envisioned results and activities are the same as found in the *Amendment to the Project Document* (dated March 4, 2004). In contrast, the planning session held in La Paz January 16-20, 2006, resulted in many changes regarding the timing and the substance of the tasks supporting the individual activities in 2006; and therefore a revised work-plan has been elaborated and included as Appendix B.

Appendix C presents the budget for 2006 distributed at institutions and budgetary lines, and also includes semester-expenditures. In addition, appears the envisioned application of dkk. 220.100 transferred from the 2005-budget appears in La Paz (dkk. 92.700) and Aarhus (dkk. 129.400). In La Paz much of the surplus will serve to extent student scholarships allowing students to finish their local degrees (activity/tasks 1.2.1/4-5 in Appendix B), and the four Master candidates to finish scientific contributions based on their Master thesis works (activity 2.3.1/7), as well as the elaboration of popular works aimed for local communities (activity 2.3.3/1-3). In Aarhus the surplus will help to finance the publication of three books by BEISA during 2006 (activity 2.3.1/1-3). Travel expenses have also been increased, in order to allow Ecuadorian project partners (OS, ZA) to visit Aarhus in April-May 2006. The objective of their visit is to collaborate with their Danish colleagues in order to finish various common publications (activity 2.3.1/6).

8. Research progress

Overall research has advanced according to the plans of BEISA. Activities commenced at PUCE and UNL in 2004 and according to the plans at UMSA in 2005. Results have been processed particularly during the second half of 2005, and will be published in 2006.

Appendix A

Abbreviations used in the Annual Report for BEISA for institutions and project as well as BEISA key persons. Persons that have acquired their degree (licenciatura/M.Sc.) before the end of 2005 are referred to as candidates (rather than students).

Institutions/ projects

AAU (University of Aarhus)
 Asdi/SAREC (University of Lund, Sweden)
 BEISA (Biodiversity and Economically Important Species in the tropical Andes)
 DFUNI (Danish Pharmaceutical University, Copenhagen, Denmark)
 FOMABO (Forest Management in Bolivia, ENRECA-project based at RVAU)
 PUCE (Pontificia Universidad Católica del Ecuador, Quito, Ecuador)
 QCA (the herbarium at PUCE in Quito, Ecuador)
 RVAU (Royal Veterinary and Agricultural University, Copenhagen, Denmark)
 UAGRM (Universidad Autónoma Gabriel René Moreno, Santa Cruz, Bolivia)
 UMSA (Universidad Mayor de San Andrés, La Paz, Bolivia)
 UMSS (Universidad Mayor de San Simón, Cochabamba, Bolivia)
 UNL (Universidad Nacional de Loja, Ecuador)

Persons

AC (Alain Carretero, UMSA-AAU, M.Sc.-candidate)
 AS (Adriana Sanjinéz, UMSA-AAU, M.Sc.-candidate)
 BO (Benjamin Oellgaard, AAU, Economic Botany BEISA book editor)
 CM (Carla Maldonado, UMSA-AAU, M.Sc.-candidate)
 FB (Finn Borchsenius, AAU, head of steering committee)
 GA (Gabriela Aguirre, UMSA licenciatura student)
 HB (Henrik Balslev, AAU, project director)
 HN (Hugo Navarreta, PUCE-BEISA project coordinator)
 JE (José Encalada, UNL, licenciatura-student)
 JL (Javier Salazar, PUCE, licenciatura-student)
 LK (Lars Peter Kvist, AAU-BEISA project coordinator)
 LM (Luis Montalvan, UNL, licenciatura-student)
 LT (Lucia de la Torre, PUCE-AAU, M.Sc. student, from 2006 Ph.D. student)
 MD (Mariana Daza, UMSA, local Master-student)
 ML (Margarita León, UNL, licenciatura-candidate)
 MM (Monica Moraes, UMSA-BEISA-project coordinator)
 MP (Miguel Paredéz, Universidad de Chuquisaca, Sucre-Bolivia, licenciatura-candidate)
 NH (Nico Hjortsø, KVL-FoMaBo Project coordinator)
 NP (Narel Paniagua, UMSA-AAU, M.Sc.-candidate)
 NT (Natali Thompson, UMSA, licenciatura student)
 OS (Orlando Sanchez, UNL, local researcher and local M.Sc. student)
 PC (Pio Cueva, UNL, licenciatura-candidate)
 PM (Priscilla Murial, PUCE, researcher/ support the installation of data-bases)
 RH (Resomber Hurtado, UMSA, licenciatura-student)
 RV (Renato Valencia, PUCE, researcher/ dictated “fund-raising for research” courses)
 SG (Silvia Guamán, UNL, licenciatura student)
 VG (Vanessa Granda, UNL, licenciatura student)
 XC (Xavier Claros, UMSA, local Master-student)
 ZA (Zhofre Aguirre, UNL-BEISA-project coordinator)