Newsletter

DFG Research Unit 816:
Biodiversity and Sustainable Management of a Megadiverse Mountain Ecosystem in Southern Ecuador

Issue 16
March 2012

Shuar women from Shaime are taking a rest in their forest garden (left). The people of the Shuar mainly relay on forest plants for food, medicine and construction material. They use more than 300 plant species in almost 500 different ways. In contrast the Saraguros in El Tibio (middle) and Mestistos in Los Guabos (right) are mainly agro-pasturalists and make use of plants they cultivate. The Saraguros inhabit the highlands whereas the Mestizos live in the vicinity of cities and supplement their income with irregular work and day labor. For the first time the financial income gained with different forms of agricultural land use for the three ethnic groups are presented in this newsletter (see rubric Science News for details). The data pave the way to evaluate what practices will work in the future to generate a secure income and to protect biodiversity. Photos (f.l.t.r.): Andrés Gerique (2) and Eduardo Tapia.

Speakers' Corner

Retrospective and Perspective

gtö Conference

At the 2012 annual Conference of the Society for Tropical Ecology in Erlangen (February 20 – 24) on "Land- and Seascape Fragmentation" a considerable number of oral and poster presentations were from teams of our Research Unit (RU). Fortunately the president of the conference, Professor Dr. Achim Bräuning, is also a member of the RU. The symposium on fragmentation of tropical mountain ecosystems which was organized by Jörg Bendix (and Erwin Beck) was the most comprehensive of the meeting, extending over the morning and the afternoon sessions. Of course there were also some contributions from other groups in this symposium but the majority of the talks were from the RU. Presentations from projects of our group were also in other symposia, e.g. dendrology, landscape history and free topics. The very successful conference was in particular successful in several aspects of our RU: Having entered the last year of funding, data analysis and writing of theses and papers is now attaining predominant importance. In almost 15 years of research in South Ecuador, a huge amount of data has accumulated which need not only analysis but also synthesis and the presentation of the scientific achievements of the RU in the conference stimulated that aspect. This is very useful with respect to writing our second book in the Ecological Studies Series. Also several contributions to this Newsletter result from contributions to the gtö conference. Finally the international conference, bring-

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ing together scientists from 26 countries, showed that the former criticism of a low international visibility of the RU is no longer justified. Symposia with contributions from our RU always had full house and many discussions extended into the coffee and lunch breaks. Our RU is grateful to Achim Bräuning, Thorsten Peters and Michael Richter, all members of our RU for organizing this excellent meeting, which was attended by a fruitful mixture of young (the majority) and senior researchers.

Member Assembly

After the scientific retrospective in the Conference, our member assembly was dominated by perspective aspects for the remaining RU-time for research and publication and of the task to write a convincing, innovative and coherent application for the new "Platform for Biodiversity and Ecosystem Monitoring and Research in South Ecuador".

Towards the New Research Platform

Based on the call for proposals in the 15th Extra-Newsletter (December 2011, see doi: 10.5678/lcrs/for816.cit.1049), 51 pre-proposals were submitted to the RU office. In January 2012, the pre-proposals were screened by the scientific advisory board (SAB) during a SAB-meeting in Marburg, in close cooperation with the initiator group (see Newsletter no 14 doi: 10.5678/lcrs/for816.cit.1031). It was decided to invite the 35 most relevant projects for a presentation at a two days' symposium in Marburg. However, the objectives of the proposals showed that a refinement of the planned platform structure became necessary. On the basis of the projects and the intended contributions of our Ecuadorian partners, the original construction of the platform as a house with four floors had to be rearranged into a house with only two floors, composed of two transfer project bundles and one bundle (A) of basic research projects (see Figure 1).

Bundle A as a basic research sub-program, if not immediately aiming at global change indicators, build on the available data gathered in both RUs (RU402 and RU816) and is mostly affiliated with the NUMEX experiment (Nutrient Manipulation Experiment, see Newsletter No. 1, doi: 10.5678/lcrs/for816.cit.1010). Both transfer project bundles must develop a prototype based on already gained knowledge and data. Bundle B of the transfer projects consists of projects which are immediately ready for transfer into application research, such as the repasturisation experiment. The prototype development will encompass the elaboration of guidelines for a sustainable management of the hotspot area of southern Ecuador. Bundle C comprises transfer projects which

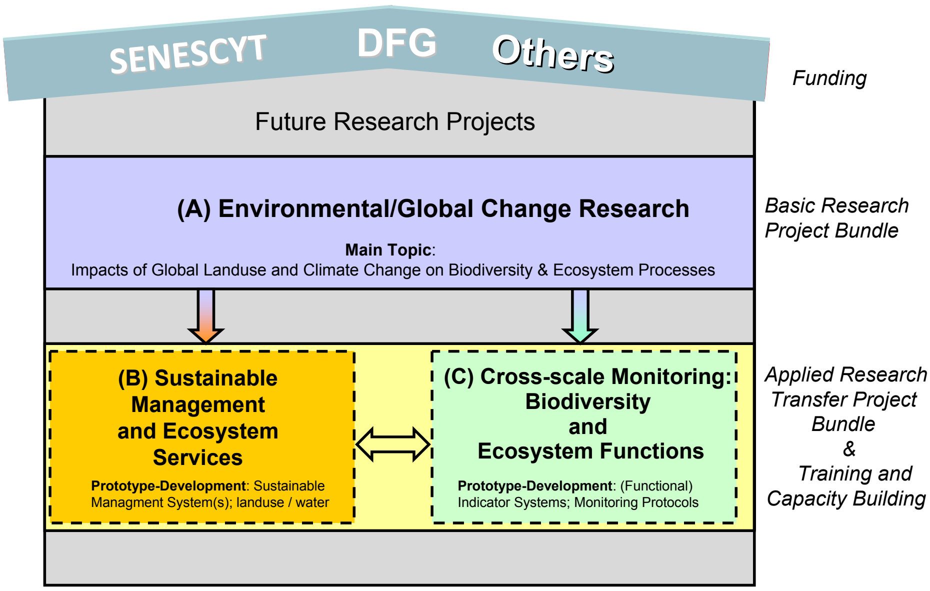

Figure 1: The refined structure of the new program.

Figure 2: Preparation symposium in Marburg. Photo: Thomas Lotz / Maik Dobbermann.

still require basic research but strive for the development of useful indicators of global change. Several types of indicators of global change have been discussed in the foregoing Newsletter No. 15 (see doi: 10.5678/lcrs/for816.cit.1049) and thus shall not be repeated here. The prototype development is devoted to develop a suitable indicator system and to provide monitoring protocols as a blue-print for an operational national monitoring system.

A two-day platform preparation symposium was organised on 16th – 17th Feb 2012 in Marburg (Figure 2). From the 35 projects presented there, 25 were encouraged to apply for a project on the platform (Figure 3). We have to admit, that the selection process after the symposium, which was conducted by the initiator group, the SAB and supported by two invited external advisors (Prof. Oberwinkler, Prof. Winiger), was a difficult task. At this place we would like to state, that none of the proposals which were not invited to join the platform were declined because of a poor scientific concept.

However, the new programme, striving for long-term funding, must comply with several conditions all of which are not easy to meet. The idea of the platform formally constitutes a joint research of a German and an Ecuadorian consortium. Although we do not have detailed knowledge about the 15

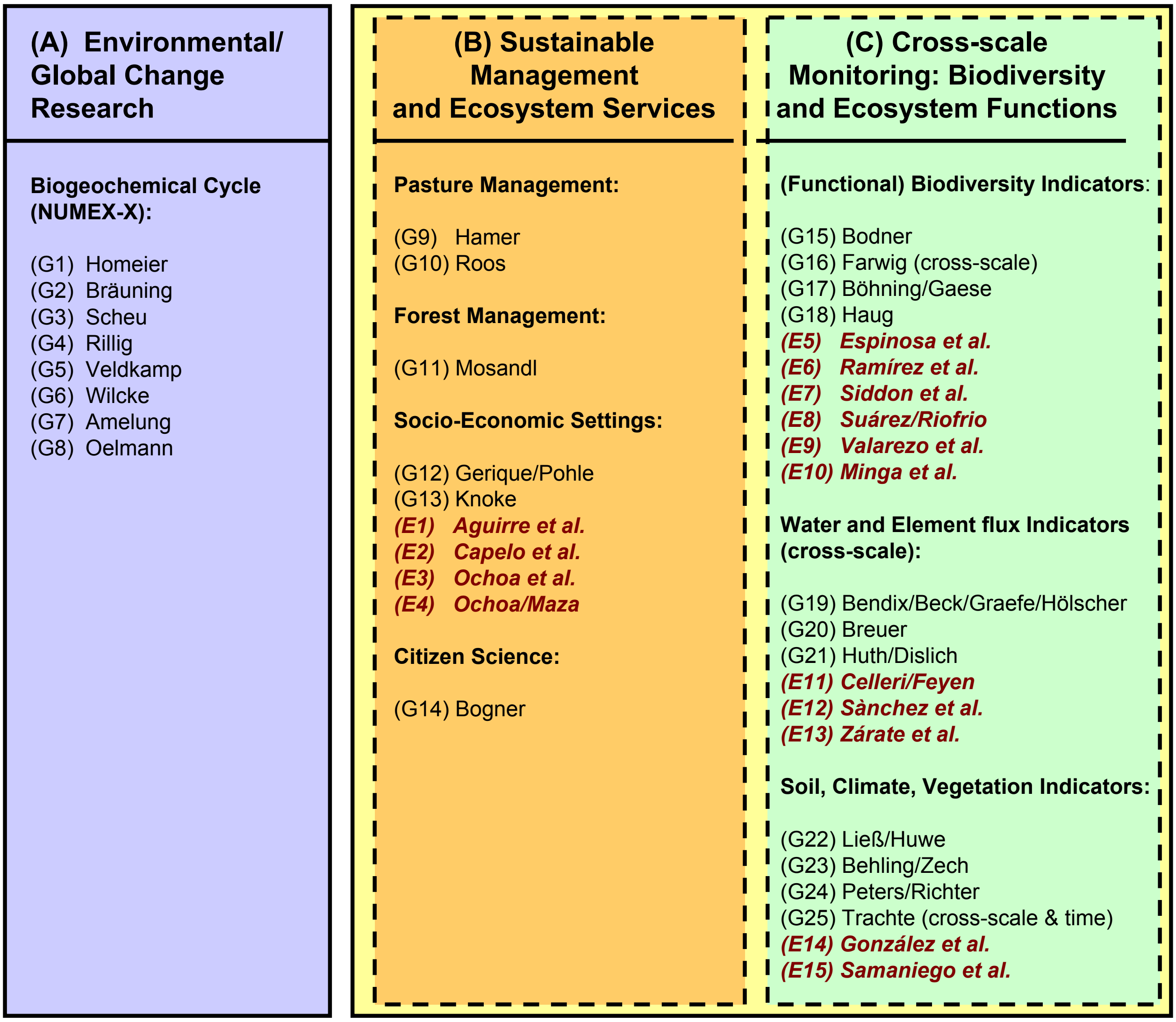

Figure 3: The outcome of the meeting at Marburg was the new project structure. **G**: Selected for application at the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG). ***E:*** Ecuadorian Partner Bundle-Proposals for submission to the Secretaria Nacional de Educación Superior, Ciencia, Tecnología y Innovación (SENESCYT).

Ecuadorian research projects, we received general descriptions and one of the basic requirements was a kind of correspondence of the German and the Ecuadorian projects. Of course these correspondences differ in tightness and the majority of the German projects have an Ecuadorian partner. However, both the German and the Ecuadorian projects must be able to stand alone, if the corresponding project would not get funding. Another requirement is the subject's fit into one of the three bundles of projects (A, B, C) each of which should be composed of a moderate and fairly balanced number of projects.

In spite of our endeavours to recruit new projects we also have to consider the ongoing ecological projects, like the NUMEX project, the expected results of which will serve the aspect of detecting and monitoring global change, e.g. eutrophication by atmospheric nutrient input. Unfortunately not many of the projects focused on continuous measurements of environmental variables such as climate, vegetation cover or run-off.

Figure 4: The planned research station Llaviuco (ETAPA) is situated at the shores of lake Laguna de Llaviuco. Photo: J. Bendix.

The New Research Areas

The selection of the three research areas and the expectations on research topics and research facilities associated with the three ecosystems and their anthropogenic replacement systems have been presented in the Extra-Newsletter mentioned above. Improvement of the research station Laipuna by the Organization Nature and Culture International (NCI) has started. However the plan to develop the compound at Illincocha by ETAPA has been dropped in favour of a station at lower altitudes where an abandoned brewery building shall become the research station Llaviuco for the Páramo site (see Figure 4).

The new station is situated at 3200 m, an altitude which is less stressful than Illincocha at 3900 m. Located immediately on the lake shore the researchers will enjoy an extremely scenic landscape near the timberline of the upper tropical mountain rain forest. In close vicinity are extensive plantations of *Pinus patula*, the anthropogenic replacement system of that forest. To reach the top (~ 4000 m) of the road from Cuenca to Guayaquil requires about 45 minutes by car. We hope that the reconstruction work at this marvellous place will start soon.

Time Schedule for Application

The preliminary time schedule which may be subject to changes plans to submit information for the application procedure due to mid April 2012. A further coordination meeting (e.g. to plan joint experimental designs) will take place end of April. At the current stage, it is planned to submit one compiled proposal to the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) and to have a joint review meeting in late 2012 at site. It is expected that the individual proposals must be submitted by June 1st to the speaker's office, allowing for an iteration time of two weeks for improvements and standardization. The latest date for submission to DFG by the RU office is 15th July 2012.

Synthesis Publications & Celebrating 15 Years of Research

Apart from the exciting new perspectives, publication of our results deserves much attention. Due to amassing deadlines, finishing of the chapters for the Ecological Studies book was delayed and a new deadline for submitting the manuscripts to the chapter editors was set (March 11). Also the action "high ranked papers" requires boosting. The hope is that after the lecture and examination time of the winter term, the assigned authors and co-authors will devote their time to the writing of the manuscripts. Our publishing editor, Dr. Esther Schwarz-Weig, is keen to work on your, on our manuscripts.

Although specific plans have not yet come up, we like to inform our readers that in 2012 three events will coincide in autumn in Loja: The annual Status Symposium of our RU, the evaluation symposium for the new research platform, and the celebration of 15 years of ecosystem and biodiversity research in South Ecuador.

Jörg Bendix & Erwin Beck
Speaker & Deputy Speaker of the RU

Figure 5: The helipad was established next to the house of the Arcoiris Foundation in the middle of the Rio San Francisco valley. Photo: Jörg Zeilinger.

News from the ECSF

Laserscanning Project Started

To obtain a tridimensional model of the vegetation of the whole watershed of the Rio San Francisco we started an airborne Laserscanning (ALS) project done with a helicopter. The data will contribute important data for the modeling of water and nutrient cycles and sustainable management of natural recourses. It is also an important prerequisite for the planned Platform for Biodiversity and Ecosystem Monitoring and Research in South Ecuador (see Special Newsletter no 15 doi: 10.5678/lcrs/for816.cit.1049). The application of the Light Detection and Ranging (LiDAR) technique for vegetation analysis is a pilot project in Ecuador. Before we started the project several socializations took place to explain it to our neighbors in the San Francisco valley, as well as to governmental and non-governmental institutions working in the area.

Unfortunately, the LiDAR mission had to be interrupted after some days of operation due to the unfavorable weather conditions and the high standby costs for the helicopter. The completion is planned for April to October this year so that the processed and validated data should be readily available for the new platform project in early 2013.

Figure 6: The Light Detection and Ranging (LiDAR) equipment is installed under the cockpit of the helicopter. Photo: Jörg Zeilinger.

Shut Down of Loja Airport

Latest news suggests that Loja airport will be closed in mid of May 2012 for a duration of 6 months. Prior to the shut down, the airstrip near Zamora will be accommodated for smaller aircraft of Tame and Saereo. Cuenca will be the alternative for larger aircraft. Tame also started to operate the route Guayaquil - Loja - Guayaquil. We will keep you informed.

Jörg Zeilinger

News from NCI

Protecting Nearly a Million Acres of Peruvian Amazon, Home to Threatened Indigenous Group

Straddling the watersheds of the Napo and Putumayo – two of the Peruvian Amazon's largest rivers – a vast wilderness harbors the full array of western Amazonia's megadiversity. It serves as a vital source of biological resources for the Maijuna people, one of the smallest and most vulnerable ethnic groups in Peru. The fates of this forest and of the Maijuna are strongly linked.

To ensure long-term protection of biological diversity and their own cultural traditions, the Maijuna people proposed the creation of a Regional Conservation Area. Applying a proven model for successful land conservation in the Peruvian state of Loreto, this method of protection emphasizes participatory management, conservation-compatible economic uses, and adaptive management.

"When the council members raised their hands in approval, I felt great pride and happiness, and all of our people were happy as well," said Sebastian Rios Ochoa, a native of the Amazon community of Sucusari. It describes why February 4th had taken on historic significance for the indigenous Maijuna People, as well as for many others in the region. On that day, their petition to create the Maijuna Regional Conservation Area was formally approved by the Regional Council of Loreto at a ceremony in the remote Amazon community of Sucusari.

The act declaring the area was approved unanimously by the Loreto Regional Council and announced by Ivan Vasquez, Regional President of Loreto. The proposal to create the reserve was prepared by the Regional Government Program for the Conservation, Management and Sustainable Use

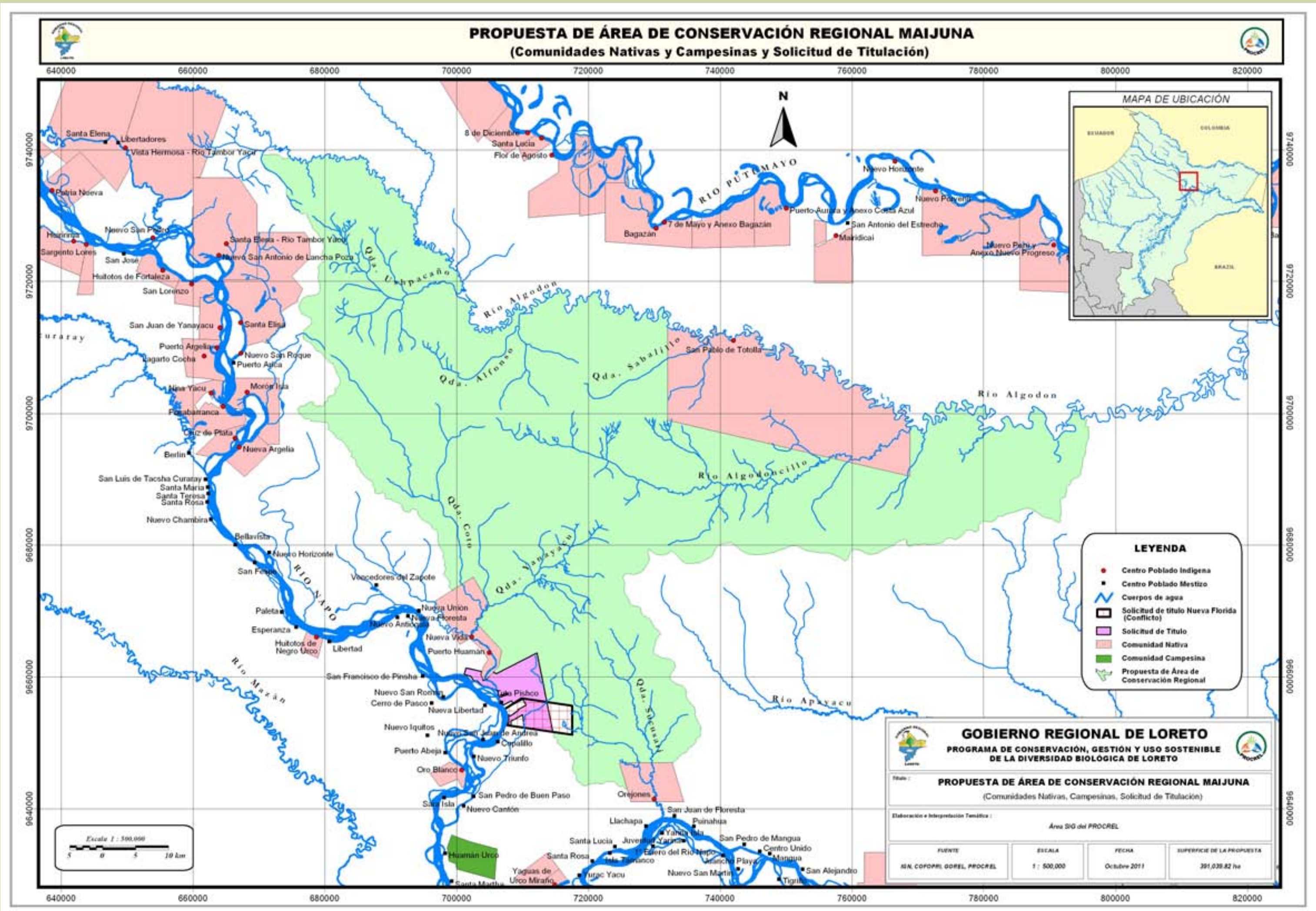

Figure 7: The map shows the area which was proposed to be protected (shaded in green) and now is a Regional Conservation Area. Map: NCI.

Figure 8: Part of the newly protected rainforest area. Photo: NCI.

of Biodiversity in Loreto (PROCREL), in cooperation with Nature and Culture International (NCI) and the Maijuna People.

This new declaration designates the 970,000 acres of primary rainforest for the conservation of both biological and cultural diversity and adds to two adjoining reserves, creating a combined protected area of more than 4 million acres. The Loreto Regional Council's action is a vital step, because it promotes a productive conservation model, protects an indigenous culture in danger of being lost, and helps combat the effects of climate change that threaten the survival of the Amazon and the planet.

The reserve protects most of the Maijuna's traditional territory, while ensuring the sustainable use of wildlife resources by this tribe and 19 other Kichwa and mestizo communities, resources that form the basis of their diet and economy. This area also houses a very rich biodiversity.

NCI, PROCREL (Program for Conservation, Management, and Sustainable Use of Biological Diversity in the Region of Loreto) and their collaborators, with support from the Gordon and Betty Moore Foundation and the Blue Moon Foundation, have worked with the Maijuna communities since 2008. The Field Museum conducted the biodiversity assessment that supported establishment of the Regional Conservation Area. Research professionals from the San Diego Zoo Global Wildlife Conservancy and George Mason University conducted ecological and socio-economic evaluations of key natural resources.

Figure 9: Most of the remaining 200 members of the Maijuna tribe, in traditional dress, attended the ceremony and celebrated this landmark achievement with cheers and applause. Photo: NCI.

In this section Nature and Culture International (NCI, www.natureandculture.org) introduces its activities and reports recent progress. NCI is a non-governmental organization whose mission is to assist in the conservation of biological and cultural diversity.

Science News

Plant Use, Land Use, and Conservation

The conservation of the tropical montane forests of the eastern Andean slopes in southern Ecuador is linked to land use and to the use of plant resources by three ethnic groups with different origin, knowledge, values and traditions, namely the Shuar, the Saraguros and the mestizos (project no C4). Thus, exhaustive research about the local specific social and ethnic ecological parameters of land and plant use is crucial for the development of sustainable productive alternatives [1].

Interviews about ethnobotany, forest use, agriculture, and settlement patterns were conducted in 10 study sites. Expert interviews were executed with professionals from different fields of activity to get a broad overview to discuss the feasibility of alternative land use and conservation options. In parallel, specimens of useful plants were collected and/or photographed and processed for their identification.

644 Different Plant Species Used

The resulting plant inventory (Figure 10, next page) encompasses 748 species, from which 644 are useful species which have been divided in 16 use categories. Figure 10 shows the main plant use categories for each ethnic group and points to the ethnospecific relevance of forests as a source of useful plants. Medicinal plants and plants used for food and construction represent the most important plant use categories.

Among the Shuar 316 species with 493 uses have been recorded (Figure 10 a). They get more than 40 % of them from the forests and cultivate species which cannot be sufficiently (e.g. edible plants) or promptly (e.g. medicinal plants) extracted. Similar to other Amazonian cultures, the traditional subsistence system of the Shuar is based on a combination of home gardens, slash and burn cultivation, and the extraction of resources from the forest. In recent times the Shuar have entered the market economy through the small-scale production of cash crops, cattle ranching, and logging. However, without being "ecologically noble savages" [2] the Shuar appear as effective partners for biodiversity conservation.

The inventory of the Saraguros comprises 230 plant species with a total of 310 uses; among the mestizos 312 useful species with a total of 409 uses have been recorded (Figure 10 b + c). The ethnobotanical knowledge in both groups is generally similar. They make little use of forest plant resources. However, the Saraguros and the mestizos make an extended use of wild species that grow in disturbed sites and pastures. Most relevant are cultivated species, which represent half of the plants. Cultivated plants are used in cattle ranching, ornaments and secure and diversify food supplies and plant remedies. While the basic food supply is guaranteed by cultivation in fields and home gardens, cattle raising is market oriented. It represents their main land use system and fulfils multiple objectives: a regular income, a prestigious social status, and a way of accumulating wealth (see also next article). The forest is being reduced as it is basically considered to be a reserve for new land for pastures and agriculture. In this way they jeopardize the sustainability of their economic system.

Conclusion

On the basis of these findings it is necessary to foster additional sources of income for the Shuar that improve their well being and the conservation of biodiversity, and that make non-traditional, non-sustainable practices such as cattle ranching less relevant in their livelihood portfolios. Ways must be found to conserve their traditional ecological knowledge during the inevitable transition to modernity and the market economy. Community-based ecotourism appears to be the most promising sustainable source of alternative income together with the implementation of market oriented agroforestry systems. In the case of the Saraguros and mestizos, the significance of cattle ranching in local economies should also be reduced through diversification. Agroforestry could be implemented in the medium term [3, 4, 5, 6]. In the short term, improved pasture management and the small-scale production of niche products could be alternatives [7]. Payments for environmental services are an example of a way of generating the seed money for such projects. Finally, to reduce the high scepticism towards conservation a readjustment of certain borders of disputed protective forest areas must be considered.

Andrés Gerique

Acknowledgements

We wish to thank all the inhabitants of the communities under study for their hospitality and generous participation. Our gratitude also goes to the staff of the Herbarium of the National University of Loja, Ecuador.

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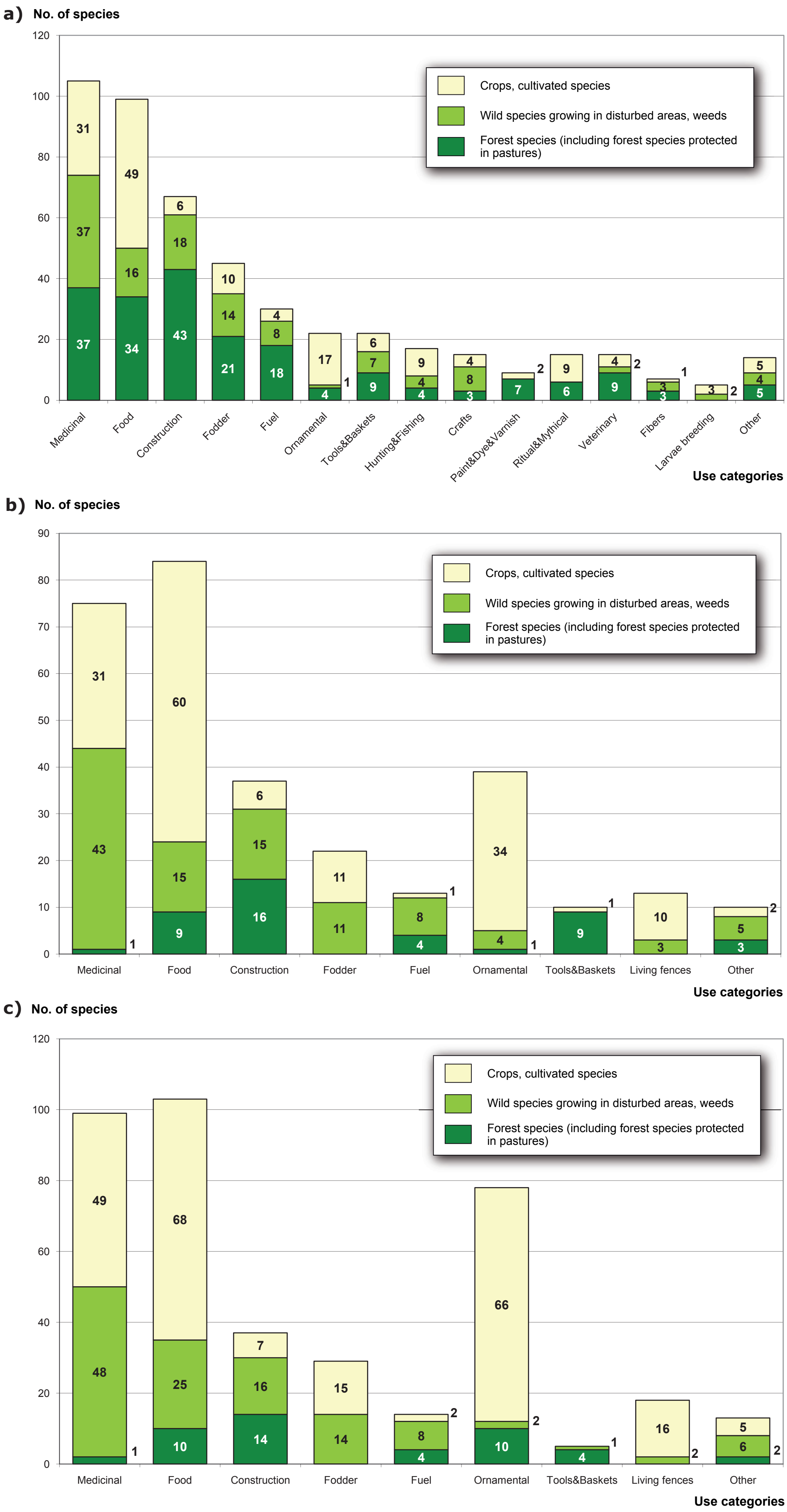

Figure 10: Main plant use categories and total of used plants in each category subjected to their main source (colored) in the ethnic groups of **a**) the Shuar, **b**) the Saraguros, and **c**) the Mestizos. Graphs: Andrés Gerique.

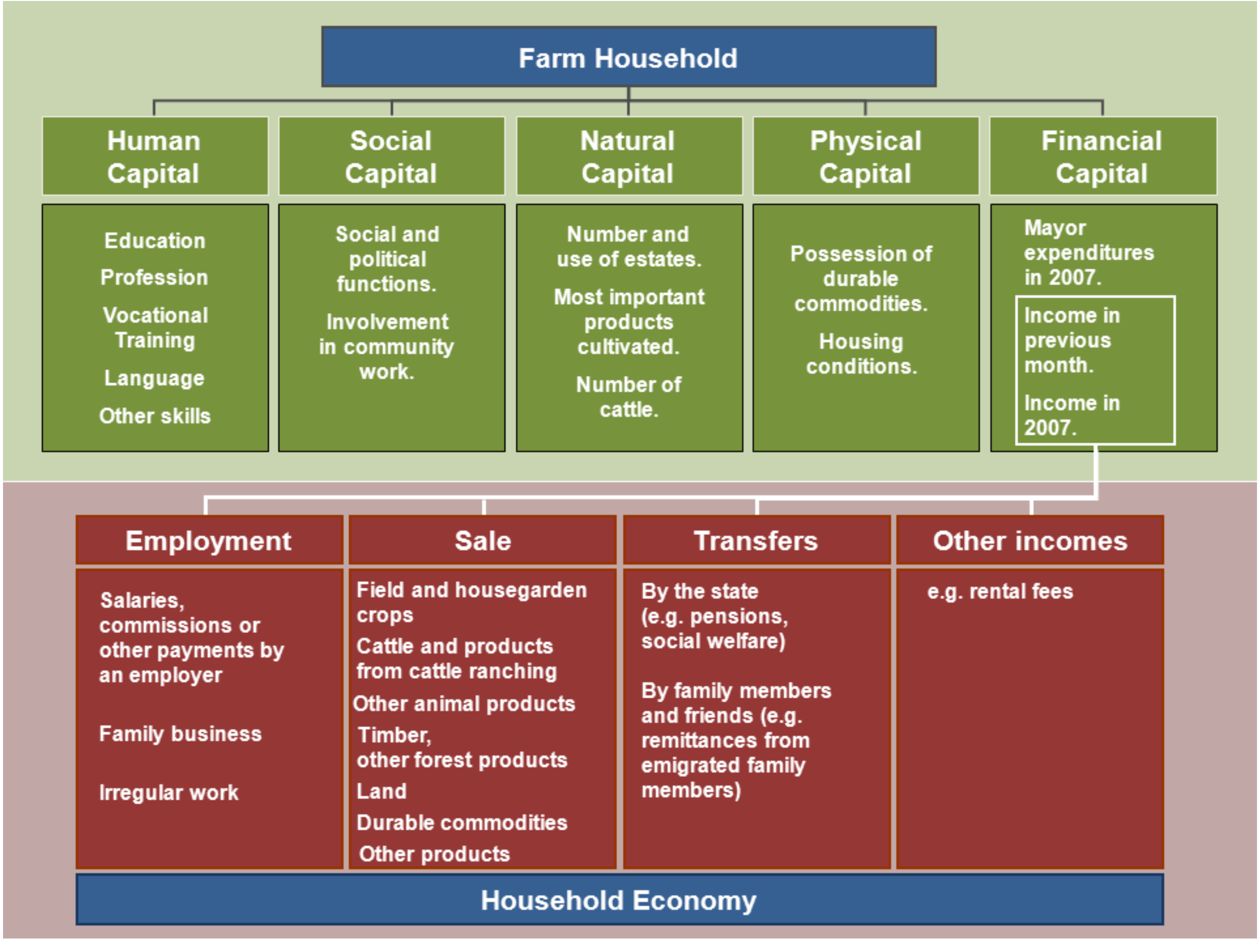

Figure 11: Overview of the surveyed assets. Redrawn after [1].

Livelihood Analysis of Small-Scale Farming Households

To identify typical livelihood strategies of rural farming households and their impact on natural resources a livelihood survey was conducted in 2008 in six rural communities (El Tibio, Los Guabos, Tutupali, La Paz, El Kiim, Muchime) of the Saraguros, Mestizos and Shuar [1] (project no C4). Interviews were carried out in 154 farm households with questionnaire items (161) focused around the five forms of capital: human, social, natural, physical and financial (cf. Figure 11; [2]).

Financial Capital

Figure 12 shows the monetary household incomes of the studied Saraguro and Mestizo communities in 2007 according to different revenue categories. In all communities revenues from employment and pasture economy are by far the most important sources of income; their percentage varies between 71 - 83 % of the total household income. Revenues from pasture economy (sale of animal products, mainly cheese) are by far higher in Saraguro households (app. 41 %) than in Mestizo households (26 - 28 %). The contribution of employment (mainly in form of irregular work and day labor) is especially high to Mestizos' household income in Los Guabos (approximately 55 %), com-

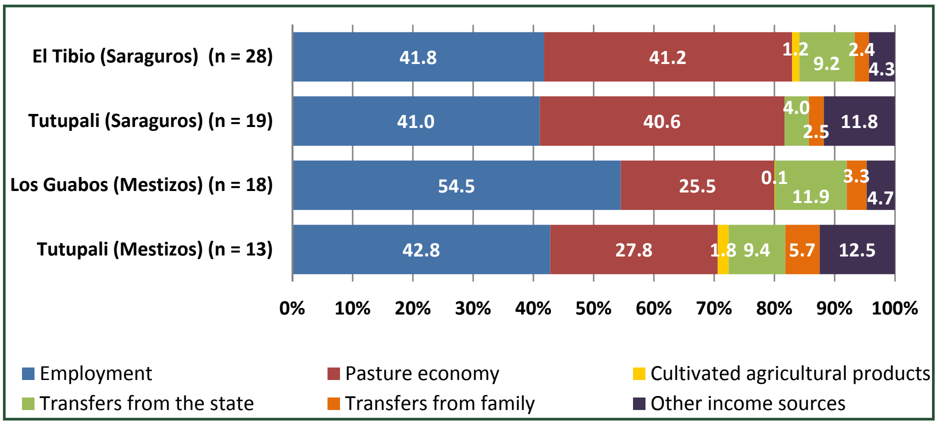

Figure 12: Monetary household incomes in 2007. Graphic: P. Pohle, M. Park & T. Hefter.

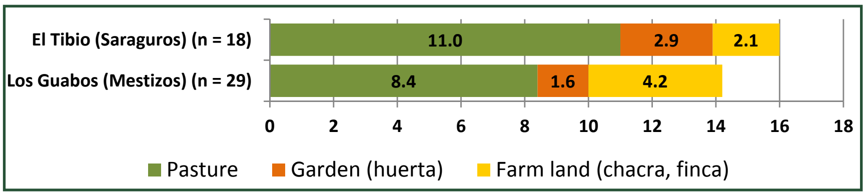

Figure 13: The households' average share of land per land use category (in ha). Graphic: P. Pohle, M. Park & T. Hefter 2011.

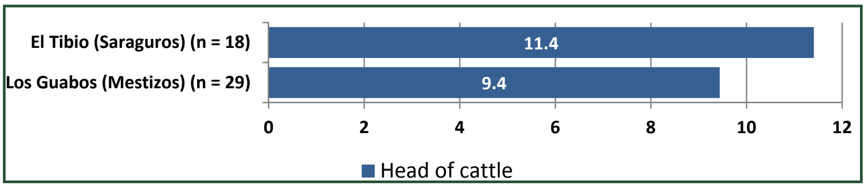

Figure 14: Average number of cattle per household. Graphic: P. Pohle, M. Park & T. Hefter 2011.

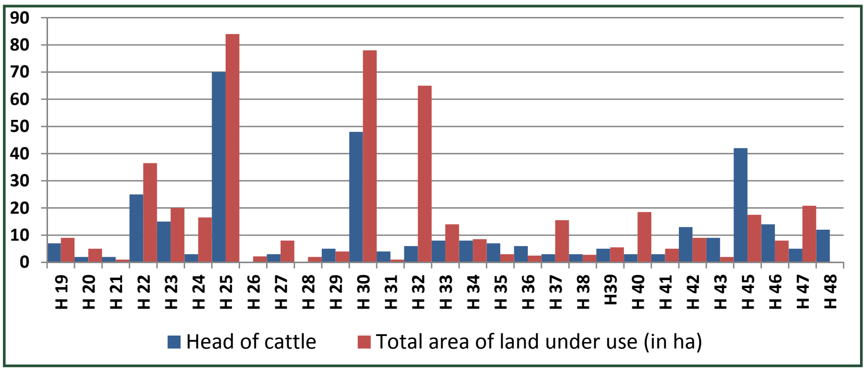

Figure 15: El Tibio: Number of cattle and total area of land under use per household. Graphic: P. Pohle, M. Park & T. Hefter 2011.

pared to Saraguro households of the other communities (approximately 42 %).

Natural Capital

Figure 13 displays the households' average share of land per land use category in the communities El Tibio (Saraguros) and Los Guabos (Mestizos). It is complemented with the average number of cattle per household (Figure 14). Cattle ranching plays a major role in both communities. However, the data show an even stronger engagement of the Saraguro households: The Saraguros of El Tibio maintain more pasture (11.0 ha per household) and own more cattle (11.4 head). In contrast, the Mestizos of Los Guabos show a stronger engagement in arable farming than the Saraguros (4.2 ha per household compared to 2.1 ha).

The number of cattle and total area of land under use for all Saraguro households in El Tibio is shown in Figure 15. It becomes obvious, that household types in the studied communities are very heterogeneous regarding their natural capital assets. A small number of privileged households owns a large number of cattle and maintains a big area of land (mainly pastures), whereas the majority of households has access to only extremely small land holdings and owns very few head of cattle.

Conclusion

Livelihood strategies in the studied communities still depend largely on natural resources which show clear signs of over-use in the area. The Saraguros and Mestizos are mainly engaged in agro-pastoral activities that combine market economy (cattle ranching and employment) and subsistence economy (crop production and horticulture). Since cattle ranching poses the main threat to the forest, alternative incomes should be found. To improve livelihoods in an economic sense, additional sources of financial income are essential. As one option, the cultivation of useful plants in home gardens for regional markets may be considered. The introduction of silvipastoral systems should also be taken into account. Additionally, the improvement of the pasture economy as well as the veterinary service is indispensable. Finally, the promotion of off-farm-employment opportunities as well as payments for environmental services can benefit the local farmers.

Perdita Pohle, Martina Park & Tomas Hefter

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Response of the Forest to Elevated Nitrogen Deposition

Long-range transport of Sahara dusts and biomass burning are two major sources of nutrient input in the Andean tropical mountain forest. It has already been demonstrated that during strong La Niña events, Calcium (Ca) and Magnesium (Mg) originating in the Sahara were deposited from the atmosphere on the eastern slopes of the Andean cordillera [1]. On the other hand, intense fire events in the Amazon basin lead to increased nitrogen (N) and acid depositions [2]. Furthermore, it is expected that the economic development of Ecuador will result in more nitrogen emissions.

Since the establishment of the nutrient manipulation experiment (NUMEX) in 2007 by the RU (see TMF Newsletter issue 1: http://dx.doi.org/10.5678/lcrs/for816.cit.1010), our subproject (A6) has continuously been monitoring the responses of the forest to human induced environmental changes at the NUMEX site in the Reserva Biológica San Francisco (RBSF) at 2000 m a.s.l.

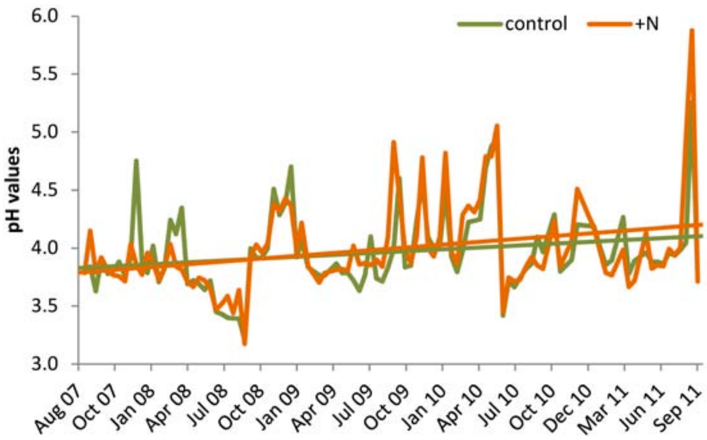

Figure 16: Mean pH values in litter leachate at the control plots and at the plots with N additions (four replicates per treatment). Figure: Velescu, Valarezo & Wilcke.

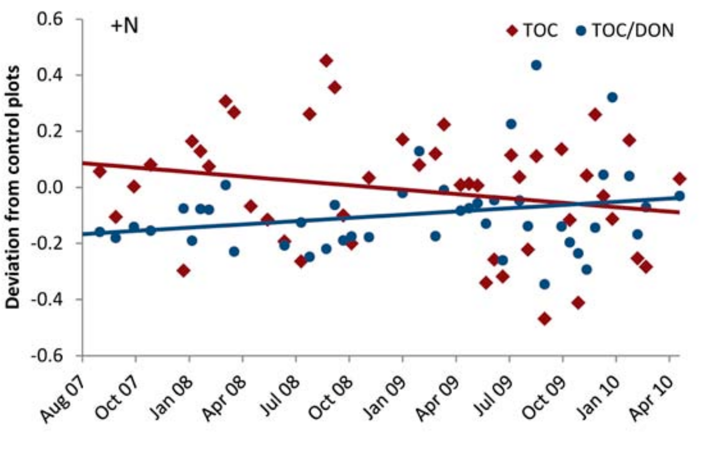

Figure 17: Mean deviation from the control plots of TOC concentrations and TOC/DON ratios in litter leachate at the plots with N additions (four replicates). Graphics: Velescu, Valarezo & Wilcke.

Ecosystem Responds Rapidly

We observed a rapid response of the ecosystem to low-level nutrient additions [3]. At the same time, pH of the soil solution leaving the thick organic layer in which most of the plant roots are located remained stable over the last three years (Figure 16), showing potentially counterbalancing effects of acid and base deposition from the atmosphere and no effect of the application of urea as N source.

Furthermore, our data indicate decreasing total organic carbon (TOC) and dissolved organic nitrogen (DON) concentrations in litter leachate and increasing TOC/DON ratios in response to the N additions (Figure 17). These responses are similar to those in an adjacent undisturbed forest site, where the same trend of decreasing TOC and increasing TOC/DON ratios was observed in response to increasing N deposition in the last decade.

Conclusion

We hypothesize therefore that the N additions have a fertilization effect not only for the vegetation, but also for microorganisms. Thus, N addition leads to an increased microbiological activity and hence to an accelerated degradation of the dissolved organic matter. In absence of an acidification trend, the decreasing concentration of TOC in litter leachate cannot be explained by a pH effect and is probably the consequence of a stimulated mineralization of the dissolved organic matter, resulting in enhanced C release to the atmosphere.

An opportunity to detect the fate of added N is the joint ^{15}N pulse-chasing experiment, which is planned in April 2012. Because the applied isotope label will be incorporated into the N cycle, budgeting all main N fluxes and pools is a promising approach to further elucidate the complex processes behind our observations.

Andre Velescu, Carlos Valarezo & Wolfgang Wilcke

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[1] Boy, J., W. Wilcke (2008): Tropical Andean forest derives calcium and magnesium from Saharan dust. – *Glob. Biogeochem. Cycle* 22, GB1027.
[2] Boy, J., R. Rollenbeck, C. Valarezo & W. Wilcke (2008): Amazonian biomass burning-derived acid and nutrient deposition in the north Andean montane forest of Ecuador. – *Glob. Biogeochem. Cycle* 22, GB4011.
[3] These results were presented in a talk given at the *Conference of the Society for Tropical Ecology* (gtö), 22-25 Feb. 2012, Erlangen, by Andre Velescu.

Nitrogen Availability Links Forest Productivity, Soil Nitrous Oxide and Nitric Oxide Fluxes

Tropical forest soils are considered the largest natural source of the powerful greenhouse gas nitrous oxide (N_2O) and they can produce nitric oxide (NO), a precursor of troposphere ozone. Because there is little information on N-oxide fluxes from tropical montane forests soils and direct green house gas (GHG) measurement in these regions is difficult, the aim of our study was to find a proxy for the prediction of N-oxide emissions. We (subproject 7) tested whether forest productivity and N-oxide fluxes are linked through nitrogen (N) availability in tropical montane forests, and thus, whether widely available plant productivity data could be used for future prediction of N-oxide fluxes.

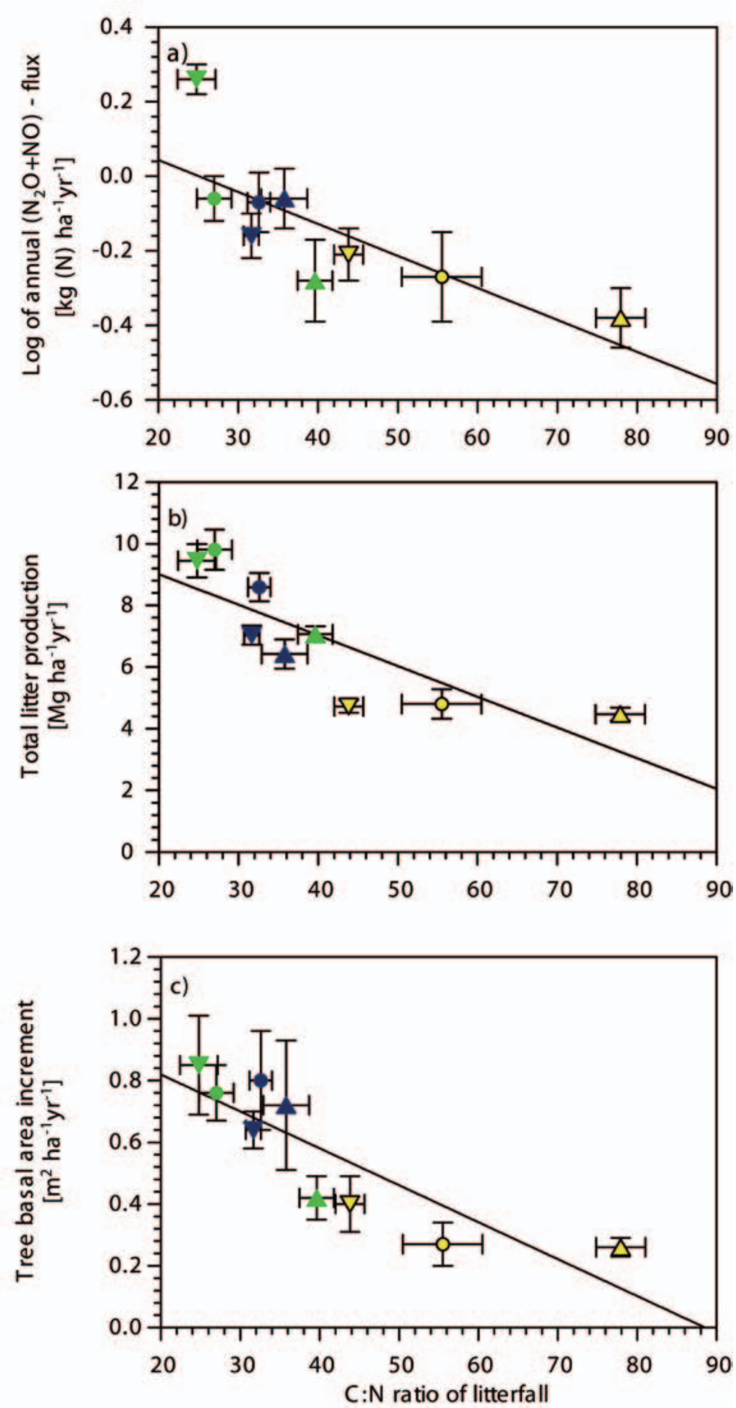

Figure 18: Linear regression of C:N ratio of litterfall and **a**) log-transformed annual N_2O + NO fluxes ($Y = 0.22 - 0.01 * X$, $R^2 = 0.54$, $p = 0.02$), **b**) total litter production ($Y = 11.0 - 0.09 * X$, $R^2 = 0.62$, $p < 0.01$) and **c**) tree basal area increment ($Y = 1.06 - 0.01 * X$, $R^2 = 0.70$, $p < 0.01$) of the topographic positions across the elevation gradient. Symbols used for data are: blue = 1000 m; green = 2000 m; yellow = 3000 m; ▼ = lower slope, ● = mid slope, ▲ = ridge. Figure redrawn from [1]: K. Wolf.

We measured N-oxide fluxes, several indices of N availability (e.g. C:N ratio in litterfall, N concentration of litterfall and δ^{15}N signatures of litterfall), and forest productivity along an elevation gradient from 1000 m, 2000 m to 3000 m a.s.l. and along topographic gradients (lower slope, mid slope, ridge). Our study shows that N-oxide fluxes and indices of tree productivity (total litterfall and tree basal area increment) were related to indices of N availability in this montane forest ecosystem (Figure 18). N-oxide fluxes and tree productivity were smallest at the highest elevations and were highest at the most nutrient rich lower and mid slope positions at the 2000 m site. We interpret these findings as evidence that N-oxide fluxes as well as tree productivity were limited by N availability. The good correlations of total litterfall and tree basal area increment with N oxides fluxes in our study (Figure 19, next page) suggest that data on forest productivity have the potential to be used as predictors of N_2O + NO fluxes. Especially increment of tree basal area was a promising proxy to predict soil N-oxide fluxes in these N limited ecosystems, possibly because it better reflects long-term forest productivity than total litterfall. However, it is important to note that, if nitrogen is not the limiting nutrient, forest productivity does not increase with N availability while N-oxide fluxes do. Thus, in ecosystems that are not N-limited (e.g. many tropical lowland forests), we cannot expect forest productivity to correlate with N availability and N-oxide fluxes. Eventually the results of our study open the possibility to include widely available data on forest productivity as co-variable in predictions of N-oxide fluxes in nitrogen limited tropical montane forests.

Katrin Wolf, Edzo Veldkamp & Jürgen Homeier

Reference

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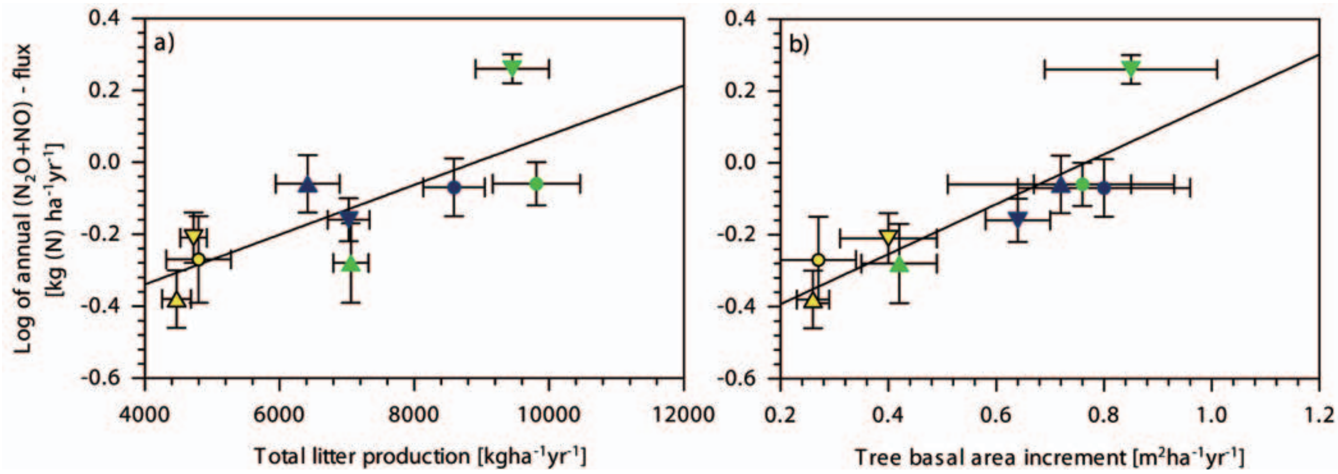

Figure 19: Linear regression of log-transformed annual N_2O + NO fluxes and **a**) total litter production (Y = -0.62 + 0.07 *X, R^2 = 0.53, p = 0.02), and **b**) tree basal area increment (Y = -0.53 + 0.69 * X, R^2 = 0.72, p < 0.01) of the topographic positions across the elevation gradient. Symbols used for data are: blue = 1000 m; green = 2000 m; yellow = 3000 m; ▼ = lower slope, ● = mid slope, ▲ = ridge. Figure redrawn from [1]: K. Wolf.

Methodological Approaches to Analyze Climate-Growth-Relationships in Trees

We provide examples from two ecological forest types to illustrate the suitability of different approaches for studying the impact of environmental effects on various aspects of tree behavior (subproject D2).

Stable Carbon Isotope Variations in *Cedrela*

The establishment of a ring-width chronology of *Cedrela montana* (Meliaceae) from RBSF is now complemented by stable carbon isotope measurements [1]. 13 trees in the sites Q2 (n = 5) and Q5 (n = 8) were analyzed. Due to the anthropogenic increase of isotopically light atmospheric $^{12}CO_2$ since industrialization, the raw $\delta^{13}C$ values were corrected according to McCaroll and Loader (2004) [4]. These corrected values are shown in Figure 20 a. The values show a high congruence in specific years and lower in others, indicating that the impact of climate on $\delta^{13}C$ is not constant over time. Other factors that might mask the climatic signal include inter-tree competition, soil conditions, small differences in phenology or short-term climatic events (microclimate). *Cedrela* is strongly influenced by light conditions (Figure 20 b), even though it is a shade tolerant tree species. The trees belong to the DAWKINS-groups 3 and 4 (lower and upper canopy; [7]). High solar irradiation leads to stomata closure and hence $\delta^{13}C$ values increase. Interestingly, this effect is more pronounced in Q2 than in Q5 trees, possibly due to the optimal position of Q2 trees in the lower canopy, in contrast to Q5 trees with positions in the upper canopy.

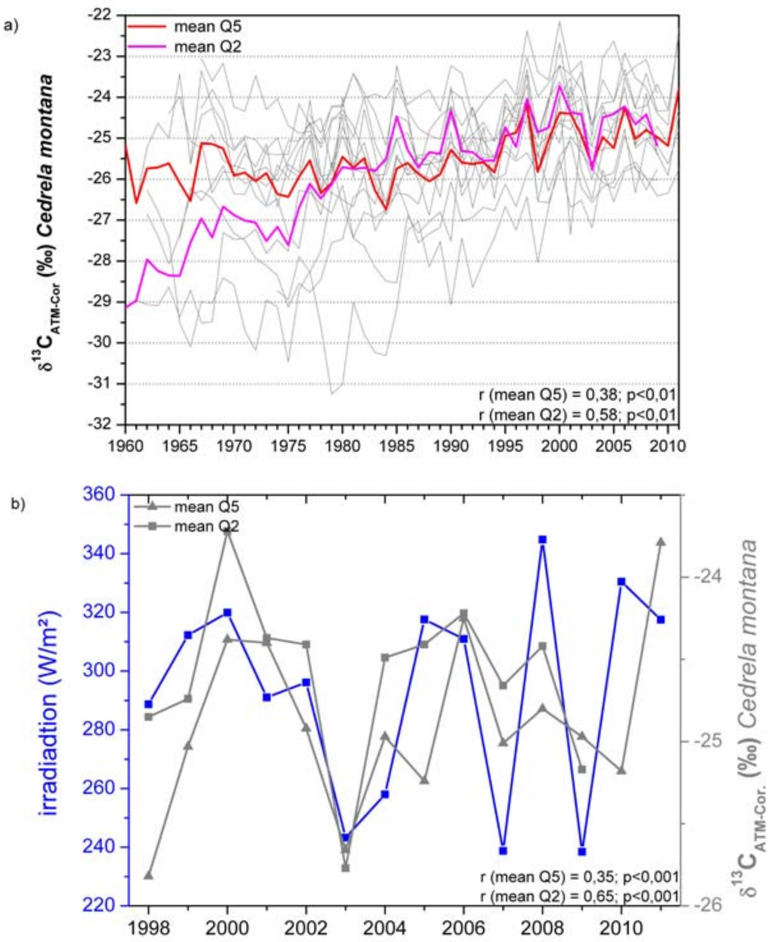

Figure 20: a) Annual $\delta^{13}C$ time series of *C. montana* from 1960 to 2011. Thin lines show individual curves and bold red/magenta line shows the average value. **b**) Combination of annual irradiation and $\delta^{13}C$ records (Q2/Q5) from 1998 to 2011. Graphics: F. Volland.

a)

b)

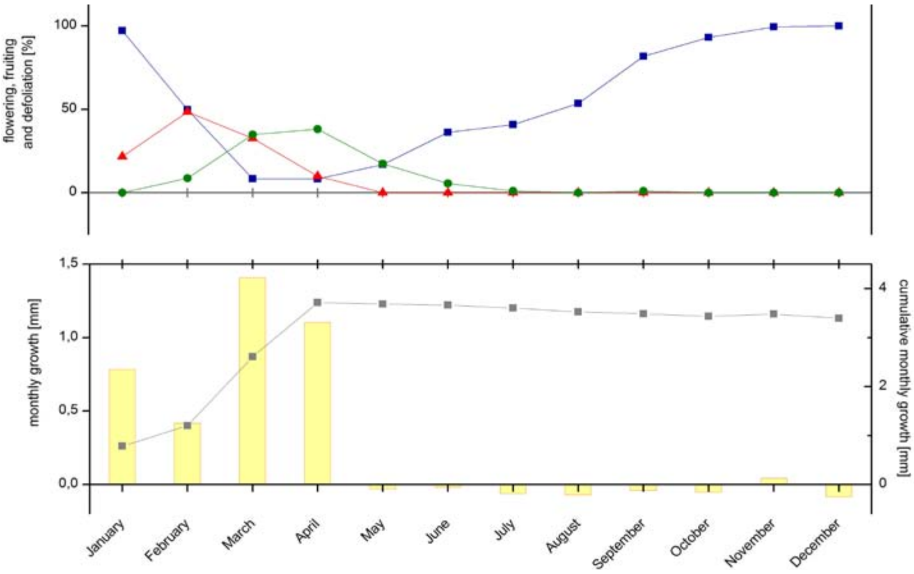

Figure 21: Relationship between phenology and diameter growth of *L. huasango*: **a**) flowering (red line), fruiting (green line) and defoliation (blue line); **b**) Monthly growth [mm] (orange columns) and cumulative monthly growth [mm] (grey line). Graphics: F. Volland.

Seasonal Growth Dynamics of *Loxopterygium*

The dry forest „La Reserva Laipuna" is located at an altitude of 1.100 m a.s.l. which is dominated by a rainy season from January to April [2,8]. Thus the contrast between seasonal weather conditions is more pronounced than at RBSF. Cumulative radial stem increment of *Loxopterygium huasango* (Anacardiacea) was related to phenological processes (Figure 21). From May to August the trees were still foliated up to 50 % while diameter growth showed stagnation or even shrinkage. With the beginning of the rainy season in January, tree individuals were nearly leafless and transpiration was strongly reduced. The rehydration of the stem compensated the shrinkage during the previous dry season. After tree increment was initiated in February, the flowering season began and one month later the first fruits were produced. Thus, *L. huasango* differs from other common tree species like *Tabebuia chrysantha* which mainly flowers during the dry season.

a)

b)

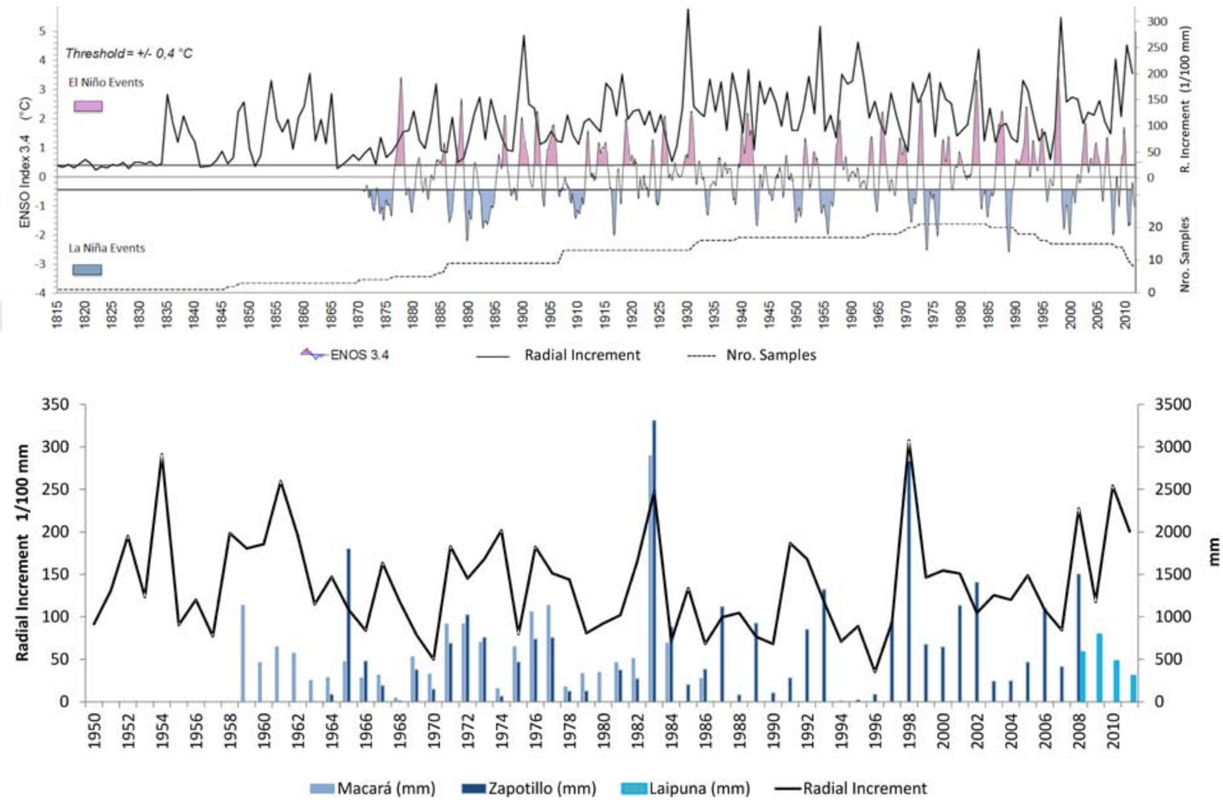

Figure 22: a) Radial increment of *B. graveolens* related to the ENSO 3.4 index (NOAA 2011 & CGD 2011 [5,6]). The dotted line shows the number of radii used in the chronology. b) Radial increment of *B. graveolens* and precipitation of nearest meteorological stations. The climate data for calibration of the ring-width chronology are provided for Macará and Zapotillo from INAMHI (2008) [3] and for Laipuna from by work group (B2, Richter/Peters, 2011). Graphics: F. Volland.

Ring-Width Variations of *Bursera*

At Laipuna increment wood cores and discs from *Bursera graveolens* (Burseraceae) were collected. The clear annual growth ring boundaries allowed the measurement of annual increments, and so the first 200-year-long tree-ring chronology for the tropical dry forest was developed (Figure 22 a), which is the longest so far known for this ecosystem. Years with high radial increment are strongly related to years with higher precipitation, coinciding with extreme El Niño events (Figure 22 b). Thus, the El Niño/La Niña-Southern Oscillation (ENSO) phenomenon shows an indirect influence on the growth of the trees.

Franziska Volland, Darwin Pucha, Achim Bräuning, Oswaldo Ganzhi, Eduardo Cueva, Thorsten Peters & Susanne Spannl

References

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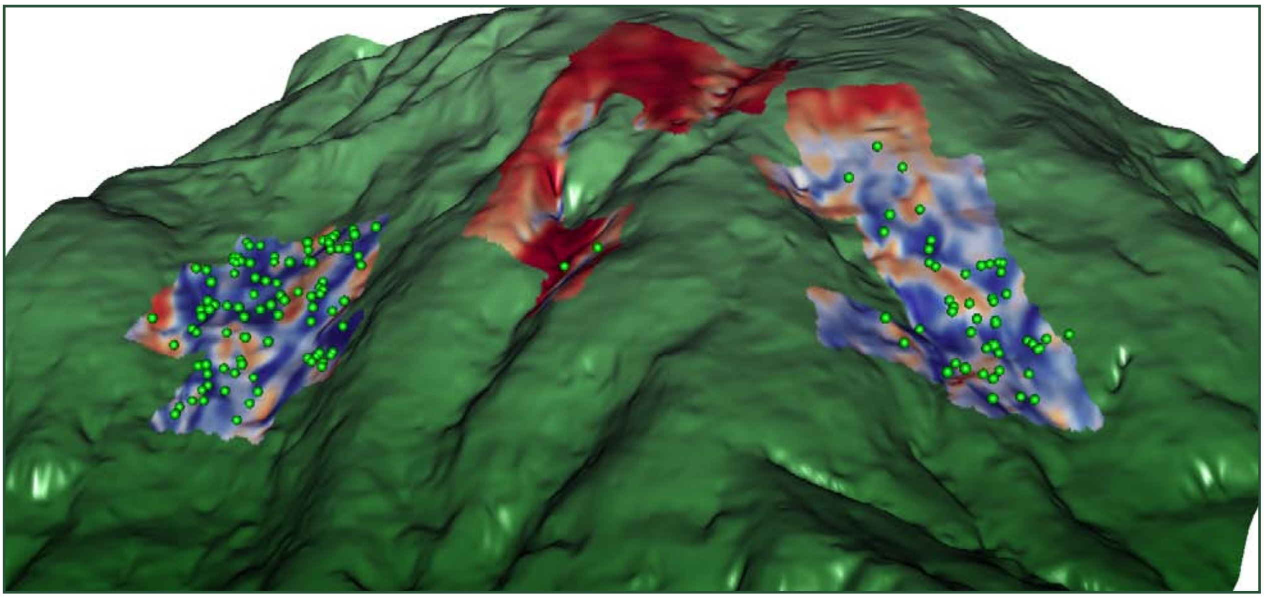

Figure 23: Habitat–suitability map for the tree *Cecropia angustifolia*. Blue colors indicate areas that are suited for this species, whereas red areas are less suited. Green dots represent all trees of *C. angustifolia* in the study area. Graphic: D. Kübler.

Factors Affecting the Spatial Distribution of Tree Species

Homeier et al. [1] identified four different forest types in the Reserva Biológica San Francisco (RBSF), which vary considerably in species composition and structure. Altitudinal and topographic factors play an important role for the occurrence of those forest types [2].

We (subproject C1) quantified the impact of different environmental predictors for the distribution of the most common tree species in our study area, using an Ecological Niche Factor Analysis (ENFA) [4]. It allows determining which environmental predictors are most responsible for the spatial distribution of a species. Tree data from our long term forest inventory plots in Q2, Q3 and Q5 (13 ha) were used in the analysis. From this data, 16 species with the highest importance value index were selected.

We used data derived from a digital elevation model (DEM: elevation, slope, wetness index, topographic position indices with radii of 10 m and 200 m, valley depth) as environmental predictors and soil texture maps (sand, silt and clay percentage) from Ließ et al. [3]. Models were validated using a k-fold cross validation. The values of the Spearman-rank correlation ranged between 0.55 - 0.93 for the different species, indicating a good model performance.

The first factorial axis of the ENFA is the marginality factor. It expresses the habitat preference of a species for an environmental predictor in respect to the study area. Positive coefficients indicate that the species has a preference for higher-than-mean values, while negative coefficients indicate that the species prefers lower-than-mean values. The marginality factor is therefore suited for the estimation of the ecological importance of different environmental predictors for the distribution of different species.

These results were than analyzed with a hierarchical cluster analysis and three different species groups were identified (see Table 1). These groups seem to be ecologically consistent: the 'blue' group are ridge-species and the 'red' group are valley-species. The one tree species in the third group (*Tapirira obtusa*) seems to be an intermediate species that can be classified as neither ridge- nor valley-species. The importance of each factor is described by the absolute value of the marginality factor. The mean of all species was calculated for each environmental predictor (see Table 1).

Additionally, habitat suitability maps were created for each species. However, they are not the principal focus of this study, and therefore only a map for one species (*Cecropia angustifolia*) is shown as an example (Figure 23, previous page).

Daniel Kübler, Patrick Hildebrandt, Bernd Stimm, Reinhard Mosandl & Michael Weber

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[3] Ließ, M., Glaser, B., and Huwe, B. (2012): Uncertainty in the spatial prediction of soil texture: Comparison of regression tree and random forest models. *Geoderma*, 170(0): 70–79.

[4] These results were presented in a talk given at the *Conference of the Society for Tropical Ecology* (gtö), 22-25 Feb. 2012, Erlangen, by Daniel Kübler.

Table 1: Marginality Factors for all tree species (columns) and environmental parameters (rows)

Brown and green background colors in the table indicate a negative and positive coefficient for the marginality factors, respectively. The color of the species names corresponds to the three different groups identified by a cluster analysis. The order of the environmental parameters corresponds to the mean marginality factor of each predictor (values in parenthesis), with the topmost predictor being the most important and the lowest being the less important. TPI: topographic position indices. Table: D. Kübler.

	Alchgran	Alzavert	Clusduco	Grafemar	Cecrandi	Cecrangu	Cedrsp	Guarpter	Hyeraspe	Micoquad	Nectline	Nectmemb	Piptdisc	Sapiglan	Tabechry	Tapiobtu
TPI 200 m (0.51)	0.5	0.6	0.5	0.5	-0.5	-0.5	-0.5	-0.7	-0.6	-0.5	-0.7	-0.4	-0.4	-0.5	-0.6	-0.1
Elevation [m] (0.46)	0.5	0.4	0.5	0.5	-0.5	-0.5	-0.5	-0.4	-0.5	-0.4	-0.4	-0.5	-0.5	-0.6	-0.5	-0.2
Valley Depth (0.42)	-0.4	-0.6	-0.5	-0.6	0.5	0.5	0.5	0.5	0.2	0.3	0.3	0.5	0.6	0.5	0.3	0.2
Wetness Index (0.29)	-0.3	-0.4	-0.3	-0.3	0.2	0.2	0.2	0.2	0.0	0.2	0.3	0.3	0.3	0.3	0.1	0.9
Clay [%] (0.25)	-0.2	0.0	-0.1	-0.1	-0.2	0.3	0.4	0.1	0.5	0.5	0.2	0.3	0.3	0.1	0.5	-0.3
Slope (0.16)	-0.3	0.1	-0.3	0.0	0.3	0.2	0.1	0.2	0.1	0.2	0.4	0.1	0.1	0.2	0.1	0.0
Sand [%] (0.14)	0.0	0.0	0.0	0.0	0.3	-0.1	-0.3	0.0	-0.2	-0.4	0.0	-0.2	-0.2	0.1	-0.3	0.1
Silt [%] (0.14)	0.2	0.0	0.2	0.1	-0.3	-0.1	0.0	-0.1	-0.2	0.1	-0.2	-0.1	-0.1	-0.2	0.0	0.2
TPI 10 m (0.09)	0.2	0.0	0.2	0.1	0.0	-0.1	0.0	0.0	0.0	-0.2	0.1	-0.1	0.0	-0.1	0.0	0.2

Cooperations

Do Soil Properties Affect Subterranean Ant Distribution at a Small Spatial Scale?

Physico-chemical properties of soils are known to have an indirect effect on ground-dwelling ant assemblages at regional scale. Up to now nothing is known on their effect on subterranean ant communities at microscale (m²).

We hypothesized that soil properties affect subterranean ant distribution at the scale of < 1 m, the actual scale of direct interactions between subterranean ants and their environment. We expected a differential response of ants to soil attributes, with particular species associated with particular soil variables.

We aimed to test this hypothesis in two contrasting sites at a distance of 2 km: along the Rio Bombuscaro, which is a primary forest located in Podocarpus National Park, and in Copalinga, which is a secondary forest. The two sites experience the same climate and have similar botanical compositions. In each site, we delineated a 100 m transect and collected a sample of mineral soil (15 x 15 x 10 cm) every meter and collected its associated ant fauna. We measured pH, organic matter content, electrical conductivity, E4:E6 ratio and soil texture. Incident light and land slope were also measured.

The soil properties of the two sites were heterogeneous, had very contrasting ranges of values, and demonstrated a strong spatial autocorrelation. The ant assemblages were distinct, with only 12 % of the species common at the two sites. Ant abundance was similar in the two sites but ant diversity was higher in Bombuscaro (46 species vs. 39 in Copalinga, Fisher-α = 21.71 and 16.01, respectively). Species richness was not correlated to any of the environmental variables measured. Soil properties did not predict the occurrence of any ant species in Copalinga. In Bombuscaro, *Hypoponera 01RI* was correlated to low pH values, and *Acropyga fuhrmanni* (Figure 24) to high clay content. By contrast, *A. fuhrmanni* did not show a correlation with this variable in Copalinga, where it was the dominant species (present in 48 % of the samples). However, inter-site comparison indicates that the presence of this species is presumably related to higher clay content, since Copalinga is much more clayey (36.7 ± 6 SD of clay in the soil) than Bombuscaro (6.5 ± 2 % SD).

Figure 24: Frontal and lateral views of *Acropyga fuhrmanni*. The small eyes, reduced antennal segmentation, lightly pigmented cuticle, and hairs covering the cuticle are typical of a completely subterranean life. Image Courtesy of Y. Laurent & I. Bachy from RBINS.

Our results suggest that the distribution of subterranean ants is poorly explained at small spatial scale by the soil properties investigated. Ant distribution is possibly influenced by some other environmental attributes, such as availability of micronutrients, vegetation, depth of the water table, or microclimate (temperature, moisture). Biotic interactions may also have structuring effects on the assemblage distribution. However, the high heterogeneity of soil parameters observed at small scale can possibly be a driver of the high diversity of soil-dwelling ants observed in our study sites.

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[2] Evolutionary Biology & Ecology, Université Libre de Bruxelles
[3] Plant Ecology and Biogeochemistry, Université Libre de Bruxelles

More Information

Royal Belgian Institute of Natural Sciences (RBINS):
http://www.naturalsciences.be/cb/ants/projects/andes-mountain-forests.htm

RBINS is one of the institutions collaborating in the European Distributed Institute of Taxonomy (EDIT). They join forces to provide accountable tools to taxonomists, to significantly accelerate global taxonomic knowledge. The RU cooperates with researchers from EDIT since 2009.

UNIVERSIDAD TÉCNICA PARTICULAR DE LOJA
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CLIRSEN — CENTRO DE LEVANTAMIENTOS INTEGRADOS DE RECURSOS NATURALES POR SENSORES REMOTOS

Geo-Information for Territorial Management in South Ecuador

Since September 2011 the Universidad Técnica Particular de Loja (UTPL) is conducting a project in which it generates Geo-information for territorial management in south Ecuador. Therefore the UTPL and the Integrated Center for Lifting of Natural Resources by Remote Sensing (CLIRSEN) signed a consulting contract. The project is carried out by six Research, Technology Transfer and Extension Centers (CITTE for its Spanish Acronym) of the UTPL who are working together to achieve the following objectives:

1. Generate information of geo-pedology, land use capacity, threat of mass movements (slip, fall, flow, and creep), water erosion hazard and permeability of soils.
2. Generate geo-information of land use, natural vegetation, size of plots, irrigated areas, characterization of agricultural production systems, forestry and characterization of quarries and mines.
3. Collect, spatializing and update data in existing infrastructure and services at the county level on telecommunications, electricity, ports, airports, health, education, oil, and tourism industries, by taking GPS points.
4. Collect and spatializing sociocultural and socioeconomic variables.
5. Update, catalog and structure a geodatabase, for all the products obtained in the project.

The study area includes the counties of Catamayo, Gonzanamá, Calvas, Sozoranga, Macara, Celica and Zapotillo in the province of Loja, and Huaquillas, Santa Rosa and Arenillas in the province of El Oro, which cover an area of nearly 7 000 km^2.

The agreement between CLIRSEN and UTPL allows doing a landmark study in the southern region of Ecuador, integrating different areas of knowledge through joint efforts of a highly qualified team, which has allowed the UTPL assuming a leading role in the region. Through this project, UTPL does a decisive contribution to regional development planning.

The beneficiaries of the project will be the Autonomous Decentralized governments, which will gain information for decision making and determination of policies and strategies for integrated management of their territories. Moreover the National Secretariat of Planning and Development (SENPLADES) will have useful information for planning and territorial management under the guidelines of sustainable development, productivity and competitiveness. The project provides updated information for the implementation of actions for economic, social and environmental development.

Fernando Oñate-Valdivieso PhD
& Dr. Juan Pablo Suarez

More Information

CITTE: http://www.utpl.edu.ec/ingles/?q=research/citte
CLIRSEN: http://www.clirsen.gob.ec/clirsen/index.php?option=com_frontpage&Itemid=1

Members from the UTPL and this as well as the preceding RU collaborate since the beginning of the first RU in the year 2000.

Data Warehouse News

Filter and Aggregate Tabular Values

The demand on viewing and analyzing tabular data within the FOR816*dw* is high. Hence a new module was designed to display, filter and aggregate the data of tabular datasets. Complementary to the established dataset search, it is now possible to work directly on the value-level. The browser-based application is called *Value Filter* and supports the user to generate subsets of extensive data tables (these are included as *tabular entities* within a dataset).

The *Value Filter* enables to

- find terms like species names, chemical compounds, land use description ...
- generate subsets of extensive tabular data like time series
  - by numerical limits (thresholds)
  - by quality flags
  - by date range
- aggregate the value subset by temporal criteria
  - hourly, daily, weekly, monthly, yearly
- download the defined value subset

An example is given in the box on the next page on how to search, filter and aggregate values.

The ongoing development will focus on the search possibilities of values within the FOR816*dw* crossing table boundaries. This may sound logical but is not trivial. To meet the heterogeneous requirements of the various scientific disciplines, attributes and data structures, the applications in the FOR816*dw* must be designed universally and adaptable. This sets some constraints in the development and has to be kept in mind when using the various search, filter and visualization functions.

Access and Maintenance Reports

To provide transparency who has accessed and downloaded one's dataset, an *Access Report* for each dataset is now available. It contains a download statistic, the names of the interested users, the date of access and the actions during access (view metadata, view data, download data). The report is visible for all registered users via the report icon in the *detailed dataset* view.

To give the data owner an overview of the evolution of his/her dataset one can view the *Maintenance Report* via the report icon on the *edit page* of a dataset. This provides an overview of all changes and updates (data or metadata supplementation and correction) that have been done in the life time of the dataset.

Thomas Lotz (Data Manager) &
Maik Dobbermann (Developer and Webmaster)

Example: How to Make Use of *Values*

You are interested in the monthly mean air temperature of a specific climate station?

1. **Find the dataset** containing the climate data of that station (use the *Extended Search* to set a spatial or temporal range of interest and to select the air temperature attribute)
2. **View the metadata** of the dataset to determine whether it contains the data you expect. Consider the measurement and quality details.
3. Within the dataset a **tabular entity** holds the time series data. Click on the *Value Filter* to **work on the values** of this table.
4. **Choose the attribute** on which the filter shall be applied (e.g. air temperature)
5. **Define the time range** you are interested in (the available range for this time series is stated in the related info box)
6. If required **set a numeric limit** to exclude extreme values
7. If required **choose a quality flag** to restrict the data to the quality of your needs. The criteria of the quality flags are described by the data owner in the metadata of the dataset.
8. **Apply the filter settings** to view the query result with all attributes of the table.
9. The **temporal aggregation** can only be executed on the selected attribute. Choose the target time step (e.g. monthly) and apply the filter and aggregation settings.
10. The **result** comes for the selected attribute in addition to the date information with the **statistical parameters** average, sum and number (n) of aggregated values. It is on you to interpret the result. The average represents the mean temperature; sum makes sense for e.g. precipitation values. Whether an aggregated average or sum is representative for a time period is indicated by n and must be considered by the user. It varies for different attributes and depends on the available temporal resolution and the functional research question.
11. An option to **download** this subset as a csv file will be available soon.

Figure 25: The *Value Filter* interface. Screenshot: T. Lotz.

Event Calendar

11 May 2012

The Data Manager invites all RU members to a Data Upload & Maintenance Workshop taking place in Marburg, Germany. We will jointly structure and enhance your data to make them more valuable for you and other scientists. Latest information on: www.tropicalmountainforest.org/news.do?newsid=123.

Miscellaneous

A Member of the RU is Blogging for the European Geosciences Union

The European Geosciences Union - which is Europe's premier geosciences union and dedicated to the pursuit of excellence in the geosciences - has set up a blog where one member of the RU shares his experiences from Ecuador now. Sandro Makowski, PhD student at the Laboratory for Climatology and Remote Sensing (LCRS) at the Marburg University, Germany, reported about the fires in the study area. For more see:
http://egugeolog.wordpress.com/2011/12/05/imag-geo-on-mondays-3/ *Sandro Makowski*

Publications

Recent Publications of the RU[1)]

Bendix, J.; Trachte, K.; Palacios, E.W.; Rollenbeck, R.; Göttlicher, D.; Nauss, T. & Bendix, A. (2011): El Niño meets la niña? Anomalous rainfall patterns in the "traditional" el Niño region of southern Ecuador. *Erdkunde* 65, 151-167. DOI: http://dx.doi.org/10.3112/erdkunde.2011.02.04

Bodner, F. (2011): Caterpillar communities on shrubs in the montane forest zone of southern Ecuador. *phd thesis*. University of Vienna

Bücker, A.; Crespo, P.; Frede, H. & Breuer, L. (2011): Solute behaviour and export rates in neotropical montane catchments under different land-uses. *Journal of Tropical Ecology* 27, 305?317. DOI: http://dx.doi.org/10.1017/S0266467410000787

Crespo, P.; Bücker, A.; Feyen, J.; Frede, H. & Breuer, L. (2012): Preliminary evaluation of the runoff processes in a remote montane cloud forest basin using Mixing Model Analysis and Mean Transit Time. *Hydrological Processes* in press, DOI: http://dx.doi.org/10.1002/hyp.8382

Crespo, P.; Feyen, J.; Buytaert, W.; Bücker, A.; Breuer, L.; Frede, H. & Ramirez, M. (2011): Identifying controls of the rainfall?runoff response of small catchments in the tropical Andes (Ecuador). *Journal of Hydrology* 407, 164-174. DOI: http://dx.doi.org/10.1016/j.jhydrol.2011.07.021.

Cruz, D.; Suarez, J.P.; Kottke, I.; Piepenbring, M. & Oberwinkler, F. (2011): Defining species in Tulasnella by correlating morphology and nrDNA ITS-5.8S sequence data of basidiomata from a tropical Andean forest . *Mycological Progress* 10, 229-238.

Fries, A.; Rollenbeck, R.; Nauss, T.; Peters, T. & Bendix, J. (2012): Near surface air humidity in a megadiverse Andean mountain ecosystem of southern Ecuador and its regionalization. *Agricultural and Forest Meteorology* 152, 17-30. DOI: http://dx.doi.org/doi:10.1016/j.agrformet.2011.08.004.

Knoke, T.; Steinbeis, O.; Bösch, M.; Roman-Cuesta, R.M. & Burkhardt, T. (2011): Cost-effective compensation to avoid carbon emissions from forest loss: An approach to consider price-quantity effects and risk-aversion. *Ecological Economics* 70, 1139-1153. DOI: http://dx.doi.org/10.1016/j.ecolecon.2011.01.007

Ließ, M. (2011): Soil-Landscape Modelling in an Andean Mountain Forest Region in Southern Ecuador. *phd thesis*. University of Bayreuth,

Ließ, M.; Glaser, B. & Huwe, B. (2011): Functional soil-landscape modelling to estimate slope stability in a steep Andean mountain forest region . *Geomorphology* 132, 287-299. DOI: http://dx.doi.org/10.1016/j.geomorph.2011.05.015

Lotz, T. (2011): Integration von OGC Web Services in eine bestehende Forschungsdateninfrastruktur - Einsatzmöglichkeiten am Beispiel des Datenbestandes der geoökologischen Forschergruppe FOR816 - *master thesis*. University for Applied Sciences Mainz

Lotz, T.; Nieschulze, J.; Bendix, J.; Dobbermann, M. & König-Ries, B. (2012): Diverse or uniform? - Intercomparison of two major German project databases for interdisciplinary collaborative functional biodiversity research. *Ecological Informatics* 8: 10-19. DOI: http://dx.doi.org/10.1016/j.ecoinf.2011.11.004

Münchow, J.; Brenning, A. & Richter, M. (2012): Geomorphic process rates of landslides along a humidity gradient in the tropical Andes. *Geomorphology* 139-140, 271-284.

Plesca, I.; Timbe, E.; Exbrayat, J.F.; Windhorst, D.; Kraft, P.; Crespo, P.; Vaché, K.; Frede, H. & Breuer, L. (2011): Model intercomparison to explore catchment functioning: Results from a remote montane tropical rainforest. *Ecological Modelling* in press, 1-11, DOI: http://dx.doi.org/10.1016/j.ecolmodel.2011.05.005

Potthast, K.; Hamer, U. & Makeschin, F. (2011): Land-use change in a tropical mountain rainforest region of southern Ecuador affects soil microorganisms and nutrient cycling. *Biogeochemistry* in Press, 1-17. DOI: http://dx.doi.org/10.1007/s10533-011-9626-7

Powell, J.; Monaghan, M.; Öpik, M. & Rillig, M.C. (2011): Evolutionary criteria outperform operational approaches in producing ecologically-relevant fungal species inventories. *Molecular Ecology* 20, 655-666. DOI: http://dx.doi.org/10.1111/j.1365-294X.2010.04964.x

Roos, K.; Rödel, H.G. & Beck, E. (2011): Short- and long-term effects of weed control on pastures infested with Pteridium arachnoideum and an attempt to regenerate abandoned pastures in South Ecuador. *Weed Research* 51, 165-176. DOI: http://dx.doi.org/10.1111/j.1365-3180.2010.00833.x

Setaro, S. & Kron, K. (2011): Neotropical and North American Vaccinioideae (Ericaceae) share their mycorrhizal Sebacinales - an indication for concerted migration?. *PLoS Currents: Tree of Life* NA, NA. DOI: http://dx.doi.org/10.1371/currents.RRN1227

Strutzenberger, P.; Brehm, G. & Fiedler, K. (2011): DNA barcoding-based species delimitation increases species count of Eois (Geometridae) moths in a well-studied tropical mountain forest by up to 50%. *Insect Science* 18, 349-362.

Volland, F.; Bräuning, A.; Ganzhi, O.; Peters, T. & Maza, H. (2011): Radial stem variations of Tabebuia chrysantha (Bignoniaceae) in different tropical forest ecosystems of southern Ecuador. *Trees* 25, 39-48.

Werner, F.A. & Mendieta-Leiva, G. (2011): *Epiphytic ferns and allies of Podocarpus Biosphere Reserve*, Issue X040. The Field Museum, Chicago, http://fm2.fieldmuseum.org/plantguides/rcg_intro.asp?lang=esp

Werner, F.A.; Homeier, J.; Oesker, M. & Boy, J. (2011): Epiphytic biomass of a tropical montane forest varies with topography. *Journal of Tropical Ecology* 28, 23-31 DOI: http://dx.doi.org/10.1017/S0266467411000526

Wolf, K.; Flessa, H. & Veldkamp, E. (2011): Atmospheric methane uptake by tropical montane forest soils and the contribution of the organic layer. *Biogeochemistry online*, 15, DOI: http://dx.doi.org/10.1007/s10533-011-9681-0

Wolf, K.; Veldkamp, E.; Homeier, J. & Martinson, G. (2011): Nitrogen availability links forest productivity, soil nitrous oxide and nitric oxide fluxes of a tropical montane forest in southern Ecuador. *Global Biogeochem. Cycles* 25, 12, DOI: http://dx.doi.org/10.1029/2010GB003876

[1)] Publications presented here are those that where uploaded to the data warehouse in the second half of 2011 and in 2012 and that weren't presented in this or one of the preceding TMF Newsletters yet.

Deadline

The editorial deadline for the forthcoming issue of the TMF Newsletter is:

May 10th 2012.

Please send your ideas, manuscripts and images to Esther Schwarz-Weig at the editorial office. E-mail: esw@sci-stories.com

People and Staff

Photo: Achim Bräuning.

Daisy Cárate, PhD student in subproject A1 (Jürgen Homeier) received the Merian Award from **Professor Dr. Manfred Nikisch**, the president of the Society for Tropical Ecology (Gesellschaft für Tropenökologie, gtö). The Merian Award honours people who presented excellent talks and posters at the annual conference of the Society. Cárate presented the third best poster during the conference in February in Erlangen, Germany, which was entitled: "Effects of experimental nutrient addition on the establishment and growth of tropical montane forest tree seedlings in southern Ecuador".

Obituary

Our colleague **Frank von Walter** worked as a PhD student in project C3.2 in the first phase of this RU. In research he focused on a socio-economic modeling component that connects the provisioning of ecosystem services to changes in farmer land use driven by their land use decisions. Before being able to wrap up his scientific work, he developed a brain tumor. Undergoing surgery and chemotherapy, he was always full of hope to finish his dissertation project even after he was diagnosed with a malign metastasis earlier this year. On March 17 Frank died at the age of 35 in his hometown of Munich. We will look back on his kind character and his scientific contribution with great fondness and esteem.

Jan Barkmann

Credits and Contact

DFG Research Unit 816

More information about the Research Unit (RU 816) investigating Tropical Mountain Forests (TMF) is available at: www.tropicalmountainforest.org

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