

DECISION SUPPORT PROJECT BP-2

Spatial & Economic Analysis for Policy and Decision Support in Agriculture and Environment

Summary

Annual Report 2006



ANNUAL REPORT SUMMARY

Project BP-2: DECISION SUPPORT

1. Project Logframe

Our goal is to improve the targeting of investments in agricultural and NRM research and development through economic and geographic analysis.

Our objective is to develop and provide analysis, information and tools to improve decisions about where, when and how innovations can be implemented to enhance rural livelihoods in a sustainable and equitable manner.

Project Logframe (MTP 2006 – 2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Implications of alternative R&D decisions analyzed	Scientists and research managers; development planners and practitioners; policymakers; donors and others who make decision about how R&D resources are invested.	<i>Decision-makers informed regarding potential tradeoffs resulting from the allocation of research or development funds, either directly or indirectly via changes in policy</i>	Impacts to R&D investments are more efficient, equitable, sustainable
Targets	Valuation of productivity benefits and environmental services generated by land use systems in Colombia	Research managers in CIAT; Policymakers and planners in Colombia and other countries with similar ecosystems	Depending on the results, research priorities for R&D are confirmed or revised.	R&D investments generate beneficial impacts, minimizing tradeoffs between environmental and productivity benefits.
	Assessment of early adoption and impact of improved forages in Asia	CIAT forages project and national partners; CIAT research management	Researchers, research managers and extensionists better understand what did and didn't work, and use the knowledge to institutionalize results of current project and to improve design of future projects.	Benefits of improved forages on farmer welfare are larger and more widespread
	Analysis of the potential impact of water research projects under implementation by the CPWF in prioritized basins.	CPWF and research partners including NGO's, Universities and environmental authorities.	An estimation of the likely impact on poverty and improvements in water management as a result of CPWF implementation	R&D investments on water related project better targeted.
OUTPUT 2	Frameworks and tools for evaluating and targeting technology and/or management alternatives in agriculture and NRM R&D	Researchers and analysts in CIAT and partner organizations	Researchers use their better conceptual and empirical understanding of how impact occurs and is measured to design more impact-oriented projects.	R&D efforts more effective, equitable and sustainable.
Targets	User friendly empirical tool for quantifying and valuing environmental services developed	Researchers and planners working on economics of environmental services	Projects and policies about payment for environmental services schemes are better designed and targeted	Economic and environmental impacts of payment for environmental services schemes are more effective, equitable, wide-spread and sustainable.
	Homologue concept demonstrated, verified and published.	Decision makers in producer associations, NGOs, and GOs.	<i>Tools are used for identification of genetic resources that are deployed to support agricultural development.</i>	<i>More effective locating and targeting of germplasm leads to higher welfare and environmental benefits</i>
	Concepts and principles and potential for site sensitive natural hazard insurance.	Policy makers and planners in agriculture and finance ministries, Organizations that work for and with producers.	Identification of sites that can most benefit from natural hazard insurance. Enhanced effectiveness of scheme implementation	Widespread implementation of insurance for smallholder farmers. Enhanced income, equity and land management.
OUTPUT 3	Spatial, economic and other information and data developed, maintained and made available to internal and external users.	Researchers internal and external to CIAT, agricultural decision makers.	Researchers and decision makers have readily-accessible accurate and appropriate information from which to conduct analysis and base actions.	Better analysis and decisions are made thereby enhancing impacts
Target	Global derivatives of high-resolution digital elevation models for tropical areas.	Researchers internal and external to CIAT. National agricultural and environmental NGOs and GOs.	<i>Accurate topographic information incorporated in analyses of agrobiodiversity and in research on soil and water management.</i>	

2. Output Targets

OUTPUT 1: Implications of alternative R&D decisions analyzed		
Output targets 2006 and Achievement		Evidence
Valuation of productivity benefits and environmental services generated by land use systems in Colombia	100%	Rubiano, J., Quintero, M., Estrada, R. & Moreno, A. (2006). Multiscale Analysis for Promoting Integrated Watershed Management. Water International Vol 31, No.3. Forthcoming
Analysis of the potential impact of water research projects under implementation by the CPWF in prioritized basins.	50%	Impact pathways constructed for 6 out of 9 CPWF basins http://impactpathways.pbwiki.com Draft impact pathway narratives constructed for 3 basins and posted on the web. Extrapolation domain analysis completed for 3 basins. Impact pathways methodology developed and published (see IPRA 2006 Output)
OUTPUT 2: Frameworks, tools for evaluating and targeting technology and/or management alternatives		
User friendly empirical tool for quantifying and valuing environmental services developed	100%	Quintero, M., Estrada, R.D. y García, J. 2006. A Manual for ECOSAUT: A Model for the Economic, Social and Environmental Evaluation of Land Use. CIAT-CIP-GTZ-CONDESAN-WFCP. Centro Internacional de la Papa. Lima, Perú. 86 p.(CD-ROM)
Homologue concept demonstrated, verified and published	95%	Homologue™ Version Beta a.0. A computer system for identifying similar environments throughout the tropical world. Jones, Diaz, Cock. CD with software and users manual. (CD-ROM)
Concepts and principles and potential for site sensitive natural hazard insurance	100%	Final Report: A system of drought insurance for poverty alleviation in rural areas. A feasibility study of a practical method of drought insurance that is self-sustaining and ready for use by poor farmers, NGOs or other development organizations. Diaz Nieto et al. 95 pages.
OUTPUT 3: Spatial, economic and other information and data		
Global derivatives of high-resolution digital elevation models for tropical areas	100%	Download webpage @ http://srtm.csi.cgiar.org/ ; Reuter H.I, A. Nelson, A. Jarvis, accepted, An evaluation of void filling interpolation methods ods for SRTM data, International Journal of Geographic Information Science. Jarvis, A., Rubiano, J., Nelson, A., Farrow, A., & Mulligan, M. Practical use of SRBM data in the tropics – Comparisons with digital elevation models generated from cartographics data. Working Document no. 198, 32 pp. CIAT, Cali, Colombia.

3. Research Highlights

- **Increased User Utility for the Topographic Data Base**

The Digital Elevation Model that has been derived from the February 2000 Shuttle Radar Topography Mission (SRTM) has been one of the most important publicly available new spatial datasets in recent years. However, the ‘finished’ grade version of the data still contains data voids (some 836,000 km²) – and other anomalies – that prevent immediate use for a wide range of applications. These voids can be filled using a range of interpolation algorithms in conjunction with other sources of elevation data, but there is little guidance on the most appropriate void filling

method. Project scientists of BP2 and their partners developed (i) a method to fill voids using a variety of interpolators, (ii) a method to determine the most appropriate void filling algorithms using a classification of the voids based on their size and a typology of their surrounding terrain; and (iii) the classification of the most appropriate algorithm for each of the 3,339,913 voids in the SRTM data. Based on a sample of 1,304 artificial but realistic voids across six terrain types and eight void size classes, it was found that the choice of void filling algorithm is dependent on both the size and terrain type of the void. The best methods can be generalised as: Kriging or Inverse Distance Weighting interpolation for small and medium size voids in relatively flat low-lying areas; Spline interpolation for small and medium sized voids in high altitude and dissected terrain; Triangular Irregular Network or Inverse Distance Weighting interpolation for large voids in very flat areas, and an advanced Spline Method for large voids in other terrains.

- **Application of BP2 developed targeting tools by National Grower's Association for the development of Denomination of Origin for higher value crops**

The BP2 project and the directorate for Intellectual Property of the National Federation of Colombian Coffee Growers (FNC) led a pilot study to understand the feasibility of supporting the implementation of denomination of origin for coffee and to derive the principles for implementing denominations of origin for higher value crops. The rationale behind the study was to understand the relationship between environmental data and quality data of product samples collected from farms during the 2006 harvest. To this end, a field survey was designed on the basis of prior knowledge from similar studies. Technical staff of the regional FNC offices identified the participating farms with the aim of including farms that were accessible and covered the range of conditions that represent the coffee-growing environments in selected departments. A large number of farms were sampled. Each farm was geo-referenced to facilitate analysis of spatial correlation. To reduce variability within the data, product samples were processed in a mobile unit that standardizes harvest and post-harvest processes. Product quality characterization was conducted at the FNC headquarters and at the FNC research center CENICAFE in Chinchina. Soil samples were also obtained in each farm. We were able to show that spatial structures in the quality data are related to those found in the environmental data and documented clear relationships between growing environment and product quality characteristics.

- **Watershed management and poverty alleviation in the Colombian Andes**

The relationship between water and poverty was assessed in two watersheds in the Colombian Andes. The methodology includes both a participatory assessment of current poverty and an analysis of how household poverty status has changed over the last 25 years. Taken together, the two results capture both direct and indirect linkages between water and poverty. They identify situations where win-win solutions may be possible, and also where it is likely that trade offs will be required, not only between environmental, economic growth and equity objectives at the watershed scale, but also between households' welfare objectives and the strategies that they use to achieve them. The results of this research suggest that in the two investigated watersheds, the indirect relationships between poverty and water via employment and income linkages may be more important than direct linkages via domestic supply. This is consistent with the diversification of rural livelihoods and the importance of off-farm income in poverty reduction. Interventions to enhance domestic supply may have big impacts in a few specific communities, but would not generally contribute much to

poverty alleviation. Interventions that would reduce employment in industries like dairying or mining in Fuquene or profitability in small scale agriculture in Coello, could have significant impacts on poverty, since these have been important pathways out of poverty over the past 25 years.

- **International prize**

Zayed International Prize. 2006. *Scientific Achievements in the Environment* (www.zayedprize.org) awarded to the authors of the Millennium Assessment.

4. Important Project Outcome

Large research and development programs working on agricultural development for the rural poor throughout the developing world were able to systematically direct their interventions to regions and peoples where impacts were the most needed and interventions the most appropriate. This was possible based on using previously developed concepts of poverty mapping, systems analyses and livelihood system analysis. Concrete outputs include development of spatial poverty characterization approaches. These were published in the journal *Food Policy* and on the project Web site (<http://www.povertymap.net/>). The integration of these methods and high resolution spatial data such as childhood malnutrition, major crop distributions, irrigated areas and environmental data such topography and climate, enabled the systematic targeting of development interventions. The 2003 – 2005 CIAT MTP identifies these outputs as “Output 3 of the PE4-Project Logframe at page 29: Analyses and prediction of socio-economic factors influencing land use development performed. Measurable indicators: Distribution of poverty and its causes identified more accurately using spatial information.”

A broad group of individuals and organizations utilized the outputs of our poverty mapping initiative. In 2006, our clients and partners downloaded 397 high-resolution poverty maps in formats suitable for analysis using geographic information system software (see <http://gisweb.ciat.cgiar.org/povertymapping/>). Users included officials of the government, non-governmental organizations, advanced research institutes, as well as university academics and students. Geographic targeting work based on spatial analysis methods that integrate poverty, demographic, agricultural and environmental information was also used for a major priority-setting exercise of the Generation Challenge Program (GCP), a long term program that invests substantially in research to improve the main crops produced by the poor in high risk drought-prone and marginal areas.

Poverty mapping work specifically focused on influencing government and non-government agencies, as well as universities in Ecuador, Honduras, Mexico, Nigeria, Kenya, Malawi, Sri Lanka, Bangladesh and Vietnam. Areas identified for targeting research and development resources of the GCP include parts of South and Southeast Asia, sub-Saharan Africa, and Mexico and Central America. Maps and related analytical approaches were used by research and development targeting exercises and academic research. For example, Ecuador uses poverty and food security maps from the project in targeting food security resources. CIMMYT used their Mexico analysis to re-orient their breeding and variety testing programs to poor and marginal environments. International agencies used Bangladesh poverty maps to respond to flooding by identifying the coincidence of damage and the vulnerability of the population. In Kenya, the poverty maps were integrated into local information systems, and were used to target development assistance. Mapping work for the Generation Challenge Program was used to prioritize and focus the work on a reasonable number of crops and environments where impacts on reducing poverty was the most needed. Use of poverty maps was partly documented when our partners and clients downloaded high-resolution poverty maps from our Web site. The Generation Challenge

Program adopted the poverty-drought analysis and database as a key element of their overall strategic planning and prioritization. The use of some of the studies was documented in the publication, “Where the poor are: an atlas of poverty”, published by Columbia University.

5. Project Publications

Articles in refereed journals

- Fisher, M.J., Braz, S.P., Dos Santos, R.S.M., Urquiaga, S., Alves, B.J.R. and Boddey, R.M. (2007). Another dimension to grazing systems: Soil carbon. *Tropical Grasslands* **41**: (In press).
- Gijsman, A.J., Thornton, P.K. and Hoogenboom, G. (2007) Using the WISE database to parameterize soil inputs for crop simulation models. *Computers and Electronics in Agriculture* **56**:85-100.
- Nelson, A., Oberthür, T. and Cook, S. (2007). Multi-scale correlations between topography and vegetation in a hillside catchment of Honduras. *International Journal of Geographical Information Science* **21**(2):145-174.
- Oberthür, T., Cook, J., Andersson, M.S., Naranjo, R.N., Castañeda, D. and Blair, M. (2007). Acquisition of low altitude digital imagery for local monitoring and management of genetic resources. *Computers and Electronics in Agriculture*. (In press).
- Ocampo, J., Coppens d'Eeckenbrugge, G., Restrepo, M., Salazar, M., Jarvis, A. and Caetano, C. (2007). Diversity of Colombian Passifloraceae: an updated list for conservation. *Biota Colombiana*. (In press).
- Otero, M.F., Rubiano, J.E., Lema, G. and Soto, V. (2006). Using similarity analyses to scale out research findings. *Water International*. Special Issue on Scales and Water Resources Management **31**(3):1-26.
- Peralta, A., García, J.A. and Johnson, N. (2006). Dinámica y definición de pobreza en los Andes colombianos: Enfoques participativos versus enfoques objetivos = Dynamics and definitions of poverty in the Colombian Andes: Participatory and objective approaches. *Desarrollo y Sociedad* (**58**):1-48.
- Reuter, H.I., Nelson, A. and Jarvis, A. (2007). An evaluation of void filling interpolation methods for SRTM data. *International Journal of Geographic Information Science*. (In press).
- Rubiano, J., Quintero, M., Estrada, R. and Moreno, A. (2006). Multiscale Analysis for Promoting Integrated Watershed Management. *Water International*. Special Issue on Scales and Water Resources Management **31**(3):1-38.
- Swallow, B., Johnson, N., Meinzen-Dick, R. and Knox, A. (2006). The challenges of inclusive cross-scale collective action in watersheds. *Water International*. Special Issue on Scales and Water Resources Management **31**(3):1-37.
- Tomich, T.P., Timmer, D.W., Alegre, J., Arskoug, V., Cash, D.W., Cattaneo, A., Cornelius, J., Ericksen, P., Joshi, L., Kasyoki, J., Legg, C., Locatelli, M., Murdiyarso, D., Palm, Ch., Porro, R., Perazzo, A.R., Salazar-Vega, A., Van Noordwijk, M., Velarde, S., Weise, S. and White, D. (2007). Integrative science in practice: Process perspectives from ASB, the Partnership for the Tropical Forest Margins. *Agriculture Ecosystems & Environment* **121**(3):269-286.
- Yeaman, S. and Jarvis, A. (2006). Regional heterogeneity and gene flow maintain variance in a quantitative trait within populations of lodgepole pine. *Proceedings of the Royal Society B: Biological Sciences* **273**: 1587-1593.

Books and monographs

- Quintero, M., Estrada, R.D. and García, J. (2006). *A Manual for ECOSAUT: A Model for the Economic, Social and Environmental Evaluation of Land Use*. CIAT-CIP-GTZ-CONDESAN-WFCP, Centro Internacional de la Papa, Lima, Perú. 86 pp.
- Quintero, M., Estrada, R.D. and García, J. (2006). *Modelo de optimización para evaluación ex ante de alternativas productivas y cuantificación de externalidades ambientales en cuencas andinas. ECOSAUT*. CIAT-CIP-GTZ-CONDESAN-WFCP, Centro Internacional de la Papa, Lima, Perú. 76 pp.
- Läderach, P. (ed). (2006). *Improving coffee quality or converting marginal areas*. Seminar Proceedings Agricultural Science and Resource Management in the Tropics and Subtropics ARTS, Universität Bonn, Germany. 150 pp.
- White, D., Rondón, M., Hurtado, M.P., Rivera, M., García, J., Amézquita, E., Rodríguez, C.A. (2006). *Valoración Ambiental y Socio-Económica de Plantaciones Forestales Prototipos en el Departamento de Córdoba, Colombia*. CIAT- CVS. 68 pp.

Book Chapters

- Bode, R., Läderach, P. and Oberthür, T. (2006). Gestión de alta calidad – percepciones, lenguajes y paradigmas. In: Pohlan, J., Soto, L. and Barrera, J. (eds.) *El Cafetal del Futuro: Realidades y Visiones*. Aachen, Shaker Verlag, Alemania. Pp. 161-176.
- Läderach, P., Oberthür, T., Niederhauser, N., Usmá, H., Collet, L. and Pohlan, J. (2006). *Café Especial: Factores, dimensiones e interacciones*. In: Pohlan, J., Soto, L. and Barrera, J. (eds.) *El Cafetal del Futuro: Realidades y Visiones*. Aachen, Shaker Verlag, Alemania. Pp. 141-160.
- Niederhauser, N. and Ritter, W. 2006. User interface for mobile data collection in rural development areas. In: Kempter, G. and von Hellberg, P. (Hrsg) *Information nutzbar machen: Zusammenfassung der Beiträge zum Usability Day IV*, Pabst Science Publishers, Lengerich, DE. Pp. 100-104.

Papers presented at formal conferences and workshops with external attendance

- Atzmanstorfer, K., Oberthür, T., Läderach, P., O'Brien, R., Collet, L., and Quiñones, G. (2006). Probability Modelling to Reduce Decision Uncertainty in Environmental Niche Identification and Driving Factor Analysis: CaNaSTA Case Studies. Conference and Exhibition on Applied Geoinformatics-AGIT, GeoInformation for Development- gi4dev AgitSPECIAL. Salzburg, Austria, 07 July, 2006.
- Barona, E., Girón, E., Feistner, K.L., Dwyer, J.L. and Hyman, G. (2006). Método de procesamiento de imágenes modis para Colombia. XII Simposio Internacional en Percepción Remota y Sistemas de Información Geográfica SELPER- Capítulo Colombia. Cartagena, Colombia, 24-29 September, 2006.
- Bolaños, S.L. (2006). Integración de Sistemas de Información Geográfica y Teledetección para Mapeo de Áreas de Café. XII Simposio Internacional en Percepción Remota y Sistemas de Información Geográfica SELPER- Capítulo Colombia. Cartagena, Colombia, 24-29 September, 2006
- Cook, S.E., Fisher, M., Diaz-Nieto, J. and Lundy, M. (2006). New Financial Instruments to Help Improve Agricultural Water Management for Poor Farmers Under Conditions of Risk. World Water Week. Stockholm, Sweden, 20-26 August, 2006.
- Cook, S.E., Jarvis, A. and González, J.P. (2006). A new global demand for digital soil information. Global Workshop on Digital Soil Mapping for Regions and Countries with Sparse Soil Data Infrastructures. Rio de Janeiro, Brazil, 4-7 July, 2006.

- Estrada, M., Läderach, P., Oberthür, T. and Pohlen, H.A.J. (2006). Análisis de las interacciones y del impacto de condiciones ambientales, agronómicas, y el manejo innovador sobre la calidad de taza del café (*Coffea arabica* L.). X Congreso Internacional de Manejo Integrado de Plagas y Agroecología. Tapachula, Chiapas, México, 27 - 29 September, 2006.
- Giron, E., Perea, C.J. and Hyman, G. (2006). Aplicación de mapeo en la web utilizando soluciones SIG de código abierto para la disseminación de información satelital sobre redes de alta velocidad como apoyo a la investigación agrícola y el manejo de recursos naturales. XII Simposio Internacional en Percepción Remota y Sistemas de Información Geográfica SELPER- Capítulo Colombia. Poster Presentation. Cartagena, Colombia, 24-29 September, 2006.
- Gonzalez, C.E., Jarvis, A. and Palacio, J.D. (2006). Biogeografía del roble común (*Quercus humboldtii* Bonpl.): distribución geográfica y su adaptación climática. Simposio Internacional sobre Robles y Ecosistemas Asociados. Santafé de Bogotá, Colombia, 11-12 May, 2006.
- Hyman, G., Kam, S. P., Legg, C., Farrow, A., Hodson, D. and Benson, T. (2006). Poverty and Food Security Mapping at Country-level: Lessons Learned from Seven Case Studies. IX International Conference of the Global Spatial Data Infrastructure-GSDI-9. Santiago, Chile, 3-11 November, 2006.
- Hyman, G., Meneses, C., Barona, E., Girón, E. and Perea, C.J. (2006). Satellite imagery and information networks for monitoring climate and vegetation in Colombia. XII Simposio Internacional en Percepción Remota y Sistemas de Información Geográfica SELPER- Capítulo Colombia. Cartagena, Colombia, 24-29 September, 2006.
- Jarvis, A., Fisher, M., Jones, P., Cook, S.E. and Guarino, L. (2006). Agriculture, Risk and Climate Change. International Workshop on Tropical Agriculture Development Transforming Tropical Agriculture: An Assessment of Major Technological, Institutional, and Policy Innovations. Brasilia, Brazil, 20-22 July, 2006.
- Jarvis, A., Paternina, M.J., Arcos, A., Rodríguez, H.J., Nagles, C. and Melo, N. (2006). Evaluación Rápida de la Adaptación al Medioambiente de Plantas Promisorias Medicinales. II Congreso Internacional de Plantas Medicinales y Aromáticas. Palmira, Colombia, 19-21 October, 2006.
- Johnson, N. and Peralta, A. (2006). Dynamics and definitions of poverty in the Colombian Andes: Participatory vs. objective approaches. International Forum on Water and Food. Vientiane, Lao PDR, November 12 – 17, 2006.
- Johnson, N., Rubiano, J.E. and Peralta, A. (2006). Introduction to Theme 2 (Water and People in Catchments) and the payment for environmental services in soil and water (PES-SW) initiative. Workshop on potential for Payment for Environmental Services (PES) approaches to contribute to equitable and sustainable management of soil and water in upper catchments. Nairobi, Kenya, 27-29 June, 2006.
- Läderach, P., Collet, L., Oberthür, T. and Pohlen, H.A.J. (2006). Café especial y sus interacciones con factores de producción. II Diplomado sobre cafecultura sustentable. Tuxtla Gutiérrez, Chiapas, 2006.
- Läderach, P., Vaast, P., Oberthür, T., O'Brien, R., Lara-Estrada, L.D. and Nelson, A. (2006). Geographical Analyses to Explore Interactions between Inherent Coffee Quality and Production Environment. XXI International Conference on Coffee Science. Montpellier, France, 11-15 September, 2006.
- Lane, A., Jarvis, A. and Hijmans, R.H. (2006). Crop Wild Relatives and Climate Change: predicting the loss of important genetic resources. ESSP Global Environmental Change Open Science Conference. Beijing, China, 9-12 November, 2006.
- Lentes, P., Peters, M., White, D., Holmann, F. and Reiber, C. (2006). "Assessing and Comparing Income Generation of Livestock Holders in Olancho, Honduras. An Analysis across Landscapes and Farming Systems." Poster presentation. *Tropentag*. Bonn, Germany, 11-13 October, 2006.
- Lozano, J., Lema, G. and Hyman, G. (2006). Mapeo de suelo a nivel de finca con métodos geoestadísticos. Estudio de caso en el Valle del Cauca. XII Simposio Internacional en Percepción Remota y Sistemas de Información Geográfica SELPER- Capítulo Colombia. Poster Presentation. Cartagena, Colombia, 24-29 September, 2006.

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- Oberthür, T., Cock, J., Niederhauser, N. and Kattinig, S. (2006). Information Management for Product Differentiation in Supply Chains: The Case of Specialty Coffee. International Conference on Coffee Science. Montpellier, France, 11-15 September, 2006.
- Pauli, N., Barrios, E., Oberthür, T. and Conacher, A. (2006). Earthworms and other soil invertebrates in the Quesungual agroforestry system of Honduras: Distribution patterns and implications for management. IV Annual Meeting of the Conservation and Sustainable Management of Belowground Biodiversity project-GEF/UNEP. Xalapa-Catemaco, México, 2006.
- Peralta, A., García, A.J. and Johnson, N. (2006). Watershed management and poverty alleviation in the Colombian Andes. International Forum on Water and Food. Vientiane, Lao PDR, November 12-17, 2006.
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- Peters, M., White, D., Fujisaka, S., Franco, L.H., Lascano, C., Muñoz, L.S., Sarria, P., Montoya, C.A., Vivas, N., Arroyave, O., Lentés, P., Schmidt, A. and Mena, M. (2006). "Forage-based Protein Feeds for Smallholder On-farm Pig and Poultry Production and the Feed Industry". Symposium- Beyond the Cow: 101 Uses for Forages and Grasslands. American Society for Agronomy, ASA-CSSA-SSSA International Annual Meetings. Indianapolis, USA, 12-16 November, 2006.
- Suárez, L.A., Läderach, P., Oberthür, T. and Pohlen, H.A.J. (2006). Impacto de la iluminación y del grado de sombrío en los atributos de la calidad del café. XX Congreso Internacional de Manejo Integrado de Plagas y Agroecología. Tapachula, Chiapas, México, 27-29 September, 2006.
- Uribe, N., Oberthür, T. and Hyman, G. (2006). Valoración de los diferentes métodos de corrección topográfica en imágenes de satélite aplicado a la respuesta espectral del café. XII Simposio Internacional en Percepción Remota y Sistemas de Información Geográfica SELPER- Capítulo Colombia. Poster presentation. Cartagena, Colombia, 24-29 September, 2006.
- White, D., Clavijo, L.A., Lundy, M., Oberthür, T., Ribeiro, M.M., Hauser, M. and Darnhofer, I. (2006). "Fostering site-specific market options to improve rural livelihoods and land management in Laos." Poster presentation. IDRC workshop. Community-based Natural Resources Management. Vientiane, Lao PDR, March, 2006.
- Yamamoto, Y., Oberthür, T., Lefroy, R., Kashiwagi, J. (2006). Capability of Satellite Imagery for Land-Use Analysis. II International Conference on Sustainable Sloping Lands and Watershed Management: Linking research to strengthen upland policies and practices. Luang Prabang, Lao PDR, 12-15 December, 2006.

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- Cook, S.E., Turrall, H. and Gichuki, F. (2006). *Agricultural Water Productivity: Issues, Concepts and Approaches*. Basin Focal Project Working Paper no. 1. 17 pp.
- Cook, S.E., Turrall, H. and Gichuki, F. (2006). *Estimation at plot, farm and basin scale*. Basin Focal Project Working Paper no. 2. 1-16 pp.
- Cook, S.E., Gichuki, F., Turrall, H. and Fisher, M.J. (2006). *Analyzing Water Poverty: Water, Agriculture and Poverty in Basins*. Basin Focal Project Working Paper. no. 3. 1-18 pp.
- Bode, R. (2006). *Knowledge management in value chains. The case of the specialty coffee association FAPECAFES, Ecuador*. In: Services for Rural Development. Knowledge systems in rural areas. Bulletin of the Sector Project, GTZ 14: 41-46.
- Niederhauser, N. and Oberthür, T. *Cinfo Information management for coffee supply chains. Information Platform for Diversification of Coffee Lands*. <http://www.cinfo.it/>
- Segnestam, L., Simonsson, L., Rubiano, J. E. and Morales, M. (2006). *Cross-level institutional processes and vulnerability to natural hazards in Honduras*. Stockholm Environment Institute. 64 p.
- Yamamoto, Y., Oberthür, T. and Lefroy, R. (2006). *Rainfed Agriculture in Northern Laos -Identification of Land Use Cycles in Slash-and-Burn Agriculture by Satellite Imagery*. JIRCAS Working Report no. 47: 1-6.

7. Project Staff (* Left during 2006; ✓ Arrived during 2006)

Thomas Oberthür (100%)	PhD, Geography	Project Manager
Nancy Johnson (100%)	PhD, Economist	Senior Scientist
Simon E. Cook (50%)	PhD, Crop Biology	Senior Scientist
Glenn G. Hyman (100%)	PhD, Geography	Senior Scientist
Douglas White (75%)	PhD, Agr. & Environ. Econ.	Senior Research Fellow
Andrew Jarvis (100%)	PhD., Geography	Senior Scientist
Roberto Porro (50%)	PhD., Anthropology	Senior Scientist
Arjan J. Gijsman	PhD, Soil Science/Crop Modeling	Assoc. Senior Scientist
Jorge Rubiano* (100%)	PhD, Geography	Postdoctoral Fellow
Andrew Farrow (100%)	MSc, GIS	Research Fellow
Norbert Niederhauser (100%)	DI(FH), Inf. & Com. Engineering	Research Fellow
Carolina González (100%)	Lawyer and Economist	Research Associate
William Díaz* (100%)	MSc, Admin./System Engineer.	Systems Analyst 1
Liliana Rojas (100%)	MSc, Natural Resources	Research Assistant 1
Viviana Gonzalías (100%)	MSc, Sustainable Forestry	Research Assistant 2
Andrés J. Peña* (100%)	MSc, Meteorology	Research Assistant 2
James García (100%)	MSc, Statistician	Data Base Specialist
Lilian Busingye (100%)	MSc, GIS	Spatial Analysis Intern
Germán Lema (100%)	BSc, Industrial Engineering	Statistical Consultant 2
Lilian P. Torres (100%)	BSc, Business Administration	Administrative Assistant 1
Luz A. Clavijo (100%)	BSc, Geography	Research Assistant 1
Germán Escobar (100%)	BSc, Biology	Research Assistant 1
Sandra Bolaños (100%)	BSc, Industrial Engineering	Research Assistant 1
Magda L. Perez* (100%)	BSc, Catastral & Geodesta Engineer	Research Assistant 1
Jenny L. Correa (100%)	BA, Social Communication	Research Assistant 1
María A. Peralta (100%)	BSc, Economist	Research Assistant 2
Marcela Estrada (100%)	Agronomy Engineering	Research Assistant 3
Mike H. Salazar (100%)	Ecology	Research Assistant 3
Elizabeth Barona (100%)	BSc, Systems Engineer	GIS Analyst 3
Silvia E. Castaño (100%)	BSc, Systems Engineer	GIS Coordinator
Claudia J. Perea (100%)	BSc, Systems Engineer	Systems Analyst 3
Jorge A. Cardona (100%)	BSc, Systems Engineer	Systems Analyst 3
Hermann Usma (100%)	Agricultural Technology	Expert Research 1
Edward Guevara (100%)	Environmental Engineering	Technician 1
Marisol Calderón (100%)	Architectural Drawing	Office Clerk 1
Juan C. Barona* (100%)	Topographic Engineer	Office Clerk 4
Ovidio Rivera (100%)	Systems Technology	Office Clerk 4
Víctor M. Soto (100%)	BSc, Business Administration	GIS Expert
Alexander Cuero (100%)	Systems Technology	GIS Expert
Carlos Nagles (100%)	Agricultural Technology	GIS Expert
Yuviza Barona* (100%)	Bilingual Secretary	Bilingual Secretary
Ana M. Guerrero (100%)	Bilingual Secretary	Bilingual Secretary
Peter Läderach (100%)	MSc, Geography	Visiting Researcher
Natasha Pauli* (50%)	MSc, Biology & Geography	Visiting Researcher
Juergen Piechaczek (100%)	MSc, Agriculture	Visiting Researcher
Reinhild Bode (100%)	MSc, Rural Development	Visiting Researcher
Fernando Rodríguez (50%)	MSc, Business Administration	Visiting Researcher
Ramiro Cuero (50%)	MSc, Candidate	Visiting Researcher
Walter Ritter✓* (50%)	DI(FH), Inf. & Com. Engineering	Visiting Researcher
Martin Wiesinger✓ (100%)	DI(FH), Inf. & Com. Engineering	Visiting Researcher
Michael Gau✓ (100%)	DI(FH), Inf. & Com. Engineering	Visiting Researcher
Carlos González (100%)	BSc, Biologist	Visiting Researcher
Karl Atzmanstorfer* (100%)	BSc, Geography	Visiting Researcher
Scott Gebhardt✓ (100%)	BSc, Geography	Visiting Researcher

Daniel Jiménez (100%)	Agronomic Engineering	Visiting Researcher
Julien Henique✓* (100%)	Agronomic Engineering	Visiting Researcher
Diana Tangarife* (100%)	Environmental Engineering	Visiting Researcher
Ginger Roberts✓ (100%)	Environmental Development	Visiting Researcher
Aske Bosselman✓ (100%)	Forestry Engineering	Visiting Researcher
Klaus Dons✓ (100%)	Forestry Engineering	Visiting Researcher
Abson Sae-Tang✓* (100%)	Electronic Engineering	Visiting Researcher
Clemens Bertschler* (100%)	Inf. & Com. Engineering	Visiting Researcher
Marlene Stroj✓ (100%)	Engineering	Visiting Researcher
Sibylle Katinig✓* (100%)	Computer Science	Visiting Researcher
Natalia Uribe* (100%)	Topographic Engineering	Undergraduate Student
Luz A. Suárez* (100%)	Topographic Engineering	Undergraduate Student
Liliana Ramírez* (100%)	Environmental Engineering	Undergraduate Student
María J. Paternina✓ (100%)	Agronomic Engineering	Undergraduate Student
Diego Sánchez* (100%)	Economist	Undergraduate Student
Gettsy Quiñones * (100%)	Statistics	Undergraduate Student
Peter G. Jones	PhD, Crop Physiology	Consultant
Myles James Fisher	PhD, Crop Physiology	Consultant
Samuel Fujisaka	PhD, Anthropology	Consultant
Meike Andersson*	PhD, Animal Science/Agronomy	Consultant
James H. Cock	PhD, Plant Physiology	Consultant
Laure D. Collet	MSc, Environmental Sciences	Consultant