Program and Abstract Book

17th Symposium of the International Farming Systems Association

Small Farms in an Ever-Changing World:

Meeting the challenges of sustainable livelihoods and food security in diverse rural communities

November 17-20, 2002
Lake Buena Vista, Florida USA

UNIVERSITY OF FLORIDA
Institute of Food and Agricultural Sciences

Project #0206
Welcome to the 17th Symposium of the International Farming Systems Association

Members of IFSA and its predecessor organizations are now entering into their third decade of work facing the challenge of improving the lives and livelihoods of those living on small farms in an ever-changing world. Yet food security and sustainable livelihoods remain a challenge, not only for the people living on these farms, themselves, but also for those of us who have been working to improve their situation over this period of time, and longer. And over this same period, even though the percentage of the human population that lives in urban environments is increasing, the total number of people who live in rural areas and work in agriculture is still increasing. In Pakistan, India and Bangladesh, alone, between 1970 and 2000, the agricultural population increased from 475 million people to 620 million people (FAOSTAT). The 145 million added people obviously are not operating large farms. If they were all on small farms, this would mean about 20 million more small farms in the region over the last 30 years.

The diversity of papers being presented at this symposium and the wide array of presenters manifest the challenges associated with improving small farm livelihoods.

The papers point out the diversity among and within these farms, which are homes first rather than businesses. That persons from so many disciplines have been coming together at these symposia over the years attests to the hope we continue to have, and in some cases, the successes we have been able to achieve.

We have learned from past symposia that while many of us may not know each other at first, we immediately recognize that we are among friends who have a common cause. For this reason, you will note that we have long breaks between formal sessions so new friends have plenty of time to get acquainted and trade ideas and innovations. Except for the opening reception, evenings are not programmed, also leaving time to renew acquaintances or create new ones.

There are several people present at his symposium who were at the first symposium, in 1982, hosted at Kansas State University by David Norman and Cornelia Flora, both of whom are here in Orlando. Others are here who have been either to the global symposia in other countries or their own regional symposia on different continents. We urge you to get acquainted with each other.

IFSA is not a formal association with voting members. By virtue of attending this symposium, you are all welcome to attend the business meeting on Wednesday morning and participate in discussions and any voting that might take place. Among other business, we will be trying to decide on the location of the next global symposium in 2004.

We are glad you were able to come and hope you have an enjoyable and productive time.

Sincerely,

The Organizing Committee

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CONFERENCE SPONSORS

We gratefully acknowledge the support, involvement and interest of our sponsors and participating organizations:

- Food First Institute for Food and Development Policy
- Iowa State University, North Central Regional Center for Rural Development (NCRCRD)
- North Carolina State University, College of Agriculture and Life Sciences
- Southern Illinois University, College of Agricultural Sciences
- Texas A & M University, International Agriculture Programs
- University of Florida, Institute of Food and Agricultural Sciences
- University of Georgia, Sustainable Agricultural & Natural Resource Management Collaborative Research Support Program (SANREM CRSP)
IFSA COMMITTEE REPRESENTATIVES

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Constance Neely, Co-President, IFSA; Deputy Director, SANREM CRSP, University of Georgia

Organizing Committee

Constance Neely, Co-President, IFSA; Deputy Director, SANREM CRSP, University of Georgia
Cornelia Flora, Co-President, IFSA; Charles F. Curtiss Distinguished Professor of Agriculture and Sociology -and- Director, North Central Regional Center for Rural Development; Iowa State University
Peter Hildebrand, Conference Organizer, University of Florida/IFAS, International Programs
Ed Price, North American Farming Systems Association; Texas A & M University, International Agriculture Programs
PROGRAM AGENDA

Sunday, November 17, 2002

1:00pm-7:00pm Registration Office Open [WESTMINISTER ROOM]
1:00pm-7:00pm Set-Up of Posters Displays and Tool Bazaar Exhibits
7:00pm-9:00pm Poolside Welcome Reception

Monday, November 18, 2002

7:00am-6:00pm Registration Office Open [WESTMINISTER ROOM]
7:00am-6:30pm Posters, Tools and Exhibits on Display: Poster presentations and tool bazaar exhibits will be on display throughout the conference, with viewing time scheduled during daily refreshment breaks. A formal POSTER and TOOL BAZAAR SESSION is scheduled from 3:00pm-4:00pm on Monday, November 18, 2002 when presenters are to be stationed at their displays.

7:00am-8:00am Early Morning Refreshments (Served in Poster & Tool Bazaar Display Area)

8:00am-9:30am OPENING PLENARY SESSION [SALONS V, VI, VII]
MODERATORS: Constance Neely, University of Georgia, SANREM CRSP, Watkinsville, GA, USA and Cornelia Flora, Iowa State University – NCRCRD, Ames, IA, USA

8:00am-8:10am Welcoming Remarks - Peter Hildebrand, Director, International Programs, University of Florida, Institute of Food and Agricultural Sciences, Gainesville, Florida, USA

8:10am-8:30am Opening Address - Michael Martin, Vice President, Agriculture and Natural Resources, University of Florida, Institute of Food and Agricultural Sciences, Gainesville, Florida, USA

8:30am-9:00am Agri-Culture: The Past, Present & Future of Farming Systems - Jules Pretty, Professor, Centre for Environment and Society and Department of Biological Sciences, University of Essex, Wivenhoe Park, Colchester, UK

9:00am-9:30am Effecting Change: Progress, Policies and Partnerships following the World Summit on Sustainable Development - Ms. Adela Backiel, Director of Sustainable Development, United States Department of Agriculture, Washington, DC, USA

9:30am-9:45am Housekeeping Remarks by Organizing Committee Introduction of Board Members, Overview of Symposium Structure and Acknowledgements

9:45am-10:30am Posters and Tool Bazaar Exhibits on Display (refreshments provided)
Monday, November 18, 2002 (continued)

10:30am-12noon  FOUR CONCURRENT SESSIONS
10:30am-12noon  Concurrent Session I - Theme 1: Small Farm Diversification and Competitiveness  [Salons V, VI, VII]
MODOERATOR: Corinne Valdivia, University of Missouri – Columbia, Social Sciences Unit, Department of Agricultural Economics and Department of Rural Sociology, Columbia, Missouri, USA

10:30am-10:40am  Opening Remarks and Session Overview by Moderator
10:40am-11:00am  Public Policy, Markets and Social Learning in Chile’s Small Scale Agriculture - Julio A. Berdegué, RIMISP, Santiago, Chile ............(p. 7)
11:00am-11:20am  What is the Future for Management Advice for Family Farms in West Africa? - Guy Faure, CIRAD Montpellier France..............(p. 9)
11:20am-11:40am  Agroecological Systems as a Strategy to Promote Sustainable Development for Small Family Farmers - S. L. G. Pinheiro, A. M. Cardoso, V. Turnes, W. Schmidt, R. Brito, and T. Guzzatti ... (p. 12)

11:40am-12 noon  Q&A between speakers and audience facilitated by Moderator

10:30am-12 noon  Concurrent Session II - Theme 2: Engaging Stakeholders in Support of Small Farms  [Dover Room – Lobby Level]
MODOERATOR: Kathleen Colverson, Heifer International, Gainesville, FL, USA

10:30am-10:40am  Opening Remarks and Session Overview by Moderator
10:40am-11:00am  An Evaluation of Participatory Action Research in the Transamazônica Region of Brazil - C. F. Jordan and C. Castellanet, Institute of Ecology, Univ. of Georgia, Athens, Georgia, USA, Groupe de Recherche et d’Echanges Technologiques (GRET), Paris, France..........................(p. 24)
11:00am-11:20am  Facilitated Learning in Soil Fertility Management: Assessing Potentials of Low-External-Input Technologies in East African Farming Systems - A. De Jager1, D. Onduru2 and C. Walaga3; 1Wageningen University and Research Center, Agricultural Economics Research Institute (LEI), Den Haag, The Netherlands; 2ETC- East Africa, Nairobi, Kenya; 3Environmental Alert, Kampala, Uganda..(p. 22)
11:20am-11:40am  Testing Scenarios on the Viability of Smallholding Irrigation Schemes in South Africa: A Participatory and Information-Based Approach - S. R. Perret, University of Pretoria and CIRAD, Department of Agricultural Economics, Extension and Rural Development, Pretoria, South Africa..........................(p. 28)

11:40am-12 noon  Q&A between speakers and audience facilitated by Moderator
Monday, November 18, 2002 (continued)

10:30am-12 noon **Concurrent Session III - Theme 3: Farming Systems Knowledge and Information Systems** [SALONS VIII, IX]

**Moderator:** Doyle Baker, Food and Agriculture Organization (FAO), Agricultural Support Systems Division, FAO, Rome, Italy

**10:30am-10:40am** Opening Remarks and Session Overview by Moderator

**10:40am-11:00am** Calculating Environmental Indicators for Individual Farms and Fields: The Case of Potato Cultivation in the Netherlands - J. W. A. Langeveld¹, P. W. J. Uithol¹, B. Kroonen-Backbier² and H. van de Akker³; ¹Plant Research International, ²Applied Plant Research, ³DLV Advisory Group; #Wageningen University and Research Centre, The Netherlands...................................................(p. 39)

**11:00am-11:20am** An Assessment of Low Input Farming Systems and Their Adoption: Some Evidence from the UK - A. P. Bailey¹, T. Rehman², C. M. Yates², J. R. Park² and R. B. Tranter³; ¹Institute of Water and Environment, Cranfield University, Silsoe, Bedfordshire, UK; ²The University of Reading, Department of Agriculture, School of Agriculture, Policy and Development, New Agriculture Building, Earley Gate, Reading, UK; ³The University of Reading, Centre for Agricultural Strategy, School of Agriculture, Policy and Development, New Agriculture Building, Earley Gate, Reading, UK.................................................................(p. 41)

**11:20am-11:40am** Integrating Soil Resources into Economic Accounting at the Farm Level: A Brief Overview - Pilar Santacoloma, Farm Management and Production Economics, Food and Agriculture Organization of the United Nations- Terme delle Caracalla, Rome, Italy........................................(p. 42)

**11:40am-12 noon** Q&A between speakers and audience facilitated by Moderator

10:30am-12 noon **Concurrent Session IV - Theme 1: Small Farm Diversification and Competitiveness** [SALONS X, XI]

**Moderator:** Christine King, The University of Queensland Gatton Campus, Toowoomba, Qld, Australia

**10:30am-10:40am** Opening Remarks and Session Overview by Moderator

**10:40am-11:00am** Rural Agro-Enterprises, Value Adding and Poverty Reduction: A Territorial Orientation for Rural Business Development (RBD) - Mark Lundy, Carlos Felipe Ostertag and Rupert Best, Centro Internacional de Agricultura Tropical (CIAT), Rural Agro-enterprise Development Project, Cali, Colombia, South America ......................(p. 10)

**11:00am-11:20am** Farming Systems Based Strategies for Improved Rural Livelihoods in Eastern Europe and Central Asia - Stjepan Tanic and John Dixon, Farming Systems Development Officer in the FAO Subregional Office for Central and Eastern Europe and Senior Officer (Farming Systems) in the Farm Management and Production Economics Service, FAO HQ, Rome, Italy.................................................................(p. 8)
Monday, November 18, 2002 (continued)

11:20am-11:40am Market Oriented Smallholder Dairy Farming as an Option for Improving the Livelihoods of Small and Marginal Farmers in the Hindu Kush - Himalaya - Pradeep M. Tulachan and Mohammad Jabbar, International Centre for Integrated Mountain Development (ICIMOD), International Livestock Research Centre (ILRI) .......... (p. 15)

11:40am-12 noon Q&A between speakers and audience facilitated by Moderator

12 noon-1:30pm Lunch on Own

1:30pm-3:00pm PLENARY SESSION [SALONS V, VI, VII]
Moderator: Peter Hildebrand, University of Florida/IFAS, Food & Resource Economics Department and IFAS International Programs, Gainesville, FL, USA

1:30pm-2:00pm Linking the Isolated Rural Poor to the New Globalization Paradigm: Institutional Bridges - Felipe Manteiga, Director For Strategic Partnerships, Representative in the United States, Inter-American Institute for Cooperation on Agriculture, Washington, DC, USA

2:00pm-2:30pm Access to Genetic Resources, Genetic Diversification, Seed Production and Integrated Cropping/Production Systems - Howard-Yana Shapiro, Research Manager, Plant Science, M&M/Mars, Mars, Inc., Hackettstown, NJ, USA

2:30pm-3:00pm Q&A between speakers and audience facilitated by Moderator

3:00pm-4:00pm Formal Poster & Tool Bazaar Session with Refreshments (Presenters to be stationed at posters and tool bazaar displays.)

4:00pm-5:30pm FOUR CONCURRENT SESSIONS

4:00pm-5:30pm Concurrent Session I - Theme 4: Farming Systems Education and Training [SALONS VIII, IX]
Moderator: Michael Bannister, University of Florida, Center for Subtropical Agroforestry, School of Forest Resources and Conservation, Gainesville, FL, USA

4:00pm-4:10pm Opening Remarks and Session Overview by Moderator


4:50pm-5:10pm Curricula Change and Human Resource Development for Integrated Farming Systems in Semi-Arid Tropical Conditions – K. P. Singh and R. K. Nanwal, Chaudhary Charan Singh Haryana Agricultural University, Hisar, India ................................................................. (p. 46)

5:10pm-5:30pm Q&A between speakers and audience facilitated by Moderator
Monday, November 18, 2002 (continued)

4:00pm-5:30pm  **Concurrent Session II-Theme 5: Food Safety and Security** [DOVER ROOM – LOBBY LEVEL]

**MODERATOR:** Clive Lightfoot, Agropolis International, International Support Group (ISG), Montpellier, France

4:00pm-4:10pm  **Opening Remarks and Session Overview by Moderator**

4:10pm-4:30pm  **Case Study on the Traceability Systems in the Fruit and Vegetable Sector** - C. Giacomini, M. C. Mancini and C. Mora, Department of Economics and Quantitative studies, Parma, Italy.................................(p. 49)

4:30pm-4:50pm  **Impact of Trade Liberalization on Small Farmers - Sri Lanka’s Experience** - N.F.C. Ranaweera, Ministry of Agriculture and Livestock, Battaramulla, Sri Lanka.......................................................(p. 49)

4:50pm-5:10pm  **The Invisible Frontier: The Current Limits of Decentralization and Privatization in Developing Countries** - William M. Rivera, College of Agriculture and Natural Resources, University of Maryland, College Park, MD, USA................................................................................(p. 50)

5:10pm-5:30pm  Q&A between speakers and audience facilitated by Moderator

4:00pm-5:30pm  **Concurrent Session III -Theme 1: Small Farm Diversification and Competitiveness** [SALONS V, VI, VII]

**MODERATOR:** Howard-Yana Shapiro, M&M Mars/Mars, Inc., Hackettstown, NJ, USA

4:00pm-4:10pm  **Opening Remarks and Session Overview by Moderator**

4:10pm-4:30pm  **Diversification of Perennial Crops to Offset Market Uncertainties: The Case of Traditional Rubber Farming Systems in West-Kalimantan** - Eric Penot, CIRAD-TERA, program THI (Tropiques Humides et Insulaires), Montpellier, France; Karine Trouillard, CNEARC, Montpellier, France.................................................................(p. 11)

4:30pm-4:50pm  **Rural Livelihoods and Agroforestry Practices in the Missouri Flood Plains** - Corinne Valdivia, Sandra S. Hodge and Andrew Raedeke, University of Missouri - Columbia, Social Sciences Unit, Department of Agricultural Economics and Department of Rural Sociology, Columbia, Missouri, USA ..............................................................................................................(p. 17)

4:50pm-5:10pm  **Agroforestry and Farm Diversification in the Southeastern United States** - S. W. Workman and P. K. R. Nair, Center for Subtropical Agroforestry, School of Forest Resources and Conservation, University of Florida, Gainesville, FL, USA ...............................................................(p. 17)

5:10pm-5:30pm  Q&A between speakers and audience facilitated by Moderator
Monday, November 18, 2002 (continued)

4:00pm-5:30pm  **Concurrent Session IV - Theme 3: Farming Systems Knowledge and Information Systems**  [SALONS X, XI]

**MODERATOR: John Caldwell**, Japan International Center for Agricultural Sciences (JIRCAS), Ohwashi Tsukuba, Ibaragi, Japan

4:00pm-4:10pm  **Opening Remarks and Session Overview by Moderator**

4:10pm-4:30pm  **Family Dynamics and Household Welfare in Cañete, Peru - V. E. Cabrera and P. E. Hildebrand**, University of Florida, College of Natural Resources and Environment, Gainesville, FL, USA...........(p. 34)

4:30pm-4:50pm  **Growth Performance and Meat Production of Fattened Paddy Herded Ducks Fed Fish Silage Mixed Diets - Antonio J. Barroga**, Department of Agri-Management, College of Agriculture, Central Luzon State University, Munoz, Nueva Ecija, Philippines; **Prof. Rocelyn M. Barroga**, Department of Agri-Management, College of Agriculture, Central Luzon State University, Munoz, Nueva Ecija, Philippines; **Dr. Prof. Hisaya Tobioka and Dr. Rahjeev Pradhan**, Laboratory of Animal Nutrition, School of Agriculture, Kyushu Tokai University, Choyo-son, Aso-gun, Kumamoto, Japan ........................................(p. 33)

4:50pm-5:10pm  **From Measuring to Assessing of Families’ Living Standard. The Application of Fuzzy Alpha-Cuts and Monte Carlo Simulation: A Case from Brazil - M. Alves dos Reys and W. Doppler**, University of Hohenheim, Institute of Agricultural Economics and Social Sciences in the Tropics and Subtropics, Stuttgart, Germany ..............................(p. 36)

5:10pm-5:30pm  Q&A between speakers and audience facilitated by Moderator

5:30pm-7:30pm  **Networking Social** (in Poster and Tool Bazaar Display Area)

Tuesday, November 19, 2002

7:00am-6:00pm  Registration Office Open [WESTMINSTER ROOM]

7:00am-6:30pm  Posters and Tool Bazaar Exhibits on Display

7:00am-8:00am  Early Morning Refreshments (Served in Poster & Tool Bazaar Display Area)

8:00am-9:30am  **OPENING PLENARY SESSION**  [SALONS V, VI, VII]

**MODERATOR: Edwin Price**, Texas A & M University, International Agriculture Programs, College Station, TX, USA

8:00am-8:10am  Housekeeping Remarks by Organizing Committee

8:10am-9:00am  **PANEL SESSION: "New Low-External-Input Approach to Rice Farming: Double Output with Lower Costs and Increased Benefit to the Environment"**  - **Norman Uphoff, Director and Panel Chair**, Cornell International Institute for Food, Agriculture and Development, Cornell University, Ithaca, NY, USA; **Rena Perez**, Advisor, Ministry of Sugar, Havana, Cuba; and **Nimal Ranaweera**, Ministry of Agriculture and Livestock, Battaramulla, Sri Lanka
Tuesday, November 19, 2002 (continued)

9:00am-9:30am The Sustainable Agriculture and Rural Development: A Perspective from the South - Miguel Angel Nunez, Instituto para la producción e Investigación Agrícola Tropical (IPIAT), Venezuela; Thomas Forster, International Partners for Sustainable Agriculture in Washington, DC, USA

9:30am-9:45am Q&A between speakers and audience facilitated by Moderator

9:45am-10:30am Posters and Tool Bazaar Exhibits on Display (refreshments provided)

10:30am-12 noon FOUR CONCURRENT SESSIONS

10:30am-12 noon Concurrent Session I - Theme 1: Small Farm Diversification and Competitiveness [DOVER ROOM – LOBBY LEVEL]
Moderator: Cornelia Flora, Iowa State University – NCRCRD, Ames, IA, USA

10:30am-10:40am Opening Remarks and Overview by Moderator

10:40am-11:00am The Pastoral-Agricultural Conflicts in Zamfara State, Nigeria - Bello Farouk Umar, North Central Regional Center for Rural Development, Iowa State University, Ames, IA, USA..........................(p. 16)

11:00am-11:20am Incremental Diversification: The Results of a Crop Diversification for Low Resource Hillside Farmers in the Dominican Republic - Carlton Pomeroy, College of Natural Resources, University of Florida, Gainesville, FL, USA.................................................................(p. 13)

11:20am-11:40am From Rice to Cocoa through a Political Economy of Dishonesty, Sulawesi, Indonesia - François Ruf, CIRAD, Humid Tropics Program, Abidjan, Ivory Coast .................................................................(p. 13)

11:40am-12 noon Q&A between speakers and audience facilitated by Moderator

10:30am-12 noon Concurrent Session II - Theme 2: Engaging Stakeholders in Support of Small Farms [SALONS V, VI, VII]
Moderator: Mike Collinson, FARM-Africa, Reading, Oxfordshire, United Kingdom

10:30am-10:40am Opening Remarks and Session Overview by Moderator

10:40am-11:00am Facilitating Multi-Stakeholder Collaboration: Impact and Lessons Learned - Clive Lightfoot, Annemarie Groot, Ricardo Ramírez, Reg Noble and Isaac Bekalo, International Support Group (ISG); Francis Shao and Grace Muro, Tanzania Multi-Sector Learning Coalition (TMLC) .................................................................(p. 26)

11:00am-11:20am Small Farmer-Private Banking Sector Linkage: The Case of the Dry Zone of Myanmar - D.G. Kahan, Agricultural Support Systems Division, Food and Agriculture Organization, Via delle Terme di Caracalla, Rome, Italy..............................................................(p. 25)

11:20am-11:40am Working with Local Institutions to Support Sustainable Livelihoods - Robin Marsh, University of California, Center for Sustainable Resource Development, Berkeley, California, USA.........................(p. 27)

11:40am-12 noon Q&A between speakers and audience facilitated by Moderator
Tuesday, November 19, 2002 (continued)

10:30am-12 noon  Concurrent Session III - Theme 3: Farming Systems Knowledge and Information Systems [SALONS VIII, IX]
Moderator: Sarah Workman, University of Florida, Center for Subtropical Agroforestry, School of Forest Resources and Conservation, Gainesville, FL, USA

10:40am-11:00am  Incorporation of Farmer-Based Climate and Risk Indicators into Research Design and Farmer Typologies in Southern Mali for Decision Support - John S. Caldwell*, Abou Berthé+, Mamadou Doumbia+, Hiromitsu Kanno", Kiyoshi Ozawa*, Abdouramane Yorote+, Kaori Sasaki", Takeshi Sakurai*; * Japan International Research Center for Agricultural Sciences (JIRCAS), Tsukuba, Ibaragi, Japan; + Institut d’Economie Rurale (IER), Sotuba, Bamako, Mali; "National Agricultural Research Center for the Tohoku Region, Morioka, Iwate, Japan.................................................................(p. 34)

11:00am-11:20am  The Recent Extension Of Muskwari Sorghums in Northern Cameroon - B. Mathieu*, D. Gautier**, and E. Fotsing***; *CIRAD Tera - Centre de coopération Internationale en Recherche Agronomique pour le Développement, département Territoires, environnement et acteurs - Montpellier, France; **CIRAD Forêt, Montpellier, France; ***CEDC - Centre d'étude de l'Environnement et de Développement au Cameroun - Maroua, Cameroon..............................................(p. 40)

11:20am-12 noon  Q&A between speakers and audience facilitated by Moderator

10:30am-12 noon  Concurrent Session IV - Theme 3: Farming Systems Knowledge and Information Systems [SALONS X, XI]
Moderator: Guy Faure, CIRAD, Montpellier, France

10:30am-10:40am  Opening Remarks and Session Overview by Moderator

10:40am-11:00am  A Framework for Aligning Social and Technical Orientations to Farming Systems Research, Development and Extension - An Australasian Experience - A.E. Crawford¹, R.A. Nettle¹, D.P. Armstrong² and M.S. Paine¹; ¹Institute of Land and Food Resources, University of Melbourne, Parkville, Victoria, Australia; ²Department of Natural Resources and Environment, Kyabram, Victoria, Australia.................................................................(p. 35)

11:00am-11:20am  A Global Farming Systems Knowledge Base - John Dixon, Aidan Gulliver, David Gibbon and Malcolm Hall, Agricultural Support Systems Division, FAO, Rome, Italy..............................................(p. 35)
Tuesday, November 19, 2002 (continued)

11:20am-11:40am  
**Does the Sustainable Livelihoods Approach Need a More Explicit Systems Perspective? Systems Dynamics Modeling to Facilitate Entry Points to Smallholder Farming Systems - Habtemariam Kassa**¹ and David Gibbon²: ¹Department of Rural Development Studies, Swedish University of Agricultural Sciences, Uppsala, Sweden. Currently at Cornell University, Ithaca, New York. ²*Rural Livelihood Systems*, Lower Barn, Cheney Longville, Craven Arms, Shropshire, United Kingdom.............................................(p. 38)

11:40am-12 noon  
Q&A between speakers and audience facilitated by Moderator

12 noon-1:30pm  
Lunch on Own

1:30pm-3:00pm  
**PLENARY SESSION** [Salons V, VI, VII]  
**MODERATOR: John Dixon**, Food and Agriculture Organization (FAO), Agricultural Support Systems Division, Rome, Italy

1:30pm-2:30pm  
**PANEL SESSION:**
Farming Systems for Rural Development Strategy  
*Chaired by: John Dixon*, Agricultural Support Systems Division, FAO, Rome, Italy  
**Panel Members:** Asia: Jagadish Timsina; Africa: Susan Minae; East Europe and Central Asia: Alex Csizinszky

2:30pm-3:00pm  
Q&A between speakers and audience facilitated by Moderator

3:00pm-4:00pm  
**POSTERS AND TOOL BAZAAR EXHIBITS ON DISPLAY** (refreshments provided)

4:00pm-5:30pm  
**FOUR CONCURRENT SESSIONS**

4:00pm-5:30pm  
**Concurrent Session I - Theme 1: Small Farm Diversification and Competitiveness** [Dover Room – Lobby Level]  
**MODERATOR: Francois Rüf**, CIRAD, Cote d’Ivoire, France

4:00pm-4:10pm  
Opening Remarks and Session Overview by Moderator

4:10pm-4:30pm  
Modeling Potential Adoption of Medicinal Plant Cultivation in Paraguay Using Ethnographic Linear Programming - *Norman Breuer*, University of Florida, College of Natural Resources and the Environment, Gainesville, FL, USA............................................(p. 7)

4:30pm-4:50pm  
Potential Adoption of Improved Fallows to Improve Income and Food Security of Diverse Smallholder Farmers in Mangwende CA, Zimbabwe - *M. Mudhara* and *P. E. Hildebrand*, Food and Resource Economics, University of Florida, Institute of Food and Agricultural Sciences, Gainesville, Florida, USA..............................................(p. 10)

4:50pm-5:10pm  
The Impact of Poor Health on Agroforestry Adoption and Household Food Security in Central Malawi - *P. H. Thangata*, *P. E. Hildebrand*² and *G. Hyden*³; ¹Interdisciplinary Ecology, CNRE, Univ. of Florida, Gainesville, FL, USA; ²Dept. of Food and Resource Economics, Univ. of Florida, Gainesville, FL, USA; ³Department of Political Science, Univ. of Florida, Gainesville, FL, USA ............(p. 14)

5:10pm-5:30pm  
Q&A between speakers and audience facilitated by Moderator
Tuesday, November 19, 2002 (continued)

4:00pm-5:30pm  **Concurrent Session II-Theme 2: Engaging Stakeholders in Support of Small Farms** [SALONS VIII, IX]  
**MODERATOR: Robin Marsh**, University of California, Center for Sustainable Resource Development, College of Natural Resources, Berkeley, CA, USA

4:00pm-4:10pm  **Opening Remarks and Session Overview by Moderator**

4:10pm-4:30pm  The “Negotiation Platform” Method’s Limits for Decentralised Natural Resource Management: Participatory Municipal Planning in the Brazilian Amazon - **Christian Castellanet***, **Iliana Salgado**; and **Carla Rocha**; *Research and Technological Exchange Group (GRET), Paris, France; ** LAET (Laboratório Agro-ecológico da Transamazônica), Altamira, Pará, Brasil ...........................................(p. 20)

4:30pm-4:50pm  Creating a Marketing Network for Limited Resource Farmers - **Kathleen Earl Colverson**, Heifer International, Gainesville, Florida, USA..........................................................................................................

4:50pm-5:10pm  *Ojalá que llueve algo en el campo: Cultural Influences of Development in the Dominican Republic - **Heather McIlvaine-Newsad**, Western Illinois University, Department of Sociology & Anthropology, College of Arts and Sciences, Macomb, IL, USA...(p. 26)

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8:45am-9:15am  The Historical Perspective of Farming Systems - David Norman, Professor, Agricultural Economics, Kansas State University, Manhattan, KS, USA

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T2 “Heifer International’s Development Model and Work in the United States” — Kathleen Colverson, Heifer International, Gainesville, FL, USA

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T4 Training Tools for Ecologically-Based Participatory Implementation of IPM and Coffee Agroforestry in Nicaragua and Central America — Jeremy Haggar, CATIE MIP/AF, Miami, FL, USA ...........................................................................................(p. 143)

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INVITED SPEAKER
ABSTRACTS
The Farming Systems Approach: A Historical Perspective

D. W. Norman
Professor, Department of Agricultural Economics, Kansas State University

Prior to the mid-1960's, active research collaboration between technical agricultural scientists (i.e., mainly working on experiment stations), agricultural economists (i.e., mostly in planning units) and anthropologists/rural sociologists (i.e., generally in academia), was limited. By the mid-1960s, the Green Revolution was beginning to have a major impact on crop production in parts of Asia and Latin America through the introduction of fertilizer-responsive, high-yielding varieties of rice, wheat, and maize in favorable and relatively homogeneous production environments where there was assured soil moisture, good soils, ready access to cheap fertilizer, and relatively efficient output markets. However such conditions did not exist in most of Sub-Saharan Africa and in certain parts of Latin America and Asia, and as a result, these areas were bypassed.

The reductionist approach failed in terms of developing technologies for resource-poor farmers in less favorable heterogeneous production environments or agricultural areas. This led to the incorporation of a systems perspective in the identification, development, and evaluation of relevant improved technologies. Hence in the mid to late 1970s, the farming systems research (FSR) approach evolved, a basic principle of which was the need to create new types of partnerships between farmers and technical and social scientists.

FSR thus became very popular with donor agencies, to the extent that, by the mid 1980s, about 250 medium- and long-term externally funded (i.e., in addition to those domestically funded) projects worldwide were implementing FSR-type activities. Between 1978 and 1988, USAID alone had funded 76 bilateral, regional, and centrally funded projects containing a farming systems orientation. Forty-five of these were in Africa. Most of these projects supported the establishment of separate FSR units, which often were poorly integrated into, or poorly linked to, mainstream technology development activities. Although it is probably true to conclude that few of these projects succeeded in producing new technologies that were widely adopted, the approach of looking at farmers’ constraints and needs for technical change from within was eventually mainstreamed into most national and international agricultural research programs by the late 1980s. Therefore although donor support for supporting explicit FSR activities dwindled towards the end of the 1980s, most national agricultural research systems (NARS) had adopted major components of the FSR philosophy and approach, and the spirit of the FSR approach lived on.

Since then there has been considerable evolution in the methodologies employed (e.g., new farmer participatory research (FPR) techniques, gender analysis, environmental impact analysis, and statistical techniques adapted to on-farm research). Also participation has been broadened to include a wider set of agricultural stakeholders, including extension, development, and sometimes even planning/policy staff. Perhaps even more significant has been incorporating the underlying principles of the farming systems approach into the priorities of donors and nationally based agricultural programs. These include increasing emphasis on participatory approaches and empowerment of farmers and their families and a new focus on ecological sustainability and sustainable livelihoods. Although appropriate technologies still are viewed as important catalysts for improving farmers’ welfare, the criteria for relevancy have become more clearly defined and specific.

In this paper I summarise how the farming systems approach that has evolved over the last 30 years with a very brief indication of the factors that contributed to bringing about those changes.
A key dimension of that evolution has been the way the scope or inclusiveness of a systems perspective has been expanded systematically over time. “The way in which the systems perspective is implemented, in particular the scope or inclusiveness of the systems analysis, depends on how, for any given problem, researchers define the ratio of variables to parameters; or put another way, which factors are considered endogenously determined and thus subject to analysis and modification, and which are taken as exogenously determined constants. Because of the analytical difficulties of simultaneously handling large numbers of variables, most of the early FSR programs took only incremental steps away from traditional reductionist approaches by limiting the number of variables they studied and by regarding the other factors that influence the farming system as parameters or constants. As analytical methods have grown more sophisticated, and particularly as farmers have become active partners in the analysis, the ratio of variables to parameters has increased, and the analytical domain has expanded considerably” [Norman and Matlon, 2000].

This evolutionary process is operationally summarized in four phases in Figure 1 [Norman and Lightfoot; Norman and Matlon, 2000]. The important point to bear in mind is that moving progressively through the four phases means dealing with a progressively higher ratio of variables to parameters. This has become feasible through the development of analytical methods that can handle increasingly complex situations and have become particularly significant in the last decade. Formal modeling techniques have often proved to be of limited value in addressing such situations simply because of the variation in, and the complexity of, potentially important relationships and the degree of understanding that is required initially to develop realistic models. In essence what has occurred is the ability to use less formal modeling approaches through farmer-participatory techniques that empower farmers to drive the modeling process and use farmers' minds as computers. This empowerment has been greatly helped as a result of the evolution of techniques for improving/systematizing collegial, interactive, and meaningful dialogue between farmers and other developmental actors.

Before looking at the four phases I briefly look at the role of farm management that was the precursor to this evolutionary process. I do this because many involved in the early days of the farming systems approach were agricultural economists trained in the neoclassical tradition. Unfortunately in those days many of us had little appreciation of what other social scientists (i.e., sociologists and anthropologists) had to offer. Fortunately our early experiences in the field helped educate us in this regard!
THEME 1
SMALL FARM DIVERSIFICATION AND COMPETITIVENESS
SPEAKER ABSTRACTS

Listed in alphabetical order by presenting author.
Presenting authors appear in **bold.**
Public Policy, Markets and Social Learning in Chile’s Small Scale Agriculture

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An analysis of the small farming development strategy followed in Chile since the early 1990’s, shows that in the context of increasingly liberalized economies open to international competition, the success and sustainability of market-oriented small farmers’ organizations depends on the interaction between market characteristics and signals, reformist public policies, and the approaches used to facilitate social learning and adaptive management. Market-oriented collective action by small farmers has a role to play only when it is directed at overcoming high transaction costs which impose insurmountable constraints to individual farmers acting alone, but fails when small farmers are simply attempting to improve their position in the marketing of undifferentiated commodities in the spot markets. When market conditions are favorable to collective action, social learning and adaptive management are essential to build specific social assets which are required to achieve economic efficiency and competitiveness. Such social assets include multi-stakeholder networks, embeddedness of market-oriented farmers’ organizations in rural communities, and effective systems of rules that structure decision-making within farmers’ organizations.

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Modeling Potential Adoption of Medicinal Plant Cultivation in Paraguay Using Ethnographic Linear Programming

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Limited-resource farmers in Eastern Paraguay moved from traditional farming systems toward cotton solecropping during the 1970s and 1980s. Toward the end of this period, cotton prices crashed and farmers were left with few sources of income. Cultivation and marketing of medicinal plants may be a source of supplementary income for certain households. Markets exist, as medicinal plant consumption is widespread. Surveys and interviews were conducted during fieldwork at two sites in 1999. Ethnographic linear program models were constructed to describe and analyze the farming systems. The principal conclusion reached through testing several scenarios was that the recommendation domain for medicinal plant cultivation projects is households with abundant female labor located within an eight-hour roundtrip from the main market.

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Goat Production by Landless and Small Scale Farmers in North Indian Plains

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Small ruminants, especially goats, contribute to the livelihoods of millions of rural poor in most of the developing countries of Asia and Africa. This is where 95% of the world’s goat population is concentrated and also the majority of world’s poor live. Goat production has witnessed excellent growth over the years despite a negative campaign against it for its perceived adverse impact on vegetation, forest and grazing lands. Small farmers and landless agricultural laborers rely increasingly on goats for cash. This micro-level study done in six selected villages of the north Indian state of Uttar Pradesh has confirms the fact that the goat is one of the most suitable livestock species for landless and small farmers, who, for a variety of reasons, cannot maintain large ruminants like cow and buffalo. Small ruminants are well-integrated into the farming systems of the small and marginal farmers of India who find in goats a vast potential for their socio-economic betterment. Women in particular were found to be more inclined towards goats while men were more focused on large animals. Goats offer a strong opportunity to development agencies for suitable interventions including micro credit, extension, technical and marketing support especially to women, landless and small farmers.

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Farming Systems Based Strategies for Improved Rural Livelihoods in Eastern Europe and Central Asia

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John Dixon
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In Eastern Europe and Central Asia, major policy and institutional changes are transforming both small and large farms, and this process of change is expected to continue for the foreseeable future. Small farmers in particular, exposed to the added pressures of market liberalisation and globalisation, have new opportunities but also face immense threats. This paper presents the results of a farming systems approach to the analysis of agricultural trends, emerging constraints and strategic priorities for agricultural and rural development in Eastern Europe and Central Asia. Both the approach and the findings for the Region are unique. The analysis highlights the importance of intensification and diversification (especially for family farms) in development strategies for raising farm incomes, as well as competitiveness in order to tap export markets.

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Gender Roles in Ensuring Food Security

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Maize is a major staple food crop in many parts of Ghana and necessary for ensuring food security in most rural households, especially in the southern part. Women contribute largely to household food security in Ghana and produce about 80 percent of the food consumed. This study examines gender roles in ensuring household food security with field sites in 3 districts of the Central Region of Ghana. Women farmers are found to allocate a greater proportion of their farm produce to household consumption than male farmers. The survey results were used to construct a linear programming model to determine the optimal farm plan, the relative profitability of maize and farmer behaviour when given the option to produce or purchase food for household consumption. The LP results show that maize production is second highest in revenue generation after vegetables. A simulation analysis including changes in land allocation and credit availability shows that consumption of staple crops is taken from own production. One way of increasing household food security is to take measures to intensify women’s maize production.

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What Is the Future of Management Advice for Family Farms in West Africa?

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The evolution of management advice for family farms in West Africa. The orientations of farm-holding in the context of a more open economy create a demand by farmers for advice that goes beyond technical aspects. The gradual withdrawal of states from extension services also encourages the rethinking of support facilities for producers. As a response, several experiments on advisory services for family farms are underway in West Africa. Beyond the variety of objectives and intervention procedures that are analysed in this paper, common features shared by many of them emerge and contribute to strengthening producers’ capacity for reflection and action. These procedures involve specific intervention methods and tools aimed at formalising the management process and enhancing learning dynamics. In this respect, they are aimed at positioning farmers in the centre of the facility to formulate his needs, define his objectives, take decisions and appraise his results. Some experiments aimed at strengthening farmers' governance of the facilities at both local and global levels are giving promising results, with strong farmer dynamics and a significant improvement of farm performance. However, these procedures can only lead to change if agricultural policies are stimulating for family farms, in particular in terms of agricultural extension, the financing of advisory services and access to loans.

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Potential Adoption of Improved Fallows to Improve Income and Food Security of Diverse Smallholder Farmers in Mangwende CA, Zimbabwe

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Low maize yields are a major constraint for raising food security and income levels for small-scale farmers in Zimbabwe. The ICRAF-Zimbabwe team and the Department of Research and Specialist Services have tested the use of improved fallows to raise maize yields and reduce fertilizer requirements. Awareness of the potential adoption of such technologies would help design appropriate extension approaches and policy interventions to support the small-scale farmers. This paper uses linear programming models to assess the potential adoption of Sesbania sesban and pigeon peas (Cajanus cajan) 1-, 2- and 3-year improved fallows by diverse farmers in Mangwende Communal Area of Zimbabwe. Household data were collected through questionnaires and focus groups. The model was validated through discussions and statistical comparisons of model and survey data. Results indicate that there is potential of Sesbania fallows being adopted. Pigeon pea fallows would be adopted when a price incentive was offered on their seed or when Sesbania sesban was not an option. Policies to support pigeon pea improved fallows are suggested.

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Rural Agro-enterprises, Value Adding and Poverty Reduction: A Territorial Orientation for Rural Business Development (RBD)

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Rural poverty continues to place high on the global agenda despite the productivity gains of the Green Revolution. To respond to this and other problems and opportunities affecting rural smallholders in developing countries, the Rural Agro-enterprise Development Project at CIAT has developed and tested a ‘Territorial Approach to Rural Business Development’ in three reference sites in Latin America. The territorial approach consists of a two phases: Planning and Implementation. The Planning phase includes (a) formation of a local work team and a common vision on RBD; (b) identification and evaluation of market opportunities available to the region; (c) participatory marketing chain analysis and design of an action plan; and (d) design of a proposal for strengthening the local RBD support system. Three case studies are mentioned, as follows: black pepper in the Peruvian Amazon, cut flowers in south-western Colombia and coffee in Honduras, in which smallholders applied the CIAT methodology and were able to negotiate better prices for their products. The implementation of CIAT’s territorial orientation to RBD has impacted institutional and small farmer attitudes, has improved awareness of the importance of a business and marketing orientation to rural development, and has increased small farmer incomes.

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Diversification of Perennial Crops to Offset Market Uncertainties: the Case of Traditional Rubber Farming Systems in West-Kalimantan

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In less than one century Dayak farmers in Indonesia have shifted from traditional hunting and gathering of forest products to slash-and-burn agriculture (with progressive integration of rubber in agroforestry systems called “jungle rubber”) to rubber monoculture in the 1980’s (based on the use of clonal planting material), and finally to oil palm in the 1990’s. Due to different constraints (*Imperata cylindrica*, a weed, and land scarcity), the farming systems used by Javanese transmigrants in official transmigration programs underwent other changes. Local farmers have progressively integrated export crops and are now linked with international markets. The recent economic crisis in Indonesia (1997-1999) increased the need for development and technical change. A significant degree of coherence was maintained between technical systems and social systems.

The example of the Sintang and Sanggau areas in the province of West Kalimantan (Borneo) allows characterization of the different farming systems, identification of a situational framework and of pathways for future change. The different strategies are considered here from the perspective of a regional approach to development. Two major challenges characterize the rubber sector: the transformation of existing jungle rubber (2.5 million ha, 85 % of smallholders’ plantations) into clonal plantations (either in agroforestry or monoculture) and the partial substitution, or complementary activity based on the cultivation of oil palm.

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This article analyses and summarizes the sustainable development experience based on agroecological systems developed by Agreco (a NGO), the Ecological Farmers Association in the Hillsides of Santa Catarina State in south Brazil. The experience includes not only the organization, management and control of bio-physical systems (called “production systems” or “hard-systems”), but also aims to understand and develop interactions which characterize more abstract and complex systems (“soft-systems”), particularly the human relations and the sustainable development of the territory in which Agreco operates. It started with the initiative of people who were born in that territory but who, like most Brazilian people, migrated to urban cities. These “new urban people” did not lose their interest in and connections with the territory, nor their relations with their relatives and friends who remained in rural regions. Instead, some of them took advantage of a development opportunity that started with the commercialization of organic products produced in that territory. As a result, Agreco was created, involving initially an organized net of several small agro-industries which were constructed with the aim to process and add value to the diverse primary organic production as well as to facilitate commercialization. Other development actions and projects complemented the Association initiative. A rural tourism project was initiated in order to consolidate the relations between rural and urban people and create new revenue perspectives. A credit cooperative was also created as an alternative to the official financial system which small family farmers do not usually have access to. In addition to that, two important Forums were organized: The Solidarity Economy Forum, approximating urban consumers and rural producers, and The Hillsides Development Forum, which involves diverse stakeholders interested in a collective action in order to promote sustainable development in the region. In that territory more than 200 families are now associated with Agreco and interact with several other families (from urban and rural regions) with the aim to construct a sustainable life project.
Incremental Diversification: The Results of a Crop Diversification for Low Resource Hillside Farmers in the Dominican Republic

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Agriculture in the Dominican Republic has changed dramatically during the later part of the last century. Agriculture employed some 60% of the population in 1960 and was reduced to 18% in the year 2000 (Banco Central, 2000). Further, structural underemployment affects a quarter of the labor force, especially those in the agricultural and tourism sectors of the economy (Aleman and Santana, 1996). Communities that depend on agriculture are subject to volatility associated with market fluctuations. In the case of the Dominican Republic the change in agricultural has been associated with the widespread problems of poverty, unemployment and income inequality (Aleman and Santana, 1996) resulting in food insecurity, poverty, and environmental degradation (Ferguson, 1993). The country’s rapid population growth, massive migration to urban areas, and increasing numbers of people living in poverty have resulted in serious deficiencies in the coverage and quality of water and sanitation services (Aleman and Santana, 1996). The question that must be asked, is agricultural development a viable conservation and development strategy for rural communities in the Dominican Republic?

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From Rice to Cocoa Through a Political Economy of Dishonesty, Sulawesi, Indonesia

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Sulawesi has been the theatre of a spectacular cocoa boom, which started from scratch in the late 1970s, with production exceeding the 200,000-tonne threshold in the mid-1990s. Sulawesi also used to be a rice granary for Indonesia. Although it still exports rice to other provinces, Sulawesi turned its dynamism towards cocoa. They mostly are Bugis farmers. Then Balinese and Javanese transmigrants started to follow. From that historical development in Sulawesi, the objective is to analyze at the microeconomic level, how Indonesia switched back from rice self-sufficiency to structural dependency on imports since 1994. Bugis used their experience and capital built on rice to start cocoa pioneer lives that proved to be highly successful. They also benefited of involuntary helpful policies such as fertilizer subsidies that were conceived for rice self-sufficiency, not for cocoa. Within official projects, Balinese and Javanese transmigrants were often obliged not to plant tree crops, or at least not beyond the 0.25ha backyard. How did these policies involuntarily trigger new impetus to cocoa and eventually hamper the development of paddy cultivation in the 1990s? The Sulawesi cocoa story may be a showcase for understanding why the gap between the national demand and supply of rice increased since the mid-1990s.

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**Integrated Farming Systems for Smallholders in India – Models and Issues for Semi-arid Tropical Conditions**

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The results of more than 15 years of investigation on the development of suitable farming systems for semi-arid tropical situations in Haryana, India, indicate that mixed farming systems of crops and animals are more efficient and remunerative, and generate more employment, than arable farming systems under small land holdings for irrigated and dry land conditions.

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**The Impact of Poor Health on Agroforestry Adoption and Household Food Security in Central Malawi**

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We report of a research conducted to assess the impact of poor health using HIV/AIDS as an example on agroforestry adoption and household food security. Our results show that the impact of diseases on the overall food production depends on the gender of the sick person. The sickness and death of a male head of household affect the total labor force available to the farm and hence the food security of the household. In the case where a woman is affected, the effect on the availability of male labor is minimal; since she is either taken to her home or a female relative looks after her at the husband’s home. We conclude that women are more food insecure than men after the death of their spouse.

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Market Oriented Smallholder Dairy Farming As an Option for Improving the Livelihoods of Small and Marginal Farmers in the Hindu Kush - Himalaya

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A rapid appraisal study carried out by ICIMOD and ILRI in collaboration with National Partner Institutions (NPIs) in four regions in the Hindu Kush Himalaya has demonstrated the fact that promotion of market oriented smallholder dairy farming in the hills/mountains can contribute positively to improving the livelihoods of small and marginal farmers, while conserving the fragile ecosystem. In the region, smallholder dairy farming is not a specialized enterprise, rather it is an integral part of mixed crops-livestock farming systems where a farm household owns one to two dairy animals along with other large and small animals on a small land holding ranging from 0.25 hectare to 1.00 hectare. Use of improved dairy animals and improved feed technologies have enabled smallholders to increase income and employment and improve family welfare including those of women and children. Based on the successful experience in some pocket areas it should be possible to replicate such model and experience in other degraded uplands of the hills/mountains for improving the livelihoods of small and poor farmers.

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The Pastoral-Agricultural Conflicts in Zamfara State, Nigeria

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The study was conducted to achieve the following specific objectives: (i) to identify factors that augment conflicts between pastoralists and farmers in the State (ii) to examine existing centralised and informal channels for managing key rural resources and resolution of conflicts in the State with a view to exposing their strengths and weaknesses; and (iii) to suggest appropriate informal mechanisms for management of common resources and resolution of intra-pastoral and pastoral-agricultural conflicts. Respondents for the study included farmers, pastoralists, and officials of selected pastoralists and farmers associations, law enforcement agents, staff of organisations concerned with management of common property resources and local leaders. Cluster sampling was used in the selection of the farmers and pastoralists. A total of 235 people (160 farmers and 75 pastoralists) were interviewed. In addition, 21 staff of selected organisations and local leaders were interviewed. Participatory rural appraisal (PRA) and questionnaire administration were employed to generate data for the study. Two sets of questionnaires were administered to farmers and pastoralists respectively. A third set of questionnaire was administered to local leaders and officials of sampled agencies and associations. Frequency distribution and ranking were employed in data analysis. The results show that the frequency of occurrence of conflicts between farmers and herders in the study area is very high (90% of the farmers and 82.7% of the herders have witnessed the conflicts in different parts of the area). Major causes of the conflicts include crop damage by herders’ livestock, encroachment of cattle corridors and grazing lands, and blockage of water points by farmers. Traditional rulers or farmers neighbouring crop fields where the disputes occur mostly settle disputes between farmers and herders in the area. Both farmers and herders have preference for traditional rulers’ arbitration over that of formal authorities like the police and courts of law. Devolution of natural resource management to local communities is strongly recommended for addressing the incessant crisis between farmers and herders.

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Rural Livelihoods and Agroforestry Practices in the Missouri Flood Plains

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Agroforestry practices, new to many small farms in the United States, may offer many economic and environmental benefits. Small farmers in Northeast and Southeast Missouri were interviewed to understand the relationship between their knowledge and interest in agroforestry practices and their livelihood strategies. Different income diversification strategies were found. The Southeast, with richer cropland, has a more diversified crop portfolio. In the Northeast, crop livestock production systems and part-time farming prevail, reflecting a rural lifestyle option where some household members engage in off-farm activities. Given differences in production systems and income from agriculture, the study finds that those interviewed have some knowledge and interest in agroforestry practices. Windbreaks and riparian buffers ranked highest in knowledge and interest in the Southeast, where household strategies focus on commercial crops and there is concern for the environment. Windbreaks and forest farming were first in the Northeast, where farm households are concerned about the environment, future generations, and new economic opportunities. This finding coincides with perceptions of the importance of trees to the environment, future generations, and economic benefits.

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Agroforestry and Farm Diversification in the Southeastern United States

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Farming systems in the southeastern United States are faced with increasing pressures of global markets and escalating levels of urbanization. Diversified and integrated production systems using agroforestry on small farms can help farmers remain competitive, endure land use and cultural transitions, as well as provide environmental amelioration and thus societal benefits. This document describes how agroforestry is being promoted through inter-institutional collaboration and extension activities in the southeastern U.S. to diversify and intensify farm system management. Surveys of land users and natural resource professionals in the states of Alabama, Florida, and Georgia indicate that while farmers are aware of the benefits of such integrated systems (e.g. shade, wildlife habitat, soil conservation), lack of familiarity with practices and lack of convincing demonstrations of the practices are the major constraints to adopting agroforestry in the region. Silvopasture is presented as an activity landowners in the southeast develop to maximize use of their knowledge, assets, and environmental setting as they adapt to policy, economic and social factors to sustain their livelihoods.

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Theme 2
Engaging Stakeholders in Support of Small Farms
Speaker Abstracts

Listed in alphabetical order by presenting author.
Presenting authors appear in bold.
The “Negotiation Platform” Method’s Limits for Decentralised Natural Resource Management: Participatory Municipal Planning in the Brazilian Amazon

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Iliana Salgado and Carla Rocha
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Natural resource management (NRM) is intimately linked to the dynamics of land occupation and resource appropriation by diverse stakeholders with divergent interests. This is especially true in the “agriculture frontier” zones that are characteristic of much of humid tropical forests. This article analyses two action-research experiments on participatory municipal planning of natural resource management in the Brazilian Amazon. The “multi-stakeholder platform” method was used with limited success in the first. In the second, priority was given to the empowerment of the weaker and more numerous stakeholders (the small farmers and traditional populations) with more encouraging results. Analysis of the two cases leads to the conclusion that the platform approach is not adapted to situations where the State is absent or weak.

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Creating a Marketing Network for Limited Resource Farmers

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Limited resource minority farmers contribute to agricultural production in the United States, but are often faced with more extensive obstacles than other small farmers. Many of these farmers have less education, and lack the resources to participate in alternative methods of production and marketing. They are frequently unable to access facilities that process livestock, thereby limiting their sales to traditional and often unprofitable markets.

This paper outlines a successful collaboration among a non-profit organization, government agency, a private cooperative and limited resource farmer groups to market agricultural products. Networking together, each partner provides resources or skills to create a marketing infrastructure that helps to minimize risks for limited resource farmers. The model has the potential for transferability to other locations.

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Facilitated Learning in Soil Fertility Management: Assessing Potentials of Low-External-Input Technologies in East African Farming Systems

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This paper describes the experiences and results of a study conducted in 4 districts of Kenya and Uganda during the period 1997-1999 in which researchers and relevant stakeholders were involved in: (1) participative diagnosis of soil fertility status and management practices, (2) identification, testing and evaluation of low-external-input technologies, (3) formulation of enabling policies and measures at district level. In all 4 research sites and studied farm management systems, the future agricultural productivity is threatened by soil nutrient depletion. The cause of depletion however, differs considerably between the sites. Low and erratic economic returns to agricultural production were observed with a considerable part of these returns based on nutrient mining. Low-External Input technologies (LEIA) alone offer limited opportunities to address the observed problems of soil nutrient depletion in the region. Site-specific combinations of external inputs and LEIA techniques appear to be the most appropriate strategy.

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Strategic Diagnosis in an Export Monoculture Area

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Banana production in the French West Indies is currently facing an economic, environmental and social crisis. Several factors are damaging the image of social advancement previously associated with banana production: fluctuations in the sales price of the fruit, the planned end of European subsidies, the considerable damage caused to the environment, and finally, the debt overload of producers. The new plan recently introduced by the French administration for the recognition of the multifunctionality of agriculture provides stakeholders in banana production areas with a unique opportunity to establish sustainable agriculture. However the influx of public funds to achieve this aim should not be standardised. This study presents a diagnosis that is strategic in the sense that it reveals how the various systems of activity in which agricultural activities are rooted can give rise to differentiated proposals for public support aimed at sustainable agriculture. As a consequence, the way in which research proceeds must also change, i.e. the links between laboratory and fieldwork, and the negotiation of research protocols with the stakeholders involved. These are the new ways of thinking that the research community will have to invent, pilot and adapt in itinere.

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An Evaluation of Participatory Action Research in the Transamazônica Region of Brazil

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In recent years, Participatory Action Research (PAR) has been tried as an alternative to the authoritarian approach for development projects and resource management. In this paper, we evaluate PAR based on five years of experience in the Transamazônica region of Brazil. The objective of the project was to improve management of both privately and communally owned resources by small farmers and traditional dwellers. We found that: although the process of reevaluating initial assumptions during the course of PAR is time-consuming and stressful, the resulting diagnoses provide a better understanding of the attitudes and actions of stakeholders toward management of natural resources; participatory research can be an effective tool to facilitate a discussion by a community on its future - however the process is not successful when the government represents a small but powerful minority; lack of transparency and dissimulation between groups can result in failure to achieve a common strategy. Notable achievements include establishment of a training program for young farmers; the concept of land-use planning has been popularized and adopted by farmers’ organizations. The main advantage of PAR is its ability to produce innovative methods of intervention and validated technical and organizational proposals adapted to local context and with a potential for large-scale adoption.

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Small Farmer-Private Banking Sector Linkage: 
The Case of the Dry Zone of Myanmar

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The purpose of this study is to document the experience of the FAO, Dry Zone Food Security project in Myanmar to facilitate linkages with private sector commercial banks and to draw lessons for replicability in other social and biophysical contexts. In this scheme Self Help Groups effectively transact with private sector banks within a risk prone, semi-arid and predominantly agriculture based setting. Over the short term the role of an intermediate facilitator body is critical in marrying the interests of both parties and creating policies and procedures for longer term sustainability of the linkage system. The intermediary body is responsible for group formation and development, the institutionalisation of self management procedures and practices, and the design and introduction of financial packages wherein savings mobilisation is encouraged and linked to credit provision. Although the performance of the scheme has been good, there are concerns of longer-term sustainability particularly after withdrawal of the intermediary body. This requires a commitment of both parties: the farmers to maintain a fully functioning apex organisation and the bank to operate policies and procedures for dealing with rural lending. Clearly scaling-up cannot be achieved without a solid farmer based structure supported by a strong commitment from the lending institution to continue operations in the future.

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Facilitating Multi-Stakeholder Collaboration: Impact and Lessons Learned

Clive Lightfoot, Annemarie Groot, Ricardo Ramírez, Reg Noble, Isaac Bekalo, Francis Shao and Grace Muro

There are a growing number of accounts of multi-stakeholder participatory processes aimed at improving the management of natural resources and community livelihoods. However, little is known about the impacts of these efforts in terms of poverty alleviation, gender equity, empowerment, good governance and democracy. In this paper we describe a case where, after a five-day capacity building workshop in multi-stakeholder collaborative learning, participants went back to their village in Tanzania and facilitated the emergence of multi-stakeholder collaboration in natural resources management and infrastructure development. Using the transcript of an interview with one of the villagers, we review the impact of multi-stakeholder collaborative learning in terms of: enhancing democracy (open public workshops, collective action), citizen empowerment (self realization and organization, self confidence to demand, outward looking), good governance (open collective decisions, countervailing power, conflict resolution), poverty alleviation (income and savings opportunities, natural resource rehabilitation for common good) and gender equity (representation, reduce drudgery, target women’s concerns). We draw from this experience lessons in terms the enabling environment and enabling processes vital to the success of collaborative learning. Among the challenges for the future, in conclusion, we highlight up-scaling, and the potential of the media and information and communication technology to enhance the learning process.

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Ojalá que llueve algo en el campo: Cultural Influences of Development in the Dominican Republic

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The globalization of agriculture continues to have a profound influence on ecosystems and subsistence based livelihoods throughout Latin America. In addition to contributing to the decline of the last remaining stands of forest in the Dominican Republic, changing agricultural practices also affect traditional gender roles and household nutritional status. Drawing on the experiences, observations, and data collected by the researcher between 1991 and 1995 in a rural Dominican community, this paper explores the links between gender, food security, the environment, and community based reforestation projects. This paper suggests that participatory approaches and gender analysis are necessary, but alone do not assure the success of small-scale forestry projects given the current political ecology of the Dominican Republic.

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Working with Local Institutions to Support Sustainable Livelihoods

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The paper summarizes the findings and policy implications of research conducted on local institution - rural household livelihood linkages in villages in India, Mozambique and Mexico. A complex array of formal and informal local institutions are identified, many often “invisible” to outsiders, as well as the socio-economic, cultural and governance roles they play in rural society. There is not a clear relationship between “belonging” to local institutions and socio-economic mobility since some institutions exclude the poor, while many serve as informal safety nets and to preserve the social order, rather than as stepping stones out of poverty. Local institutions may often be more inclusive, effective and resilient than formal outside institutions. The paper concludes that it is, therefore, important to work collaboratively with these institutions, from within, when mutual goals of poverty alleviation and community development are established.

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The Challenges to Sustainable Beef Production in Botswana: Implications on Rangeland Management

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The precursor to Botswana's present-day approach to pastoral issues took form in the colonial period. The colonial period witnessed the fundamental transformation and evolution of social relations, and the institution of market and infrastructure conditions, which wrought the logic for present day policy toward livestock development (Lawry, 1983). Up till then, livestock practices were normally organized and operated under a diversity of social and ecological conditions. The objective of this paper is to outline and analyze the historical development of the cattle sector before integration into the world trade system to present. Much of the data used here is from secondary sources. This paper is guided by the hypothesis that, due to the integration of the beef sector into the world trade system, the character of the interaction between cattle keeping and ecological conditions changed considerably and has had consequent implications in the construction of the livestock policy.

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Testing Scenarios on the Viability of Smallholding Irrigation Schemes in South Africa: A Participatory and Information-Based Approach

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Government smallholder irrigation schemes were developed in former homeland areas of South Africa during the apartheid era. Although experiencing serious financial, technical, and institutional problems, most of them are now earmarked for rehabilitation and transfer to water users’ associations. Transfer operators find it difficult to evaluate the potential for viability, then to organise the transfer accordingly. The paper refers to a multi-disciplinary, action-research approach that has been proposed to address such issues. It has been implemented in a case study scheme of the Northern Province in 2001. A simulation tool has been developed. Its main features involves simulations and scenario-testing on the costs incurred by scheme management, the possible contributions by farmers to cover these costs, the possible charging system to be set up, and finally the impact of certain measures or decisions, or certain farmers’ strategies on the financial viability of the scheme. The paper mainly presents and discusses some principles of the approach, especially the need for a sustained and multi-disciplinary partnership during scenario development and discussion, including farmers and transfer operators. Such an approach shows huge potential for information and decision-making support towards transfer operators, for training, and for farmers’ participation.

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Environmental Hazard In Cotton Farming - Indian Perspective.

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In recent years, environmental hazard has become a global phenomenon, mainly due to indiscriminate use of fertilizers and plant protection chemicals. The present study was conducted with the main objective of quantifying the awareness of environmental hazard among cotton farmers and agricultural assistants, besides investigating the extent of adoption of eco-friendly technology by farmers to minimize the environmental hazard. The study was conducted in one of the major cotton growing tracts in south India by selecting 120 farmers and 68 agricultural assistants. The variable environmental hazard and adoption of eco-friendly technology were measured using standardized scales / indices.

The findings indicated that nearly two-thirds of both the categories of respondents (cotton farmers and agricultural assistants) belonged to medium awareness category. However, the agricultural assistants scored significantly higher awareness index than the farmers. Both categories had high awareness of "deterioration of soil health and eco-system " and less awareness of "global warming and climatic change". The educational level of farmers exerted a significant influence on the awareness of farmers, while it was job involvement in the case of agricultural assistants. The adoption of eco-friendly technologies varied from 15 to 65 percent, with lowest adoption of bio-fertilizers and biological pest control measures.

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THREE 3
FARMING SYSTEMS KNOWLEDGE AND INFORMATION SYSTEMS
SPEAKER ABSTRACTS

Listed in alphabetical order by presenting author.
Presenting authors appear in **bold**.
Small Farms, Women and Traditional Knowledge-Experiences from Kumaon Hills

Rakesh Agrawal

Traditional knowledge system has been a key to the survival of the hill society, be it in cropping, forestry or health. It has not only ensured continuous livelihood of farm households but also ecological sustainability. Farming in the hills is highly interdependent with forestry and animal husbandry, and women have been the backbone to this totally integrated system. They have a high workload but have successfully preserved transformed and carried traditional agricultural knowledge from generation to generation. However, over the last few decades, this entire knowledge system has been threatened due to various reasons. Any way, women’s role as the preservers and carriers of this knowledge has not been adequately recognised so far. The paper is the presentation of a study carried out in 10 villages of a micro watershed in the hills in Uttarakhand- a north India state. It studies women’s role as the carriers and preservers of traditional agricultural knowledge, including the links to forestry and animal husbandry and agents of change.

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Growth Performance and Meat Production of Fattened Paddy Herded Ducks Fed Fish Silage Mixed Diets

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The growth performance and carcass characteristics of fattened paddy herded ducks was investigated. The fattened ducks were fed on agro by-products of the food industries namely; fish silage, tofu cake and sweet potato and comprised up to 50 % of the diet. The dry matter intake and daily gain of Cherry Valley (CV) tended to be higher than the Aigamo (AG) during the brooding period. The DG of CV was higher than AG during a paddy grazing period of 56 days and appeared to be superior in paddy herding condition. Both breeds fattened with diets containing agro by-products showed comparable growth performance to the reference diet. The dressing percentage, meat yield and carcass meat of ducks fed agro by-products tended to be better than the reference diet while carcass fat + skin was largely reduced upon supplementation of DL-methionine. The CP and moisture content of the breast meat of CV fed agro by-products of fish silage and tofu cake was significantly higher than the reference diet. There was a tendency for amino acids to increase in both the thigh and breast meat of both breeds fed on fish silage based diets. This proved that paddy herded ducks can adapt well to fish silage mixed diets without adverse effects on their growth performance and carcass quality.

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Family Dynamics and Household Welfare in Cañete, Peru

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Family composition is believed to be a major component in the capability of small farm households to achieve sustainable development. In order to understand and test the effect of household composition on overall farm household well being, a process simulation model was developed. The model accounts dynamically for the birth, age and death of the members and for the crops, livestock, and financial activities. Prices and yields were stochastic variables. Ten typical Cañete households were simulated. Results in 10, 20 and 40-year runs showed that the family composition has a great influence on economic stress. Smaller families were always better off than large families. Only the 20-year run is illustrated.

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Incorporation of Farmer-Based Climate and Risk Indicators into Research Design and Farmer Typologies in Southern Mali for Decision Support

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To target research aimed at development of a decision aid system for climatic risk management, a reconnaissance was conducted of nine villages, followed by focus group assessment and household surveys in two villages. One village each in the semi-arid 800 mm rainfall (Niessoumana) and the semi-humid 1200 mm rainfall (Diou) zones was selected by team ranking of 10 criteria. The extension typology based on animal traction was used for focus groups: fully-equipped (A), sub-equipped (B), and non-equipped/manual (C/D). A second typology was generated from key informant (farmer group leaders) classification of farmers as more risk robust (A1, B1) or more risk vulnerable (A2, B2). A third typology was based on farm household’s self-assessment of risk robustness indicators from the focus groups: food self-sufficiency, cattle herd size, and exterior remittances. The majority of farmers were sub-equipped (Diou, 75%; Niessoumana, 67%). Key informants classified more sub-equipped farmers as less risk robust (B2) (Diou, 70%; Niessoumana, 68%). Self-assessment revealed greater risk robustness in the semi-humid than the semi-arid zone. Only 4% of A farmers and no B farmers had food deficits in Diou, while 37% of A and 63% of B farmers had food deficits of 2-3 months in Niessoumana.

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A Framework for Aligning Social and Technical Orientations to Farming Systems Research, Development and Extension - An Australasian Experience

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Recognition of the complexity of dairy production in Australia has led industry to a farming systems approach for dairy research, development and extension (RD&E). This frequently highlights tension that exists between those that emphasise a greater appreciation of human (soft) systems and those that believe such methods are unscientific. A general framework has been developed in an attempt to explore and align these different positions. This paper documents a framework for undertaking farming systems RD&E, and also contains a critique of the framework using two case study projects, and an agenda for future developments. Whilst useful in aligning soft and hard systems approaches across all aspects of farming systems projects, our critique identified the need for further revision of the framework to better address the human dimension, and result in improved integration of dairy sector capabilities.

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A Global Farming Systems Knowledge Base

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Knowledge and information are increasingly viewed as driving forces for hunger reduction and rural development. The acceleration of learning about rural development processes at all levels requires an organising framework for the effective sharing of knowledge. The farming systems knowledge base produced by a FAO/World Bank Global Farming Systems Study is outlined in this paper. It documents trends, emerging constraints and strategic priorities of some 72 broad farming systems identified in six developing regions, organised around five rural development themes, viz., natural resources, technologies, markets, policies/institutions and information/human capital. Building on sustainable livelihoods concepts the Study estimates, for each major farming system, the relative importance of five household strategies for escaping poverty: intensification, diversification, increased farm or enterprise size, increased off-farm income and exit from agriculture. The knowledge base provides a robust platform for the exchange of information on rural development trends, experiences and strategies and can be used to underpin agricultural sector studies and the formulation of national rural development strategies.

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From Measuring to Assessing of Families’ Living Standard--The Application of Fuzzy Alpha-Cuts and Monte Carlo Simulation: A Case From Brazil

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Socio-economic assessment of the achievements of farming families in the past as well as the assessment of future strategies should be based on the needs, values, preferences and objectives of the respective target group. This paper goes beyond the measurement of goal achievement and discusses methods for assessing the achievements and the impact of future strategies by using fuzzy methodology and Monte Carlo simulation. The proposed methodology is applied in a case in Western Tocantins, Brazil for different groups of families. The results show that the methodology is appropriate for assessment analyses where target groups evaluation of needs and achievements are included.

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The Case of the Commune of Ancaca in the Lake Titicaca Watershed, Puno, Peru (1985 - 1999): Is This Sustainability?

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This work is within the context of sustainable agricultural development in the highlands of the Titicaca Lake watershed. Agriculture in this area has been practiced for 4 to 6 thousand hectares. There are a series of age old technologies and infrastructure like dry land terraces, elevated fields, "cochas", sectoral fallow and social organizations that are still in use (Mujica, E. 1997; Morlon P. 1996; Schalke, M.1996). Today, the local population of quechua and aymara origins has yearly mean income of USD 500 per capita. The present paper tries to relate information from dynamic monitoring registered from 1987 to 1992 (PISA, 1993) and revisited during the harvest season of 1999 in the peasant commune of Ancaca (Laraqueri District, Puno, Perú).

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Farmer’s Behavioral Responses to Seasonal Rainfall Forecasts in the Sahel-Sudan

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Recent developments in climate predictions suggest that seasonal rainfall forecasts have potential for alleviating the vulnerability of livelihoods to climate variability in the Sahel-Sudan of West Africa, where most rural households depend on rainfed agriculture for food and income (Hammer et al., 2001). Washington and Downing (1999:255) postulated that “climate forecasts may indeed revolutionize resource management in Africa.” Still, much remains to be learned about whether and how African farmers will understand and respond to scientifically derived forecasts and what will be the social, economic, environmental impacts of farmers’ decisions that are based on climate forecasts.

This paper reports on an experience of experimental dissemination of seasonal rainfall forecasts in Burkina Faso undertaken in the context of the Climate Forecasting and Agricultural Resources (C FAR) project. This comparison of responses of farmers in three different agro-ecological zones of the country illustrates the diversity of options and constraints that farmers face in the Sahel-Sudan region as they assimilate climate forecasts into the suite of information that they use to establish their production strategies. Based on this case study, we have identified key factors that can enhance farmers’ ability to respond optimally to forecasts and we recommend priorities for further research.

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Does the Sustainable Livelihoods Approach Need a More Explicit Systems Perspective? Systems Dynamics Modeling to Facilitate Entry Points to Smallholder Farming Systems

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Technical solutions that have been suggested to smallholder farmers to address problems of declining production, poverty and rising levels of natural resources degradation have had very limited impact in many developing countries. Many pointed out the inadequate understanding of researchers and development planners of the rationale of farmers and the limitations in subsistence farming systems. In response, different approaches were proposed and employed to better understand smallholder farming and to generate best bet technologies. Following participatory methodologies, the sustainable livelihoods systems approach has been proposed to help development practitioners better understand the resources, strategies and desired outcomes of the livelihoods of smallholder farmers. The study of livelihood systems results in the collection of a wide range of information. Yet few tools and techniques are available to sift out most important information and to deal with the complex interactions taking place at different levels. This paper reviews the evolving approaches and the criticisms raised and proposes System Dynamics Modeling (SDM) as a set of tools to facilitate critical reflection on articulating problem behavior in complex livelihood systems, and to enhance capacity to make ex-ante impact assessment of alternative entry points to improve performance. A case study has also been presented to illustrate some of the steps in the use of SDM in the study of smallholder farming systems.

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Calculating Environmental Indicators for Individual Farms and Fields: The Case of Potato Cultivation in the Netherlands

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The Dutch project Telen met toekomst (‘Farming with a future’) designs and tests environmentally friendly arable farming systems, paying particular attention to nutrient emissions. To facilitate communication with farmers, environmental indicators are calculated for individual fields and farms. They are calculated using data from different sources that have been collected at different scales (field, crop, farm). The set-up of the special database created to manage the data is discussed and environmental indicators are calculated for potato farms in the south-east of the Netherlands. The indicators used for individual fields include (1) the mineral nitrogen present in the soil at harvest and (2) at the beginning of winter (the major period of nitrate leaching). The farm level indicators are the nitrogen surplus calculated with (3) a nutrient mass balance and (4) MINAS (MINeral Accounting System: the calculation method mandatory for Dutch farmers). The field-level indicators suggest that potato cultivation partly complies with the project’s objectives, but that the emissions from the farm as a whole are too high. This is partly explained by the fact that vegetable and pulse crops do not use available nitrogen efficiently. The data collection, management and analysis are discussed and improvements are suggested.

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The Recent Extension of Muskwari Sorghums in Northern Cameroon

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The extension of transplanted sorghum in northern Cameroon began in the 1950s and is now attaining remarkable proportions. It concerns from 150,000 to 200,000 ha throughout the plains in the extreme north according to the climatic conditions of the year. This spread has been caused mainly by the increase in food crop requirements resulting from population increase and also the development of cotton growing on land previously used for rainfed food crops. Studies have been performed at the local area ("terroir") level to gain a better understanding of the reasons for the phenomenon and its effects on farming systems. The spread can be as much as 200% in 20 years and is on vertisols and also seemingly less propitious vertic soils. It has been made possible by the perfecting of cultivation techniques and the endogenous dissemination of farming know-how, with an astonishing diversity of environments and varieties cultivated. Growers using the cropping system are encountering new constraints—especially weed growth—and are calling for external aid. An R&D programme initiated by the DPGT project (Développement Paysannal et Gestion des Terroirs) is leading to support services managed collectively by farmers’ organisations.

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Status of Farm Data Systems and Farmer Decision Support in Sub-Saharan Africa

**Susan Minae, Doyle Baker and John Dixon**

Farm data are essential to sound decision making by farmers as well as to organisations that provide support facilities and advisory services to enhance agricultural production. The importance of farm data in appraising farm profitability and in support of sound investments has increased in the recent years with increasing agricultural commercialisation. A synthesis of ten national review papers on the status of farm data systems in sub-Saharan Africa indicates that the importance of farm data has tended to be underrated in the past two decades of participatory development. A declining allocation of human and material resources from the public sector for farm data systems has culminated in low quantity and poor quality data, coupled with ineffective dissemination to the main users.

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An Assessment of Low Input Farming Systems and Their Adoption: Some Evidence from the UK

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With the increase in agricultural intensity in the north-western Europe there is growing concern over the increasing use of agro-chemicals including pesticides on soil, water, air and habitat resources. In this context, an Integrated Arable Farming Systems are seen as being potentially more sustainable farming practices in the long run. The objectives of such systems are to reduce off farm inputs whilst maintaining food quality and income. This paper reviews the research that has been undertaken in the UK and, using the results from the LINK IFS experiment within a Compromise Programming model, examines the economic and environmental consequences of adopting integrated systems to estimate the potential adoption of such systems on commercial farms. The results of the modelling exercise show that there is significant potential for these systems to be adopted into UK agricultural production, particularly with farmers who consider environmental concerns as part of their farm objectives.

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Integrating Soil Resources into Economic Accounting at the Farm Level: A Brief Overview

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Where farm record keeping is used to calculate farm-household income, it commonly considers only financial accounts. Awareness of resource degradation or improvement, however, calls urgently for a better understanding of the interrelations between environmental and socio-economic aspects in decision-making. This paper presents an overview of a methodology aimed at integrating environmental and economic accounts at the farm level. Emphasis is on including natural capital deterioration as part of production costs, with the aim of identifying sustainable farm-household income. The method is based on a nutrient flow balance calculated both in physical and financial terms. Calculations consider nutrient inflows and outflows derived from agricultural practices as well as those derived from natural processes. Data requirements are mainly biophysical conditions, soil deterioration/improvement, farm management and nutrient contents. Preliminary evaluations show the method’s usefulness for valuing efficiency of soil resources and nutrient management, as well as for illustrating the value of environmental assets to decision-makers.

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THEME 4
FARMING SYSTEMS EDUCATION AND TRAINING
SPEAKER ABSTRACTS

Listed in alphabetical order by presenting author. Presenting authors appear in **bold**.
Building Capacity for Ecological-based Reasoning in Farmer Management of Shaded Coffee in Central America

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Central American coffee farmers have faced a series of environmental, ecological and economic challenges over the past two decades. Green revolution technology has offered little preparation for farmers, particularly small, to cope with these challenges. Through participatory research agroecological diagnostic tools were developed to help farmers understand the ecological relations in their coffee systems and make better informed management decisions. These techniques have been disseminated to over 9000 farmers and 240 technicians across Central America, leading to reductions in pesticide use while maintaining yields. Current challenges are to improve farmer decision-making in the economic management and marketing of their produce in an environment of low world coffee prices.

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Communicating Agricultural Research in Africa: The New Role of Rural Radio

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New developments in rural radio in Africa hold promise for the application of farming systems thinking for agricultural innovation and development. This paper examines the challenge of international and national agricultural research institutions moving beyond the conventional “technology triangle” of research-extension-farmer linkages whereby information tends to be selectively released and controlled. In contrast, a web-like set of interactions among multiple stakeholders and research institutions prevails and requires a learning-centered approach to knowledge generation and information sharing to support agricultural innovation for rural development. A pilot project at the International Service for National Agricultural Research (ISNAR) to investigate the current role of broadcast radio in linking farmers, research institutions and rural extension in Africa is discussed. To date, the project has carried out a study of radio/research linkage needs and worked with teams of African researchers and radio broadcasters. The results suggest a ‘linkage gap’ exists that prevents the two ‘stations’ of research and radio rarely, if ever, interacting. Lack of teamwork, and certain policy and organizational issues operate against research/radio linkages. Overcoming these limitations will be an on-going effort, but there are encouraging ways forward.

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By re-orienting university curricula and emphasizing human resource development and training for multidisciplinary learning, educational programs can be responsive to the needs of smallholder farmers. The farming systems (FS) movement has attracted the attention of international agricultural scientists and practitioners for several decades. In developing countries the integrated farming systems (IFS) approach serves as a good model for helping subsistence farmers achieve a reliable food supply, increased income, and greater environmental sustainability. The IFS approach is holistic, multidisciplinary, problem solving, location specific and farmer-oriented, and it treats agriculture as a complex interaction between natural and social phenomena.

Recent initiatives in India’s State Agricultural Universities (SAUs) have led to revised curricula that is more in tune with the challenges of the real world. This has lead to better-trained personnel for implementation of farming systems approaches in Indian agriculture. Improved human resource development approaches now stress multidisciplinary team approaches for learning, on-farm and on-station research, and learning from farmers. This paper addresses curriculum changes, human resource development and training strategies, and institutional rewards and policy changes that are helping to strengthen agricultural institutions in countries like India where the small holder farmer is of central concern.

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Case Study on the Traceability Systems in the Fruit and Vegetable Sector

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The Italian fruit system offers good quality production, but finds it difficult to adapt to market globalisation. Even the great improvement in exports cannot compensate for the challenges the sector will have to face in the near future from the strong competition of Eastern Europe. In such a situation, the only way to compete will be to count on the quality, safety and traceability of the products. The high level of fragmentation, the low levels of association and the lack of structural development are all elements which trigger doubts as to the capacity of the sector to respond to these challenges.

The traceability system discussed in this paper represents one of the first replies from the Italian agricultural system to the growing demand for product traceability. This system has been implemented by a co-operative that groups together about 500 small and medium fruit farms. It is precisely the co-operative which can guarantee a winning reply to the most recent demands for supply chain traceability, which will be obligatory in Europe after 2005. Product traceability also represents an important processing chain marketing incentive which can be used by the agricultural world to counterbalance the extreme powers of multi-channel large scale distribution.

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Impact of Trade Liberalization on Small Farmers - Sri Lanka’s Experience

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Sri Lanka has experienced a significant impact to its agriculture sector since being a signatory to the Agreement on Agriculture (AoA). With the disbanding of a large number of non-tariff barriers and fixing tariff at 35% on agricultural commodities there was a surge of imports of "sensitive" agricultural crops to the country. This impacted negatively on the extent, production and incomes of farmers cultivating, as well as on rural employment - in areas where these crops are cultivated.

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The Invisible Frontier: The Current Limits of Decentralization and Privatization in Developing Countries

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This paper reviews agricultural and rural extension reform literature with the purpose of arguing for a new vision within which to reformulate current reform strategies. Its purpose is to suggest how to traverse “the invisible frontier” where the current limits of decentralization and privatization strategies operate and to break through into a vision that promotes balance of powers aimed ultimately at greater democratic development.

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The Effect of Income Generating Activities and Household Composition on Household Food Security in Southern Malawi

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Diversifying household activities is essential to household food security in Southern Malawi. Farms are extremely small; many farms are less than half a hectare. With these small landholdings, food security cannot be achieved by subsistence farming alone. Cash crops and off-farm income are key to these livelihood systems. This research was conducted in 1998 as a part of a study to examine options for improving household food security in Southern Malawi.

Twenty households from three villages near the town of Malosa in the Zomba district of Southern Malawi were interviewed to collect information about household livelihood systems. Twelve male-headed and eight female-headed households were interviewed. The information collected was used to construct linear programming models to model household livelihood systems. These models were used to test different options for improving household food security. Three of the options that were tested were a loan for growing tobacco, increased off-farm work, and a loan to start a small business. All three options were found to improve household food security, although household composition and resources affected which option improved food security the most.

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Towards a Marketing Strategy for Countryside Stewardship

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In December 1999, the UK government committed an extra £500 million to the Countryside Stewardship Scheme (CSS) over the period 2001 to 2007. The CSS involves land managers undertaking an agreement to achieve specified conservation outcomes in return for annual financial award. The scheme is a key policy instrument in the emerging strategy for rural development, especially regarding achievement of sustainable rural livelihoods, environmental protection and enhancement, and enjoyment of the countryside.

In 1999 there were almost 10,000 agreement holders covering 150,000 ha and an annual spend of £35 million. While in some areas scheme take-up by farmers has been high, in other, especially intensively farmed areas, applications have been disappointing.

In this context, the Ministry of Agriculture, Fisheries and Food (now Department for Environment, Food and Rural Affairs) identified the need for an integrated strategic approach to marketing the scheme in accordance with the scheme’s overall agri-environmental objectives and the need to deliver best value. Specifically, there was a need to identify key scheme marketing issues, define the ‘market’ for the scheme, apply the concept of the marketing mix (the 4Ps: product, promotion, pricing and place), and provide a framework and action plan for formulating a marketing strategy.

The study drew on a combination of resources: a review of relevant research literature, visits to regional MAFF offices, a participatory workshop with MAFF/FRCA staff and discussion with partner organisations.

The study concluded that there is potential benefit from adopting a ‘relationship marketing’ approach which emphasises enduring partnerships with agreement holders and sponsoring organisations. The study recommended that DEFRA, as part of a scheme marketing development programme: undertake a market audit, marketing research, and establish an information system to support the marketing function; and set national and regional objectives and targets, and base marketing decisions on the 4Ps with an emphasis on particular market segments and local needs.

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Agroforestry Practices in Two Communities in the Highlands of Guatemala

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In Guatemala’s highlands, agricultural productivity is low because of steep slopes, erosion hazards, and poor soils; cool temperatures and unpredictable weather add to the problem. Small land holdings, often < 0.5 ha per farm (1), may also limit productivity. Previous attempts to increase productivity with cool season vegetable cropping increased household incomes within some groups, however, food security and nutritional status were not improved (2). Agroforestry-based alternatives can increase economic yields through more efficient temporal partitioning of resources between crops and trees (3). Fruit-tree based agroforestry systems (Malus and Prunus spp.), within associated annual crops are prevalent within the region. However, a central agroforestry hypothesis that trees provide socioeconomic benefits and ecological functions using resources otherwise unexploited in tree-less systems (4) has not been tested in northwestern Guatemala. Greater understanding of factors that mediate farmer adoption of fruit tree-based agroforestry systems is necessary as a first step toward validation of this theory.

With this background, family and farm characteristics were investigated in two communities, selected based on the presence of fruit tree-based systems. Ethnographic information on farm families in the two communities was gathered using national and municipal data, published technical reports, field observations, and semi-structured interviews. Additional information on farming practices was collected from field plots and local market research.

A farm simulation-model using ethnographic linear-programming was developed and used to analyze livelihood options. Labor and inputs for sole cropping, intercropping, and mixed cropping, land holdings, family composition, and seasonal price differences for crops are explicitly considered. The roles of livestock for food, cash, and additional use of fodder or non-food crop components are considered, as are off-farm livelihood options. The effects of farm size and labor availability, calculated as a function of family composition, were examined to assess their impact on fruit tree management. The findings suggest that fruit production appears to contribute to food security through cash income during a critical season. However, low fruit quality and variable yields make intensive management less attractive. Further studies should include detailed analysis of fruit tree responses to management and quantitative analysis of yield suppression in associated crops.

Literature


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Assessing the Economic Benefits of an Early Wet Season Rice Crop in Cambodia’s Rainfed Lowlands

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New innovations are desperately needed to improve the productivity of rainfed-lowland rice-based farming systems in Cambodia. In this ecosystem, most farmers grow a single rice crop on infertile soil under unfavourable climatic conditions. With poor yields, farmers normally experience food shortages for at least two to five months before the next crop is harvested. After modern photoperiod-insensitive and short-duration rice varieties such as IR66 became available, farmers in some areas have been able to grow an additional (early wet season or EWS) rice crop at the start of the rainy season to reduce these frequent food shortages. To examine the effectiveness of this form of double cropping, a case study was conducted in a typical Cambodian rainfed-lowland village. Five farm families who only grow a single rice crop a year, and five who double-crop rice, were randomly selected to interview about the costs and returns of rice cultivation, using a 60-question survey. The results indicate that, with higher inputs, early wet season rice can produce a better yield than the wet season crop. Double-cropping rice can produce food for consumption all the year round and may earn some additional cash. Significant capital investment is needed to install a tubewell and pump in order to reduce the risk of yield loss resulting from unpredictable rainfall during the early wet season. However, the returns to this investment are high. The economic advantages of EWS rice, however, depend on the way in which inputs (especially family labour) are costed.

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From Centrally Planned Agriculture to Private Farming: Problems and Progress of Small Vegetable Farmers in a Former Socialist Country

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Agriculture in the Ukraine is in the process of moving from a centrally planned and directed socialized system to market-orientated private farming. In 1991, the Ukrainian Parliament passed the Land Code that guarantees private ownership of 26 million hectares of land for 6.1 million people by 2003. Farmers, especially those in horticulture, face major problems during the transition period. They have very little or no experience working in a market-driven economy. There are no extension-type programs available for them to acquire new knowledge and information regarding modern production and marketing methods. The majority of the small farmers can not obtain loans to purchase machinery or irrigation equipment. In spite of the difficulties, there are a growing number of successful small- and medium-size farms that supply fruit and vegetables for fresh-market or for processing through joint ventures with western European companies. Training of farmers in modern agrotechniques and marketing methods by volunteers from western countries also helps them to increase farm income and improve their lives.

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Family Farming Systems Based on Grain Production in the Northern Region of Paraná State, Brazil

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EMATER and IAPAR, based on Farming Systems and Research & Development approaches, are carrying out this project since June 1998 called “References’ Network for Family Farming - NETS”, now present in 11 out of 20 regions of Paraná State, integrating the IRDP “Paraná 12 Meses”. The aim of the NETS is to enforce family farming of Paraná State through the proposition and diffusion of new sustainable farming systems, with high potential of adoption by means of feasibility, profitability and stability. This study describes and analyse the three farming systems followed by NETS in the North Mesorregion, composed by 34 farms located in Apucarana, Cornélio Procópio and Londrina regions, Paraná State, Brazil. At the very beginning NETS method is quickly described, pin-pointing the advantages in integrating Research, Extension and Farmers. After this, region environment is described and the farming systems Grains specialized, Grains diversified and Coffee plus Grains are described observing their general characteristics. At this moment, indicators of technical and economic performance are presented and discussed in relation to 1998/99 and 1999/00 harvest periods. At last, future perspectives for these systems are discussed and methodological aspects are raised, focussed on interdisciplinary and participating planning.

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Potential of Promiscuous Soybean in Tropical Cropping Systems

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Soybean [Glycine max (L.) Merril] is the most important leguminous crop worldwide. When supplied with an appropriate strain of soil bacteria (rhizobia), soybean symbiotically fixes atmospheric nitrogen (N$_2$) in root nodules thereby providing nitrogen for growth and improving soil fertility. In addition, the crop residue adds quality litter material to the soil, which subsequently decomposes. Promiscuous soybean types form nodules with indigenous rhizobia of the cowpea group that are ubiquitous in African soils. Such soybean types are attractive to farmers in production systems that lack or have no mechanisms to provide commercial rhizobia. The genetics of promiscuity in soybean is unknown. The objective of this research was to conduct inheritance studies of promiscuous nodulation in soybean to determine if it is possible to manipulate the trait in plant breeding programs aimed at developing improved promiscuous cultivars. Hybridization experiments showed that promiscuous nodulation could be transferred into adapted cultivars. Leaf chlorophyll content, compared with nodule number per plant and nodule weight per plant, was most effective in identifying promiscuous plants that were grown in N$_2$ depleted medium (wash sand) containing a cowpea type rhizobial strain. Promiscuous nodulation technology has great potential in the development of improved cultivars for smallholder soybean production systems in Africa.

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Sustainable and Equitable Forest Product Valorization: Organizing an Integrated Supply Chain in Acre, Brazil

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Different socio-economic-environmental models argue for an increased effort to better valorize tropical forests non-timber products (Brazil nuts, natural rubber, guarana, cat’s claw, …) in order to improve forest inhabitants’ livelihoods, while reducing pressure on the natural resources base.

In the Brazilian Amazon region, at least two very distinct supply chains exists for NTFP. The first system represents the traditional forms of gathering, harvesting, processing and utilization of products by the forest inhabitants themselves and by local traditional customers in the region. The second system focuses on the manufacturing and sales of improved and new intermediate and final products from the therapeutic, natural medicine and cosmetics industries, using the NTFP as product ingredients.

The government of the state of Acre, aiming for an economically and environmentally sustainable and equitable tropical forest development, has targeted the valorization of NTFP, alongside strategies for sustainable timber management & extraction, and road construction. Thesis research including primary data collection along NTFP supply chains in Brazil, analyzed past and current constraints and opportunities and formulates a set of recommendations regarding the need for integration of key actors in the chain, most importantly in the raw material supply zones (forest margins). Technical, economical and organizational recommendations, however, need to be complemented by specific government (federal) policies.

The paper introduces the main thoughts on models for sustainable forest development. It analyzes all aspects of the NTFP supply chains and its actors. It concludes with a set of recommendations for the development of the NTFP chain.

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Farmer Research Groups in Southern New England

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**Introduction** Farmers in southern New England are increasingly isolated from their peers. Farmers innovate independently, usually relying on trial and error. Applied agricultural research expertise is increasingly limited in the region. Many on-farm experiments are managed by one scientist communicating with individual farmers. This project is developing farmer leadership and a network of farmer researchers. Our project aims to increase collaborative learning among farmers and scientists to streamline technology development and assessment. The approach is engaging farmers who have not traditionally worked with extension or research professionals.

**Approach** Farmers know what issues are important to them. The farmers communicate their research ideas or topics to us through meetings and mailings. When 3-8 farmers are interested in a topic we arrange a telephone conference call. The group discusses the idea or issue and decides a plan of action. Eventually they meet face-to-face to plan an experiment appropriate for their farming systems. A group may investigate a new idea or evaluate a recommendation. Farmers individually implement the experiments on their farms, but the experiments share a common design and protocol, and consequently results. Groups are led by farmers and facilitated by scientists. Active farmers receive a small honorarium. Groups conduct field days and share results at an annual conference.

**What We Are Learning** Shifting research leadership from scientists to farmers is challenging. Scientists, and the farmers they work with, are comfortable with familiar systems and roles. Farmers and scientists need repeated opportunities to understand the concept of farmer-led research. Initially, research must be defined broadly with emphasis on participation and ownership rather than research rigor, which makes it difficult to quickly generate publishable results. Farmers always set the pace and direction of successful groups. Groups formed around ideas make more rapid progress than groups formed around problems. Research and learning are closely interwoven. Both farmers and scientists are learning. Appreciation of research principles and group process takes experience. A tinkering phase is normal for most groups, and attrition is expected. Some farmers prefer to innovate alone, which must be respected; others just follow a group's progress. Listening is critical, but difficult, especially for experts. Each Farmer Research Group takes time to develop, for incubation and for actual communication and implementation.

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Studies on Land Degradation in Gurgaon District of Haryana (India) through Remote Sensing Technique

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Haryana is an agriculturally rich state having about 90% area under cultivation. With the introduction of canal irrigation, a large part of cultivated area in the state has been infected by rising water table and increase in salt concentration. The area under the degraded soils has been increasing, as more area is becoming water logged. Although there have been sporadic studies on the extent of problem in different districts, however, continuous monitoring is lacking. Moreover, there is limited studies conducted with the help of computer aided GIS and digital image processing techniques. Keeping these facts in view, studies were conducted to identify, delineate and map different categories of degraded soils with the aid of multi-spectral and multi-temporal satellite data and to study salt affected and water logged soils through GIS and image processing techniques.

Two methods viz., visual image interpretation and digital image interpretation were employed for conducting these studies. In visual image interpretation firstly a base map of important control points was prepared with the help of survey of India toposheets, then visual interpretation of satellite imagery based on tone, texture, pattern, association, shadow etc. was transferred on this base map. The delineated units were checked in exhaustive field checking, supported by the laboratory analysis of soil samples. Different multi temporal satellite data products like Landsat TM, IRS IA, IB, IC and ID of different resolutions on 1:250,000 and 1:50,000 scale were employed for this study (Table 3). All the interpreted units were fed into the GIS environment either through digitization or scanning. Areas of respective polygons were then calculated by the computer.

Digital image analysis was carried out on UNIX workstation by loading the satellite data of different paths and rows. The path-row of the LISS III data was 96/51, 96/52 and 95/51 whereas for WiFS data it was 96/52. The data came in the form of CD and after loading, it was rectified for georeferencing, then it was resampled and then area of interest was cut. GIS ARC/INFO and ERDAS imagine softwares were used for digital analysis of the raster image. Different physiographic and sub physiographic units were delineated with the help of computer and supported by the field checks and laboratory analysis of soil samples a landform-soil relationship was established. Extent of waterlogged and salt affected area in different years was calculated in GIS environment.

The results of these studies reveal that in north-west India overall extent of water logged and salt affected areas can be mapped by any season imaginary of the available satellite but their maximum extent is reflected only during November and May months respectively. The salt affected and water logged soils mainly occurred along the canals and in micro-depressions. These appeared in light grey, moderately white and bluish white tones with continuous regular way pattern. Studies further indicate that multispectral and multitemporal imageries of different resource satellites can be used for identification and delineation of different categories of water logged and salt affected soils. The results of different satellites have shown that higher the resolutions better was the mapping capabilities.

These studies reveal that remote sensing, GIS and digital image processing techniques were helpful in recognizing landform-soil relationship and also in mapping and monitoring of waterlogged and salt affected soils. GIS and digital image processing techniques also provided a
Adoption of Cultivation of Medicinal Plants in Wasteland Areas for Improvement of Farmers Socio-Economical Status

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India has great biodiversity due to its variation in climatic and edaphic factor, which is enhancing in its biodiversity option. Chhattisgarh state is also rich in this aspect but the major problem of this state is presence of 20 per cent area under Entisols, which is generally treated as wasteland or uncultivated area. Some small and marginal farmers grow some unprofitable crops such as Lathyrus, Vigna radiata and Vigna moong only for his livelihood sustain, this area farmers are not able to go cultivation of profitable crops due to very low fertility status and very low water holding capacity of this soil so farmer is not getting good income from his produce and his socio-economic status is very poor, Chhattisgarh state has great potential on medicinal plants but unfortunately no farmer interested to cultivate medicinal plants and also not interested to adopt medicinal plants in his farming system. Ashwagandha (Withania somnifera) is a medicinal plants which is grown in very poor fertility and moisture status, but still no serious affords are made for its cultivation. For this region farmers Ashwagandha cultivation has open a new way for improvement in his social and economical status because in world market this crop have good demand so that farmer get good prices for his produce. Entisols nature is acidic but Ashwagandha cultivation favours to neutral to slightly alkali nature. For this reason it is necessary to go for liming. Dolomite is one of the liming materials which are present in huge amount in Chhattisgarh state. So we test different rate of application of dolomite for cultivation of Ashwagandha and we get positive results about application of dolomite in terms of morph-physiological yield attributes of this crop.

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Impact of Water Harvesting with Diversified Farming on Productivity and Income of Rainfed Farms in Chhattisgarh, India

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Chhattisgarh state in eastern India receives abundant rainfall, which is sufficient for a good rice crop and a rainfed short duration post rice crop. But due to lack of water harvesting system, majority of farmers rarely harvest a good crop of rice owing to water stress at one or other stages of the crop. Therefore, an on farm experiment by constructing a farm pond was conducted to alleviate drought in rice and increased productivity and income of rice-based farming system. The average size of experimental farm was 2 ha, in which, 0.15 ha area was allotted for construction of dugout farm pond for collection of runoff and its recycling for crop production during water stress and establishment of post rice crops. Rice-chickpea, rice-mustard, soybean-chickpea and soybean-mustard systems were tested in the service and catchment area of the seven farm ponds. Results of the study showed that rice-chickpea system was suitable and economical for service area of the pond whereas, soybean-mustard cropping system was found economical for command area. The productivity, cropping intensity and income of farm with farm pond increased by 2 times as compared to rainfed traditional rice without farm pond. Rearing of fish in the pond was also proved beneficial. It can be concluded that the farm ponds are not only viable in terms of economical returns but also in terms of unaccounted benefits such as increased employment (by more than 100 men days/ha/year), reduced risk of crop production, increased value of land, prospects of enhanced profitability by growing high value crops including vegetables and fish culture.

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Linking Agricultural Research and Farmer Learning for Sustainable Small Scale Horticulture Production in Colombia

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Economic and ecological pressure on small farmer production in Colombia has increased since the globalization of trade in the early 1990s. Mechanisms are required to help these producers find alternatives to stabilize their income while reducing the negative effect their farming practices have had on the environment. A case study was used in which a methodology was designed with small farmers to gradually convert their vegetable plots to more ecologically friendly practices. This involved new (technical) learning for the farmers and parallel capacity building to ensure long lasting effects of these efforts, at both farm and landscape level.

Emerging from the facilitation of the farmer learning process came a sequence of coherent and novel research activities designed to generate farmer learning: understand the context, implement participatory diagnostic research to anchor the work in real problems, encourage the creation of a learning platform, interactively (with farmers) design a system based on their priorities, effective and acceptable to farmers, identify and test science-based applicable technologies at the farm level, scale up this system from the farm to higher system levels, and ensure long-term project impact and farming community autonomy by providing the tools for accessing new information and training local facilitators.

By studying the interface between the farmer learning pathway and the set of research activities involved in its facilitation, it became apparent that the farmers’ learning pathway is divided up into four phases. These are: I. participatory diagnosis and the beginning of the creation of a learning platform, II. improvement of production at farm level due to better technical knowledge leads to the realization of the importance of working together as a community, III. this in turn leads to the search for solutions on a larger scale as a tool for regional development, and IV. building the capacity of the farmers to stand on their own. Each phase is related to the progress made by the farmers throughout the research based on accomplishments in the three dimensions of the development project: 1. technical know-how for appropriate farm management, 2. the creation of a cooperating group of farmers, and 3. long-term sustainability through autonomy and self-reliance.

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High Grafting, Technique that Allows to Produce Wood and Fruit of Quality Simultaneously

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The diversification of species and of cultivation techniques it is a desirable phenomenon for the forest sector because it has important impacts from the social point of view (new actors’ incorporation, especially those that at the moment don’t participate of the forest development). Because of market issues (it allows the access to new market niches and also to face the recurrent fluctuations of prices that the market of noble timber presents. Environmentally (a higher diversity diminishes the risk of biotic and non-biotic damages); and economically ( originate products of high value that present significantly higher prices that those traditionally produced and whose demand is currently interesting). It also represents an alternative to reduce the problems of the industrial plantation’s monoculture, which cover more than 2 million hectares in Chile.

In the last years, the agricultural sector has been affected by a sustained crisis, given mainly by the low yields of the traditional cultures (low technology, scarce innovation) and fluctuations in the national and international markets. Also by the incorporation of Chile to international treaties (with the consequent entrance of products at an inferior cost that the national similar ones); the sale of lands to low price; and the existence of important extensions of soils with forest potential not used in small and medium owners' hands. Everything has converged in a process of transformation denominated agricultural transformation.

In this context the use of non-traditional species to produce high value timber, as common walnut (Juglans regia), as well as of other fruit-bearing species that possess valuable wood, it constitutes a feasible alternative to be incorporated in the traditional rural agricultural productive systems.

Walnut is a vigorous tree that can reach heights of 24 to 31 m and diameters of the trunk of 60 to 90 cm, until 1.5 m. It is high, right, that opens up in a wide and leafy crown. Its timber is compact and with a beautiful grain. It grows quite fast contrarily to the common thought, and is accepted by the farmers since several centuries because it produces valuable fruits (US $1.7 - 2.1/Kg) and valuable timber (US $300-2.500/m3 standing).

It is a very well known and diffused species of agricultural and forest interest since it produces appreciated edible fruits and high value timber requested for the production of style furniture and handcrafts. In fact, it is one of the most requested timbers in the European market, with a stable and exclusive market from several centuries.

THE HIGH GRAFTING

The fact that walnut is per excellence an agricultural species (nuts) makes the incorporation of the forest component an interesting complement to the property economic activity.

The above-mentioned means that it is feasible the timber and nut production simultaneously and complementarily in the same tree, It can be achieved appropriately for both items through the application of the technique of the high grafting.
This because with timber markets demand logs of 3-4 m of long, right, without defects, and with a regular growth rhythm. In particular grafting made out in the inferior part of the tree are considered as an important defect, because they cause a timber discoloration that is transmitted toward the superior part that make lose quality and it reduces their value in a significant form. Additionally, the varieties selected by their fruit quality possess a vigor and vegetative growth very diminished, aspect selected with the objective of nut harvest facilitation.

On the other hand, the market of the nuts has become sophisticated and more and more exigent with regard to the uniformity of the product, giving preference to light colors. This makes impossible the cultivation of trees coming from seed with nut goals, because they are characterized by its high heterogeneity.

To cultivate individuals with double purpose (timber and nuts) a log without defects of about 3 - 4 m, and to develop at that height a crown dedicated to the fruit production.

The technique of the high grafting consists of planting a rootstock (plant reproduced by seed without grafting). Then to make a specialized pruning that allows forming the log with the appropriate characteristics for the high value timber production. And finally to apply a topping once the wanted log length is reached (3-4 m, height that is reached at 2-4 years). On the sprouts that are originated product of the topping the grafting are made, and give origin to a specialized fruit bearing crown. Pruning techniques applied from now on correspond to the classic techniques used in the agronomic field.

In this way it will be obtained an individual that will produce fruit of quality during the whole rotation (20-40 years), and later on a high value timber harvest, integrating two business. This will allow increasing the profitability of the cultivation and at the same time it offers a conduction system in which currency fluency exists during the whole rotation.

Figures 1. 15 year-old walnut orchard settled down with the technique of the high grafting to produce high value timber and quality nuts.

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Integration of Cattle and Improved Pastures Under Coconuts

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Results of two studies involving 1) grazing of Signal grass (*Brachiaria decumbens*) pastures at different stocking and 2) introduced forage species in smallholder farms for cattle under coconuts are presented. Average daily gains (ADG) of cattle grazed on Signal grass pastures were 0.34, 0.30 and 0.24 kg at stocking rates of 1, 2 and 3 au/ha, respectively. In small farms, ADG ranging from 0.2 kg to 0.3 kg was obtained on Signal grass and Humidicola (*B. humidicola*) under cut-and-carry system and mixed with crop byproducts and local forages.

Monetary values of liveweight gains (LWG) from the studies were estimated and presented. Both studies showed that overall productivity and income from coconut lands is increased by raising cattle on improved pastures under coconuts.

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Optimum Dairy Based Farming System Models for Stable Income of Small Farms

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Farming system is an integrated set of activities that farmers perform in their farms under their resources and circumstances to maximize the productivity and net farm income on a sustainable basis. The present study has been made to identify types of farming system and to assess the potentialities for increasing farm income through reallocation of resources in farming system. The data were collected from 120 respondents pertaining Kolar district, India during 2000-01. The optimum farming system helped to increase in maximum net farm income to the extent of 213 per cent from crop + dairy + forestry system over existing farming system. Mulberry was suggested in all the seasons in tube well-irrigated land while forestry under dry land. The increase in the farm income was due to the change in the cropping pattern, interaction and interrelation among different enterprises of various farming systems.

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Institutional and Socioeconomic Factors Shaping Adoption Of Soil Management Practices (Courbes De Niveau) among West African Farmers (Mali)

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This poster illustrates preliminary findings from a NASA-funded project that seeks to determine the potential for adoption of carbon sequestrating land management technologies (courbes de niveau) in West Africa (Mali). The study identifies conditions for and constraints to their adoption at aggregate scale and institutional mechanisms to support their dissemination.

The findings draw from fieldwork among farmers in three sites that differ in terms of agro-ecological conditions, history of technology transfer and adoption, and institutional frameworks. Among the factors that shape technology adoption and performance are a) farmers’ perceptions of environmental conditions, particularly related to water management; b) farmers’ resource endowment, especially access to labor and animal traction; c) the profitability of rainfed cropping systems, which determines farmers’ willingness and ability to invest in improved land management; c) organizational capacity and literacy rates at the community level.

The technology’s dependence on fee-based external technical support for its initial installation raises key questions concerning the privatization of extension services and the role of NGOs and CBOs in technology transfer. The institutional analysis also throw light on the implications of decentralization of local level government and restructuring of rural sector services for the implementation of improved land management technologies at aggregate scale.

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Comparison of Corn-Based Cropping Systems for Smallholder Farmers in Nigeria

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Land-use intensification in Sub-Saharan Africa has been employed as a means of meeting food and feed demands under current conditions of overexploitation caused by rising human and animal populations. Simultaneously, rising prices of fertilisers are driving smallholders toward lower inputs of inorganic N for cereal production.

Cereals and legumes constitute important components of most Nigerian cropping systems where crop residues are used as a feed source for ruminants. The integration of small amounts of inorganic N fertiliser along with N from legumes has the potential to overcome N depletion in intensive land use systems. In this study, field experiments were conducted at a mid latitude (33° S) site in Australia to emulate some of the annual double-cropping systems in parts of Nigeria. Five cropping systems (CS) have been studied over two years, including: i) corn - field pea - corn (CS1), ii) corn - intercropped barley/lucerne - intercropped corn/lucerne (CS2), iii) intercropped corn/cowpea - field pea - intercropped corn/cowpea (CS3), corn - barley - corn (CS4) and corn - fallow - corn (CS5). For CS1, field pea was incorporated into the soil at mid flowering prior to subsequent corn production while for CS3, it was grown to maturity for grain production. Sub-plots within all corn (Zea mays L.) crops were fertilised with 0, 60 or 120 kg N ha⁻¹.

Productivity of the initial corn crop was similar for all cropping systems. For the second corn crop (following the legume/barley/fallow treatments), the mean grain, stover and whole-plant yields were highest in CS1 and lowest in CS2 (P<0.05). Corn yields in all cropping systems also increased significantly (P<0.05) with N fertiliser application rates. Corn grain and whole-plant N uptake differed significantly (P<0.05) between cropping systems for second year corn, ranging from 82 to 121 kg N ha⁻¹ and 127 to 198 kg N ha⁻¹ respectively. Application of 60 and 120 kg N ha⁻¹ increased mean total N uptake by 36 and 65% respectively relative to the 0 kg N ha⁻¹ control. The N recovery as a percent of applied inorganic N fertiliser was highest in CS4 (57%) and lowest in CS2 (17%). Cropping options for the multiple crop/livestock requirements and the implications of this research for Nigerian smallholders are briefly discussed.

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Impact of Labor Migration on Commercial and Subsistence Farming in India

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Migration of labor is a natural phenomenon, particularly in the developing nations. Depending on the demands, qualifications possessed by the migrant, they migrate to different destinations; within the country or outside their domicile. Both these types of migrations are also common in India. This has a strong bearing on the agricultural economy of the place of origin of labor and on the place of destination of migration. This study examined the patterns of labor migration, and quantified the impacts of migration on agricultural productivity and other livelihood systems in both the places.

The results indicate that migration of labor within India is from subsistence agricultural areas, e.g. eastern India, to commercial agricultural areas, e.g. Punjab, India. This makes significant changes in the roles of women that are left behind to manage the farms because of male migration, although there are some financial benefits that are brought through remittances from their male family members leading towards a little better life. However, such remittances are not always spent in agriculture but on housing, children education and household expenses. Thus, there is no visible change in the agricultural productivity at the place of origin. On the other hand, since these labor are technically highly skilled (though maybe illiterate) for specific agricultural commodities, e.g. high quality rice growing, the cropping of specialized commodities such as basmati rice, fruits and dairy etc has been intensified, thereby bringing higher incomes and freeing the landowners time to engage themselves in other enterprises. While on the job, the in migrants learn new techniques, e.g. tractor operation etc. and bring such a knowledge back home. Therefore, besides providing the labor, these migrants also provide technical knowledge and assist in moving the technology both ways. However, some of them also inherit anti-social activities, e.g. intoxication. The details of this study are in the poster.

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Developing Diversified Rainfed-Farming Systems for Chhattisgarh (India): Agronomic, Environmental and Socio-Economic Effects

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Integrated farming systems have potential agronomic, environmental and socio-economic advantages over traditional farming. Farmers of the region are taking rice in valleys (midland) but adjoining uplands remains unutilised for crop production. Soil and water erosion is the major problem of barren uplands. Eroded uplands are poor in soil fertility and shallow in depth but suitable for plantation crops. Optimal management of soil and rainwater holds the key for better land use and productivity of uplands as well as for rice grown below. Therefore, in order to optimise land use and generate income and employment opportunities from same piece of land, experiments were conducted on farmers field with four farming systems namely (i) drumstick (*Moringa oleifera*) in upland and rice below in midland, (ii) aonla (*Emblica officianilis*) in upland and rice below in midland, (iii) cashew nut (*Anacardium occidentale*) in upland and rice below in midland and (iv) khamar (*Gmelina arborea*) in upland and rice below in midland. Intercropping of black gram, groundnut, horse gram, tomato, chillies and brinjal was done between the plantations. Wheat was grown after rice in midland with supplemental irrigation from farm pond. Each farming system was replicated thrice covering 0.80 to 1.20 ha area.

The productivity and net return increased twice with 170% cropping intensity in integrated farming systems as compared to traditional farming with 67% cropping intensity. Rice + tomato (during rainy season) and wheat (during post rainy season) cropping system was found most attractive and economical. Drumstick and cashew nut based farming systems were liked by the farmer owing to early fruiting in drumstick (within 10 months) and better survival of cashew nut. Substantial organic matter was added with litter fall from plantation that leads to development of soil microenvironment. Significant increase in employment to the farm family was recorded. The findings indicate that the fruit and forestry based farming systems, which may produce early economic return and fit in social system are most suitable for optimal land use and generation of income and employment to the rainfed farmers. Inclusion of water harvesting structure like farm pond is one of the suitable strategies for drought alleviation in rice, upland crops and vegetables during rainy season and for providing supplemental irrigation to post-rice crops.

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Diversified Cropping and Sustainable Land Resource Management Options for Eastern India

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Natures two vital resources- land and water are under tremendous stress due to ever increasing population and biotic pressure. The site-specific ecofriendly technologies are only a promising solution to meet out the demands of present and future population in the world. Besides prime land, the sustainable use of upland is major concern in eastern India comprises of Bihar, Madhya Pradesh, Chhattisgarh and Orissa states. Traditionally, farmers are cultivating rice in upland fields, which suffers with water stress almost every year, resulted in poor yield. The uplands fields are suitable for short duration upland crops like Soybean, Maize, Groundnut, Castor etc., but farmers are not switching towards adoption of these crops with appropriate soil water conservation measures. Incorporation of perennial trees specially fruit and nitrogen fixing tree species on upland generate more income. Presently mono cropping of rice in rainfed uplands constitutes more than 70 per cent of the total area under upland rice, which are mainly owned by small and marginal farmers and also work against the land degradation and soil relates constraints. Rice is the main food crop of the region therefore, it is rather difficult to completely replace the upland rice but it is feasible to introduce new crops/trees as sole, mixed and inter-crop in upland with appropriate land and water management practices.

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Small Farm Diversification and Competitiveness through Water Harvesting in Rainfed Areas

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Rainfed agriculture is facing increasing challenges in the face of temporal variability of monsoon leading to unpredictable droughts and floods and competition for scarce water resources. Decreased investments and declined performance of monocropping (rice) in rainfed areas particularly, small farms of 1-2 ha, interest has been developing to harness rainwater through small farm reservoirs (SFR) and shallow dug wells, SDW (1-5 m dia. and 6-8 m depth) in order to facilitate double cropping and allied activities through conjunctive use of surface and ground water. It not merely improves the productivity and livelihoods of small farmers but eco-friendly environment is also created through increased ground water recharge and sustainability in agriculture. Comprising the majority in developing countries, small-scale farmers should be perceived as key players in increasing global agricultural production and achieving food security. An individual small farmer would find managing a SFR and a SDW relatively simple and easy. Small farm (1-2 ha) if made hydrologically isolated and independent from surroundings can be conceptualized as micro-watershed (MW). Within it all rainwater is either conserved and/or stored in SFR through surface drainage system and subsequently recycled for crop production. SDW can also supplement water thus facilitate conjunctive use of surface and recharged ground water. Long term study conducted in Chhattisgarh plains and Bastar plateau region of India indicated that the SFR’s constructed in 10-13% area of small farms either in the middle or lowest point increased the B/C ratio from 1.06-1.16 to 2.33-2.78. These SFR’s were designed at 80% probability of exceedence of rainfall and runoff. The capacity of SFR’s varied from 1500 to 7000 cu.m. and depth 1.75 to 3.0 m. It accommodated 60 to 90% of the available rainfall (1000-1200 mm). It facilitated the increased cropping intensity (63-100 to 200%). Increased recharge through SDW was harnessed for crop production. Additional employment of 1500-3000 man days was generated, which helped in preventing migration of local work force, a recurring phenomenon in the region due to delayed onset or break in monsoon. The fish rearing as an optional activity in SFR further strengthened the economy of small farms. Optimal crop plans, prepared for small farms showed that vegetables and fish rearing gave the highest B/C ratio, 2.49-2.78. Due to local food habit it is very difficult to replace rice completely but restricted to its coverage in 15-20% of farm area, in that case the B/C ratio came down to 2.40-2.58. Farmers with strong affinity to rice with its coverage at least 25-30 per cent of farm area, the B/C ratio was found lowest, 2.33-2.50. In all such cases fish rearing was an essential component. It can be concluded that there could be remarkable changes in economic scenario of SFR based farming in MWs, besides recharging local aquifer which can be exploited through SDW constructed D/S of SFR. Farmer’s ingenuity plays crucial role in bringing farm diversification and competitiveness in rainfed areas. For example adopting low cost micro irrigation and the treadle pump further offer resource poor farmers to enhance their water use efficiency upto 50%, at the same time improving yields by 30% or more.

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Competitiveness through Higher Productivity in Perennial Crop Based Farming Systems of India

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Indian agriculture predominated with small farmers’ (>80%) faces many structural and institutional constraints. Low productivity and production inefficiency in pre and post harvest sectors poses serious hurdles for its sustained growth in long run. These problems are more prevalent in perennial crop based farming systems involving crops like coconut, arecanut and high value spices like black pepper, in which revoking the decision is cost ineffective. To tide over the problems, increasing the productivity per unit area through crop diversification and intensification through multiple cropping, recycling of farm wastes, adoption of integrated nutrient and pests management practices and on farm value addition are the major technologies suggested by the research institutes. However adoption of these technologies is subject to their technical feasibility and economic viability under farmers’ field conditions. Further the resource poor small farmers need institutional support for their production and marketing. For sustained growth of perennial crop based farming systems in India, at micro level, competitiveness through higher productivity based on Farming System Research is the major solution. At macro level price and trade policy needs to be retuned in coherence with the changing global trade scenario. These issues are discussed with specific reference to coconut and arecanut based farming systems.

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Integration of Various Agriculture-Fishery-Livestock Systems to Develop Ecofriendly and Sustainable Model

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Organic farming was a practice in the past producing quality and nutritive food. As the time progressed situation has changed with the concept to increase food production for growing population. Inorganic farming became essential which supercede the organic farming. Simultaneously industrialization and deforestation too joined the race to over-come human needs in terms of fuel, food and luxury. These activities without proper check resulted in the imbalance in aquatic, terrestrial and atmospheric environment. To overcome this problem, an ecofriendly model is developed to reshape and recharge damaged ecosystem surplus fresh water and recycled waste water discharged by residential colonies can be used (after treatment) for the production of azolla, bluegreen algae, fish and worms. The interaction of duckery, poultry with the production of vermicompost and vegetable crops in this system is one of the appropriate examples of integrated farming system. The paper deals with the work done at KVK, Badgaon to develop a model for small and marginal farmers who cannot sustain their family with a single agriculture crop. Integration of various systems is an alternative with the same land holding. Such studies have also been conducted earlier (Tiwari, et, al., 1999; Swami Nathan, 1981; Tiwari, 1993, Singh, 1991). This system would thus enhance the production through optimum utilization of above said resources, which not only improve the degraded nutrient holding capacity of soil strata but also produces nutrient rich quality food.

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Farm Pond: An Effective Tool For Increasing Productivity and Socio-Economic Status of the Farmers

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The present investigation was carried out in 15 selected villages of Raipur, Durg and Mahasamund districts of Chhattisgarh Plains during the year 2000-2001. A total of 135 respondents including 90 beneficiary and 45 non-beneficiary farmers were selected randomly and interviewed personally with the help of the structured interview schedule.

Results of the study revealed that majority of the beneficiary and non-beneficiary respondents were belonged to scheduled tribe and scheduled caste, illiterate or less educated and residing in joint family system. Majority of beneficiaries belonged to medium to high-income category, while, majority of non-beneficiaries belonged to Rs. 12001-30000 annual income category. Majority of farmers having 2-4 ha of land holding, involved in more than one occupation and getting the agricultural information from village level worker and local farmers. However, beneficiaries showed the significantly higher level of education, size of family, social participation, annual income, land holding, credit acquisition and extension contacts as compared to non-beneficiary farmers. Level of irrigation and cropping intensity were also found significantly higher among the beneficiaries. Out of the total cropped area, maximum area occupied by the rice followed by soybean, chickpea and grasspea. Maximum farm ponds were constructed in Inseptisols and Vertisols and having less than 2 ha of land as service area. Majority of the beneficiaries were utilizing the water of farm pond for agriculture as well as other purposes. More than 62 per cent of the beneficiaries were having medium level of knowledge, social acceptability, economic viability and technical feasibility about the farm ponds. The ponds were found to be more acceptable to medium and small farmers as compared to marginal and large farmers. As a direct impact of farm ponds, majority of the beneficiaries acquired significantly higher productivity as compared to non-beneficiaries. Similarly, majority of the respondents showed medium level of socio-economic status, however beneficiaries had significantly higher socio-economic status than non-beneficiaries. On the basis of entire findings it can be concluded that farm ponds are playing significant role in increasing the productivity of crops and socio-economic status of the farmers. This paper also suggests a farmers’ perspective strategy for increasing the participation of small and medium farmers towards the farm ponds for sustainability in their agriculture.

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Farming System Approach; For Sustainable Agricultural Productivity and Income of Poor-Resource Rainfed Rice Farmers

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Rainfed uplands in Chhattisgarh state of eastern India covers about 10 million hectares. The resource-poor marginal and small rainfed rice farmers in the region accounts for about 75 per cent in number but having < 25 per cent land. On one hand, uplands are prone to severe water and soil erosion year after the other and on the other hand, rainfed rice cultivation during wet season in mid- and lowlands (The foothills of uplands) is the only source of income and employment. Due to small size of holding, low productivity of single rice crop, poor soils and productivity, majority of the resource-poor farmers depend on irregular earning opportunities to meet their day to day food and other basic needs. Thus, the situation of resource-poor farmers in this region is shrinking socio-economically and this calls for designing research based appropriate farming systems that can help the poor farm families to get regular employment and income from their own farm. Hence, an on-farm farmer-participatory study was initiated with an objective to elevate the income status of farm families through appropriate farming systems approach.

Seven farmers having 0.4 to 1.0 hectares of land holding were selected and provided with a farming system package consisted of black gram, peanut, tomato in the uplands and rice in the mid and lowlands along with six to twenty goats. The results obtained in last one and half years time are favorable and highly encouraging in terms of increased family income and employment round the year from the same piece of land. Of the various cropping systems, rice + peanut (an oil seed crop), rice + tomato were found to be the most attractive and remunerative. Significant increases in production, consumption and marketing of milk, meat and manure yields as well as in labour employment were recorded. Further, the analysis showed that goatry was a profitable combination with crop husbandry provided subabool or other similar fodder species are grown on field bunds as an integral part of farming system.

Judicious and remunerative utilization of upland through inclusion of value addition crops, reduced fertile-soil erosion, incorporation of goatry were the sufficient reasons to re-attract the lost-hearted farmers towards the promising farming system in the same environments.

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Employment Generation Potential of Integrated Farming Systems on Small Farm Situations in India

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The studies were conducted for twelve years at experimental farm of Chaudhary Charan Singh Haryana Agricultural University, Hisar, situated in semi-arid tract of north-west India. The state of Haryana is an agriculturally rich state, however, the land holdings are decreasing and about 76% of cultivators own a land holding of less than 2 hectares each. These farmers face the problem of unemployment or under-employment in one or the other seasons of the year. It is, therefore, essential to develop farm technologies, which may provide round the year employment to these segments of farmers. With these considerations, integrated farming systems models were developed and compared for twelve years at various land holding sizes under different situations. The labor utilization in different seasons for whole the year was computed from the daily data collected from different units. Employment generation was about three to six times higher and uniformly distributed throughout the year in mixed farming systems and specialized dairy farming systems compared to arable farming. Total employment generation and its distribution during different seasons are discussed in this paper.

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The authors acknowledge the contribution of farming system multi-disciplinary research team of CCS Haryana Agricultural University, Hisar in collection of data which enabled the authors the preparation of this paper.

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On-Farm Studies under Rural Agriculture Work Experience (RAWE) Education Programme in India - Some Results

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Chaudhary Charan Singh Haryana Agricultural University started Rural Agricultural Work Experience (RAWE) programme to expose out going final year undergraduate students of agriculture discipline. The students are placed in rural areas and attached to farmers families to study the crop production technology adopted by the farmer family, its techno-economic survey and extent of agriculture extension in the preparation of technology to the farmers. The students are guided and supervised by a team of specialized teachers and scientists from Regional Research Stations and District Agricultural Science Technology Centres. In this programme during the year 2001-2002 a class of 60 students was offered this programme. These students were placed in 15 villages of six districts of Haryana state. Prior to their placement, the students were given basic training for carrying out survey work in the field. Out of the data collected and submitted by these students to the teacher incharge compilation and analysis were made on total income from agriculture including milch and draught animals, expenditure, net income from subsidiary occupation. This data was utilized for finding out net income from agriculture, subsidiary income and income per earning family member of the farmer. The size of holding varies between 3 acres to 25 acres and, therefore, small, medium and large holding farmers were covered in these studies.

The analysis of data on net income reveal that income from agriculture (crops + livestock) was higher under large size holding, however, per unit net income was more under small and medium size holder. Subsidiary income from subsidiary occupation like sale of vegetable, operating telephone booth, preparation and sale of animal feed, operating of a shop was found to be a good source of income to the farmers family. Therefore, income per earning family member per hectare was higher when there was a subsidiary occupation of the family.

These on-farm studies indicate that small farm can give good earning provided sufficient resource base is available with the farmer. The combination of agriculture including livestock with a subsidiary occupation may help in the improvement of the economic condition of the farmer. The studies further reveal that a combination of education and on-farm research and extension programme had better exposure of fresh agricultural graduates to the real ground problems at farmers field and acted as a tool of the feed back to research workers for planning their research programmes.

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Relative Price Index--An Efficient Index for Comparing Integrated Farming System Models

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In agricultural systems number of methodologies and approaches have been suggested for developing models based on resource use efficiency, output and economic analysis. Comparison of different models has inherent deficiency of lacking in their consistency due to variation in prices from year to year. Thus there is need to develop a tool, which can be used as an index for comparing different models. Studies were conducted at Chaudhary Charan Singh Haryana Agricultural University, Hisar (India) to work out an index based on fixed prices (base 1982) which has been termed as Link Relative Index (LRI). The farming system models tested for productivity and return, were compared for their efficiency using a Link Relative Index based on the following formula:

\[
\text{Link Relative Index (LRI)} = \frac{NI_1}{NI_0} \times 100
\]

\(NI_0\) - mean net income of arable farming on 1 ha (base 1982 prices).
\(NI_1\) - mean net income of the system to be compared (base 1982 prices).

The LRI were computed by taking either arable farming as the standard base among farming system models. The results reveal that highest LRI was obtained with mixed farming of three crossbred cows on 1 ha land which was followed by mixed farming of buffaloes on 1 ha land. Conversion of prices at fixed level and then computing LRI eliminated the factor of variation due to difference in prices in different years. CV was worked out for finding goodness of fit of these LRIs in the calculations, which shows large variations in buffalo and arable units.

On the basis of these studies it is revealed that computed LRIs gave a good measure of comparison among various farming system models and this approach can be used for identifying suitable farming systems for various farming situations. The pattern of net income and coefficient of variation also suggests that LRI computed in this study is an efficient index for comparing farming systems.

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Sustainability Approach for Comparison of Integrated Farming Systems Models under Small Holder Situations

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Even after four decades of green revolution, the small and marginal farmers are subject to high level of risk and uncertainty in respect of their income through crop production. Of late, Farming Systems Research, which involves a combination of various enterprises, has been practiced in view of its generating income and labour days. Such findings are based on the information of the net income obtained after subtracting gross expenditure from gross income of the particular model over years. Such comparisons lack the uniformity and consistency due to year to year /season-to-season variation in production and prices. Therefore, there is a need to develop a tool, which may take into account these factors of variability and making a confidence interval at 95% level of significance. Integrated farming systems models were tested for several years at the research farm of Department of Agronomy, Chaudhary Charan Singh Haryana Agricultural University, Hisar- 125004, India., Hisar, since 1984-85. The data recorded in these models were used to develop Sustainable Value Index (SVI).

A Sustainable Value Index (SVI) is the ratio of absolute value of the difference of Average Net Income (ANI) from 1.96 times standard deviation of ANI’s to the maximum net income in the whole period:

\[
SVI = \frac{\text{Abs} \{ \text{ANI} - 1.96 \times \text{S.D.} \}}{\text{Max. Net Income}}
\]

The standard deviation of ANI is multiplied by 1.96 to form 95% confidence interval.

The above value of SVI interprets that larger the deviation among ANIs, smaller will be the numerator of SVI and hence SVI tends to zero. Smaller the deviation among ANI’s, larger will be the numerator of SVI and hence SVI tends to one. So the value of SVI lies between 0 and 1. A value of SVI near to zero gives that model is not sustainable while a value of SVI near to one gives that model is sustainable.

In this way the SVI will take account of both variability and maximum net income over the years in the system. In this paper SVI’s have also been worked out for the prices at fixed base of 1982 to make the various prices smoothened.

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Impact of IVLP on Small Farm Diversification in Chhattisgarh

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A comprehensive Institution-Village Linkage Programme was launched by the Indian Council of Agril. Research in collaboration with the Indira Gandhi Agricultural University, Raipur in the Tarra and Chatoud villages. Primary and Secondary data of these villages regarding agricultural, socio-economic and other allied scenarios were collected by using the intensive PRA techniques and methods. According to the existing various farming systems of these villages, specific problems were identify to intervene for sustainability and stability in these risk prone diversified conditions in which most of the small and marginal farmers lives. These interventions were carried out on the 1000 selected farm families since last 7 years and the data were collected by intensive survey of these families. The findings shows that due to this multidisciplinary efforts of the scientists in these villages more than 70% of the rice area is now converted with the high yielding rice varieties in place of tall, long duration varieties. In rabi season also, the chickpea/lentil crops occupied more than 70% of the area. This area was diversified from the less remunerative grasspea. Other farming systems which includes animal husbandry, fisheries, post harvest value addition activities are also now poular in these villages. This diversification is more popular amongst the small and marginal farmers. The change in variety, crops, use of bio-fertilizers, food security were also reported by the farmers. Other modern activities were also adopted in a sizeable area of these villages. Due to this change, the farmers of nearby villages were also taking interest in modern techniques.

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Diversified Strategic Land Use System for Small Farm Holders Based on Rainwater Harvesting for Rainfed Rice Areas

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Resource-poor, rainfed rice farmers are badly trapped in a vicious circle of poverty--low level of input use--low productivity. Vagarious rainfall distribution often plays an aggravating role in this situation. Droughts are almost a regular feature occurring within a short span of 2-3 years in rainfed rice areas. Worst hit droughts occur in about 5-7 years’ interval, which shatter the economic back of the poor farm family such that it is hardly able to recoup subsequently before the occurrence of the next similar severe drought. The size of holding is small therefore majority of the resource-poor farmers depend on earning from wages to meet their day to day food and the other basic needs. The situation is indeed very alarming and it calls for designing of research based innovative, diversified management solutions that can help the poor farm families to get some earning and employment almost daily on their own farms without sacrificing their basic human dignity and rights. Therefore, this study was conducted with the objectives to, (i) provide round-the-year income and employment to the farm family right on their land with diversified land use without sacrificing total rice output from the farm and (ii) ensure reliable water supply by rainwater harvesting for diversified and remunerative land use system.

An agro-horticulture farming system model was tested in 1.05 ha with a farm pond (1000-m$^3$ capacity) by leaving two-third area for growing upland crops and fruits plants above the pond. Remaining one-third area blow pond was devoted to rice with view that by applying recommended fertilizer dose and harvested water from pond it yields about that much rice that farmer harvested from one hectare rainfed rice field in Chhattisgarh region. Four fruit plants i.e. Drumstic (Moringa olfera), Ber (Zizyphus moritiana), Lemon (Citrus limon) and guava (Psidium gojava) each in 1620 m$^2$ area were planted during July 1999 in the catchment area of the pond (plant to plant spacing of 6m x 6m). Soybean was planted as inter crop between the plantations during wet season. After rice and soybean, chickpea was established in residual soil moisture and a supplemental irrigation was given at seedling stage from the water conserved in the pond. The fruit plants were saved during summer season of 2000 and 2001 by low cost locally fabricated drip irrigation system.

The average seed yields for three years’ (1999-2000 to 2001-02) were 1.1 tons rice from 0.30 ha, 1.2 tons soybean from 0.66 ha and 0.6 tons chickpea after rice and soybean from 0.96 ha. Net return of US$ 198 was obtained from the rice, soybean and chickpea cropping in 0.96 ha area. In addition to the returns from the main crops, an amount of US$ 9 was also obtained during 1999-2000 (first year) from selling of drumstic fruits. In 2000-01 and 2001-02 (second and third years), the fruits were available for marketing from October to June (during dry months). The gross income of US$ 88 and 107 ha$^{-1}$ was obtained by selling of drumstic fruits from 0.162 ha area respectively during 2000-01 and 2001-02. Ber plants also gave fruits for marketing from November to January during 2000-01 and 2001-02 (second and third year). The gross income of US$ 10 and 13 was obtained by selling of ber fruits from 0.162 ha area respectively during 2000-01 and 2001-02. The findings suggest that if a rainfed farmer will adopt drumstic, ber, guava and leman fruits plantations and inter-cropped with soybean in addition to the main crop of rice with on-farm pond, then he will get round-the-year income and employment from his own farm. An enterprising farmer may grow vegetables in the plantation area for better returns over the soybean crop.

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Intercropping Sweet Corn with Legume Cover Crops: Its Effects on Corn Yield and Intercrop Contribution to the Productivity of Dry-Land Farming Systems in Lombok and Sumbawa, Indonesia

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Lombok and Sumbawa are the main islands of the “NTB” (West Nusa Tenggara) Province in Indonesia. In terms of land uses for farming systems, the majority of the arable lands can only be used for dry land farming, especially in Sumbawa island, where the annual rainfall is lower than that in Lombok island. This paper discusses responses of sweet corn to different legume cover crops as intercrops and contributions of the intercrops to the productivity of dry land farming systems.

The experiments were conducted on farmers’ fields at two locations, i.e. Labangka (Plampang district) in Sumbawa and Mataram in West Lombok. In experiment one (Labangka), the cover crops used were wing-bean (*Psophocarpus tetragonolobus* L.), mucuna (*Mucuna pruriens* L.), lab-lab (*Dolichos lablab* L.) and cowpea (*Vigna anguiculata* L.). In experiment two (Mataram), however, mucuna was replaced with peanut (*Arachis hypogaea* L.), while other cover crops were the same as those used in experiment one. The intercrops as the treatments were planted one row between two rows of sweet corn (*Zea mays* L. var. *saccharata*) as the main crop in both experiments. All treatments in each experiment were arranged based on Randomized Complete Block Design (RCBD) with three replicates (blocks).

Results indicated that there were no significant differences in the response of sweet corn yield to different intercrops in both experiments. However, for the same types of cover crops, seed yields of the cover crops were relatively higher in Mataram than those obtained in Labangka. Due to its better economic value, peanut contributed the highest overall economic return among the cover crops. In terms of soil fertility maintenance, these cover crops contributed up to 90-100 kg N per ha to subsequent crops when the fodders were returned to the soil.

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VAM Populations in Rice-based Cropping Systems in Central Lombok, Indonesia

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In Lombok, crops such as soybean, peanut, mungbean and corn are commonly grown in rotation with rice, without fertilizer, so VAM (vesicular-arbuscular mycorrhizas) are potentially important for these crops (Wetterauer and Killorn 1996; Smith and Read 1997; Arihara and Karasawa 2001).

This paper reports part of an extensive field survey of different combinations of soil types and rice-based cropping systems (45 sites) for 2-3 growing seasons to determine the dynamics of VAM in rotations including rice, conducted in Lombok from July 1999 to April 2000. Samples of soil and roots were taken from farmers’ fields on 4 different rice-based systems: upland, once-rice a year, twice-rice a year and “Gora” rice, 4-5 sites per system (5 replicates per site). The first sampling was during the non-rice season in 1999, around crop maturity or in fallow. The second and third samplings were during the following rice season, at the early vegetative stage and maturity.

There were significant differences (P<0.05) between systems in levels of root colonization and transparent-spore numbers, especially during and at the end of the rice season, being lowest in twice-rice and highest in upland and “Gora” rice. The percentage of black (presumably dead) to total spores (%BkT) at the end of the rice season was significantly different (P<0.05) between systems, being highest in twice-rice and lowest in “Gora” rice. This difference in %BkT was much larger when the crops before rice were non-legumes compared with legumes. The implications of these findings for growing VAM-dependent non-rice crops after rice are discussed in relation to the generally low capability of the majority of the farmers to afford inorganic phosphate fertilizers for their non-rice crops.

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Sustainability Analysis of the Irrigated Vegetable Project at Banco Village, Mali

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Winrock International has been working with farmers in Banco village to restore a 5-hectare irrigated vegetable field located alongside the River Niger 30 km from Bamako. Approximately 70 women and men from the village have been cultivating individual plots during the 2001/2002 dry season. Winrock provided a diesel pump to replace the previously broken diesel pump, and Kilabo (the local NGO responsible for overseeing the project) along with the Banco growers association expressed a commitment to providing better management and achieving better results. However, from the onset, inefficient pump usage, mechanical problems, and poor management led to repeated pump breakdowns, growing frustration among the Banco growers, and the projects early collapse. This is the latest in a series of NGO funded irrigated vegetable production activities in Banco since 1987.

Most families in Banco consume their grain supply of millet and sorghum within five or six months after harvest. Generating sufficient income to keep their families fed and healthy is a considerable challenge for adults in Banco. Vegetable production is valued as an important source of income in Banco, and at times totally 50% of household earnings for some growers. A primary objective of the irrigated vegetable project is to be self-sustaining, therefore requiring that participating farmers pay all operating and repair costs in addition to a three-year reimbursement plan for the pump. The choice of a diesel pump has proven problematic in achieving this state of financial independence. Alternative water-lifting options include hand lifting, treadle pumps, gasoline pumps, solar powered pumps, and drip irrigation.

The treadle pump and hand lifting from wells are shown to be the affordable, practical alternatives. If Banco can establish a well-organized, profitable garden using either of these simple, appropriate means, they could eventually conduct an economic feasibility analysis to determine if the garden association could finance and successfully transition towards small gasoline pumps. This poster will describe the lessons learned from the difficulties experienced at Banco, analyze the alternative water-lifting options, and then outline a future course of action that has the best chance of achieving long-term success.

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South Carolina Consumer Survey Indicates Market Opportunities for IPM- and Organically-Grown Produce

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Organic is one of the fastest growing agricultural markets in the U.S. Sales of organic products have increased on average by 20% annually since 1990. South Carolina farmers could participate and potentially profit from expanding organic markets because of the long growing season and the proximity of rural farming communities to large metropolitan centers. Before farmers explore organic markets, it would be helpful for them to have information on local consumer attitudes related to purchase of organic products. The purpose of our study was to conduct surveys to assess local consumer preferences for IPM- and organically grown produce to determine if market opportunities exist. The majority of those surveyed expressed concerned about the health effects of pesticide residues on produce, and that if given a choice, they would prefer to purchase produce grown using IPM or organic farming practices compared with conventionally produced produce. Results also indicate that consumers would preferentially purchase IPM or organic produce to produce grown using conventional pest control methods if labels/information were labeled to reflect pest management practices. Survey respondents also indicated that they would accept produce with slight blemishes provided that they had knowledge that IPM/organic practices were used. They also indicated a willingness to pay more for IPM/organic produce than for conventionally grown produce, even if the IPM/organic produce had slight cosmetic blemishes.

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THEME 2
ENGAGING STAKEHOLDERS
IN SUPPORT OF SMALL FARMS
POSTER ABSTRACTS

Listed in alphabetical order by presenting author.
Presenting authors appear in bold.
Review of the Benefits and Costs of Flood Defence Options on the Somerset Levels and Moors

Joe Morris, Alison Bailey and David Gowing
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The Somerset Levels and Moors, an Environmentally Sensitive Area (ESA), are the largest body of lowland wet grassland in the UK. The natural and human characteristics of the area are largely defined by the interface between land and water, and in particular by a long history of flood defence, land reclamation, and farming practice.

Changing priorities for rural land use and pressure on flood defence budgets have encouraged a review of flood defence objectives and methods. The benefits and costs of flood defence for three main elements, agriculture, nature conservation, and urban property, were examined for three standard of service options:

• the continuation of the existing flood defence regime (Scenario 1)
• a ‘do-nothing’ option, implying a reversion to pre-drainage conditions (scenario 2), and
• an intermediate option involving managed storage of winter flood water on the Moors (scenario 3)

Impacts on other interests, such as tourism, recreation, fisheries, archaeology, and the peat and withy industries were also examined.

The study concluded that managed storage of winter flood water on agricultural land could, through suitable incentives to land managers, help balance conservation and farming interest, whilst potentially reducing the risk to urban areas in the catchment. Managed winter storage would be mainly beneficial for tourism, recreation, fisheries and archaeological interests, but detrimental for the peat and withy industries. There is scope for a modified flood regime set in the context of a revised agri-environmental and rural flood defence policy instrument.

The study recommended that the feasibility of modified flood regimes could be explored at the scale of individual catchments and hydraulic units, simultaneously recognising the interconnectedness of the whole flood defence and drainage system.

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Social Capital in the semi-arid (Sertão) of the State of Bahia: An Organizational Experience of Small Farmers in the Municipality of Valente

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State University of Campinas - UNICAMP

The Small Farmers’ Association of the Municipality of Valente (APAEB-Valente) is a socio-economic organization set up by the civil society, managed by the social movements of the sisal producing region and supported by national and international NGO’s. In our study we analyzed the Social Capital and showed that, through the organization, coalition and active participation of the small sertanejo farmers, it was possible to stimulate the active construction of social capital and, as a result, promote the strengthening of the social, economic, ecologic and cultural bases of the development process of a traditional sisal producing area in the state of Bahia. The APAEB-Valente, therefore, is considered by us as being an important agent in the building of a development model adapted to the environment of a semi-arid, as well as being a concrete positive reference for future public policy proposals for the sustainable development of rural areas in the state of Bahia.

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Conflicts, Resolutions and Management

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Case study on Karusandara land and River Sebwe conflict between Farmers and Pastrolists.

The Communities in the semi arid land area of Karusandara in Kasese District Uganda that include farmers and cattle keepers started conflicting over the land in 1994 the conflict lasted for three years.

With population increase and arable land becoming scarce, conflict in natural resources arises from the competing demands placed on the resources by different claimants in case the conflicting group came from the Mountains were land became scarce.

In Uganda with its diversity of tribes, each with its own culture, the major sources of the conflicts is the ethnic diversity of resources users, which has complications for resource demands.

For example a serious conflict that erupted in Karusandara when the ethnic Bakonjo expelled Basongora from the grazing land and water source of sebwe aiming to start cultivation of Cotton maize and other crops, therefore denying the Basongora from using the land for grazing their animals and using the water.

This conflicts affected both men women, children and caused death to some people from both sides of the conflicts.

In this case study we shall be able to understand the major causes of conflicts and to get the communities opinion concerning the resources, we shall present the result of our investigation and the involvement of the stake holders in resolving this conflicts.

During the workshop we shall share knowledge and experiences gained from the study with other stake holders with a view to improve on the resource management and at the same time managing conflicts.

The recommendation that we gave out shall be shared during the presentation of this paper, that helped to end the conflicts and get better solutions that aimed at sustainable land and other resources use and management in the area.

The complex of values and rules that now exist in the community that serves as a basis often to be enriched with new elements for the creation of local institutions for resource management.

Lastly we shall discuss during the presentation sources of conflicts, that include Socio-economic conflicts, Politics, Legislation and others.

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Conflict in Human and Natural Resource Management: The Case of *Saba senegalensis* in Southeastern Senegal

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Human and natural resource conflicts are becoming more and more prominent throughout the world, particularly in the resource-poor Third World. In southeastern Sénégal today the local population, specifically women and children, has recently begun to harvest a wild fruit (*Saba senegalensis*) from surrounding forests for local consumption as well as for export to markets in larger cities such as Dakar, Tambacounda, and Bamako. As the natural resource base in this region of Africa is quite degraded, shifting cultivation practices and slash-and-burn agriculture are common. As a result, many animal populations face impending habitat destruction. This competition for scarce natural resources brings the human and animal populations into unnaturally close contact. Conflicts have also arisen around the use of human time, labor, knowledge, and information as well as issues of the long-term sustainability of fruit extraction.

While initiating my research in Kédougou during the summer of 2002, I had the opportunity to live with, work with, and learn from the Bassari, Bedik, and Malinké people. Using a key informant approach, I was able to determine the most significant participants in the harvest and marketing of *Saba*. These stakeholders were asked to discuss issues regarding environmental services, human-animal competition for forest resources, and the economic issues surrounding this harvest. By drawing on local expertise, I was able to refine my research to address those areas that appear to be of greatest priority to the local community, and which also meet my own needs for timely analysis.

The poster will discuss the human and natural resource conflicts stemming from the harvest of *Saba senegalensis* in and around Kédougou, Sénégal, focusing primarily on the gendered conflict over the use of time, control of capital, and on the long-term sustainability issues relating to high levels of forest resource extraction, for both humans and animals. The intent of this research is to contribute to the analysis of the sustainability of the human, animal, and *Saba senegalensis* populations in southeast Sénégal.

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Interactions between Plains Grass (*Stipa Aristiglumis*) and the Quality of Surface Water Passing through Liverpool Plains - A Case Study with the Herbicide Atrazine

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Floodplains of North-Western NSW are one of the most productive grain regions in Australia. Intensive agriculture and summer rainfall initiate erosion and water runoff, which cause soil degradation. These are the major reasons for deteriorating water quality of the Liverpool Plains (LP) floodplains through agro-chemical pollution.

The native grasslands patches, dominated by Plains Grass (*Stipa aristiglumis*), have been reported to have possible “biofiltering” effect on chemical contamination. Foreign research has proven this effect suggesting increased water and soluble pollutants infiltration and retention. This study aims to understand and describe the *Stipa aristiglumis* ecosystem interactions with adjoining agroecosystems and its potential for grassland conservation and for improving water quality in the LP floodplains.

The research tries to determine the seasonal variations of herbicide atrazine concentration in runoff water, determine of how grassland affects atrazine concentration in runoff water and determine the effect of atrazine in runoff on *Stipa* grassland ecosystem properties. A study on identification of key soil biological responses to atrazine, and atrazine-degrading microbes in particular, was performed. Based on the research findings a plan for reintroduction of *Stipa* grasslands on larger catchment scale will be developed. This is with aim to help farmers decrease the environmental and economic risk associated with flooding.

The research descriptive phase included monitoring of catchment water quality (using rising water stage samplers) and measuring changes in soil and vegetation (baseline survey). The analytical phase concerns identification of some interaction mechanisms between grassland vegetation, soil microbial and physico-chemical parameters and atrazine degradation (soil incubation experiment performed in June 2002). An evaluation of benefits from reintroduction of *Stipa* in Strategic LP locations will be executed.

The preliminary results show differences in atrazine concentration in runoff water passing through crop fields and grasslands. This may affect (in case of small but regular floods) grassland vegetation, soil and water quality. A soil incubation experiment results suggests that soil biological response, and especially atrazine-degrading microbial communities, could be an indicator of changes to soil ecosystems resulting from agricultural management.

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Institutionalizing Participatory Plant Breeding in the National Agricultural Research Systems: Issues and Future Challenges

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R. Thakur
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On-farm research and participatory breeding program came into prominence during the early eighties. One of these examples is the participatory rice breeding research that was carried out at the Narendra Dev University of Agriculture and Technology (NDUAT), Uttar Pradesh, India in 1980s. However, inspite of the potential advantages of this innovative approach, this effort did not sustain and failed to be integrated within the national agricultural research system. Concerns for the active participation of farmers in the process of crop varietal improvement were revived in late 1990s, which led to the launching of a “system wide initiative” on participatory plant breeding involving several centers of the Consultative Group on International Agricultural Research (CGIAR), NARES and NGOs. The International Rice Research Institute (IRRI), in collaboration with four research institutions under the Indian Council of Agricultural Research (ICAR) examined why the efforts in 1980s were not sustained and initiated this study in the rainfed region of eastern India. The results of this study clearly demonstrated the importance of early participation of farmers, right from the identification of the traits that farmers look for in a genotype all the way to the selection of fixed lines having the desired traits. Such an importance is also pointed towards well laid out protocol of participation between researchers and farmers and among the team members of research. Likewise the findings show the need for pursuing these efforts through and within the existing “national norms” of developing, release and promotion of genotypes and to bring in the needed changes gradually through the system.

This paper provides details of relevant and practical strategies for institutionalizing this approach in the national agricultural research systems.

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Developing Community-Based Land and Water Management Practices for Sustainable Production on a Landscape Continuum: A Case Study of the Manupali River Watershed, Bukidnon, Philippines

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Inappropriate agricultural practices, coupled with deforestation for acquiring new lands have resulted in high rates of soil erosion and the degradation of land and water resources. In view of these concerns and to develop community-based land and water management practices for sustainable production on a landscape continuum, a study was undertaken in the Manupali River Watershed, Philippines. The approaches employed in the study included farm surveys, field measurements, farmers’ focal group discussions, ocular inspections and longterm climatic and land use data analysis.

The results indicate that the owner operators held 59% of the lands, rentees 25%, certified land title (CLT) holders and mortgages 6% each, and tenants 4%. A majority of the farmers (62%) are in-migrants and the remaining natives. Farmers grow a variety of crops, 70% corn, 15% vegetables, 15% coffee, 3% rice, and 1% sugarcane. Adult men provide 80-100 percent of the labor requirements and women contribute from 15-40 percent.

The important factors affecting the crop yields were soil erosion and fertility, pests and quality of seeds. Soil erosion not only affected the productivity in the uplands but also influenced the irrigated rice in the lowest landscape through siltation, and decreased irrigation water availability and its quality. While siltation differed among canals, the siltation load was increasing, as some canals silted up in 2-3 months time from previous desilting. Thus, inspite of no evident decline in the rainfall over time, the irrigation capacity of the system was decreasing. The main contributory factors to soil erosion were farmers’ land and soil management practices with respect to a crop and constraints and incentives to soil conservation measures among different types of land operators.

Farmer’s perceived and in some cases the actual soil erosion control measures included trees, hedgerows and vegetative strip planting, constructing ditches, contour plowing, zero tillage and erosion barriers. For these, the capital scarcity was a constraint for owners and tenants alike and irrespective of having a commercial or subsistence oriented production system. Low perceived return on labor and capital investment for soil conservation practices was a concern among poorer farmers and no return on such investments on rented lands by the renters as was the cost of trees for those who were interested in planting trees.

Currently used land rental agreements discouraged the long-term soil erosion control measures, such as the planting of trees. Planting of trees on equal sharing basis for a specific period of time was a consensus that emerged between owners and renters. This would, however, need modifications in the written rental agreements, specifically stipulating the control of planted trees by the renter who planted them beyond the life of land rental contract, even if the land may be subsequently given to another renter. Similarly, stipulation of other soil conservation measures may subsequently have to be included in all tenancy contracts.

This study found the social component of employing the erosion control measures more important than the technical aspects of it. Therefore, the social aspects, which are the
prerequisites for applying the erosion control technologies, may have to be dealt on priority than
developing these technologies. Other details of this study are presented in the poster.

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Participatory On-Farm Hydrological Interventions for Restoring the Productivity of Degraded Uplands in the Chhotanagpur Plateau, India

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The cultivated uplands in India cover over 5.0 million ha. In the eastern region, particularly the Chhotanagpur plateau, they are grown to rice in the wet season. Low rainfall and short rainy season, modest to steep slopes, high run-off, lateritic, coarse textured, low fertility, low water holding capacity soils and frequent drought are characteristics of these lands. Land terrain in this area limits the possibilities of large scale gravity irrigation and some social conflicts related to the landholding and inheritance patterns and to the collection and sharing of rain water restrict the community level efforts on rain water management. Because of these, the crops suffer from drought and the productivity and the cropping intensity are low throughout the region.

With these concerns, “an individual on-farm approach” for run-off management, i.e. run-off collection in dug-out interceptors and using it for subsurface irrigation (both operations within the same farm), was jointly developed with the farmers and tried at Handio and Khorahar villages in Hazaribagh District, Chhotanagpur Plateau, India. Farmers dug out the interceptors at specified designs in 1996, and thereafter grew rice under their own level of crop management. Crop performance was compared with the adjoining lands without interceptors under similar level of management.

The four years rice farming results indicate that the run-off interceptors provided an advantage to rice in all the situations. Rice grain yields were only about 1.0 t/ha or less in the control fields (without interceptors) and were significantly higher with the interceptors. The increase in rice yields due to interceptors was from 31 % to 95 %, depending on the specifications of the interceptors, position of the rice fields in the landscape with respect to the slope of the lands and the number of cropping season after digging the interceptors. Generally, broader interceptors at closer spacing intervals along the slope provided the greatest yield advantage. The lower fields benefited more (60% yield gain over control) than the upper fields (13% yield gain over control) on lands with steep slopes, but both types of fields in lands with modest slopes benefited equally (both about 40% yield gain) from the interceptors. The benefits of the interceptors to rice yields were progressively incremental over time, 36% in the first year to 70% in the forth year. Such a yield advantage was primarily contributed by increased plant population, higher number of filled grains and higher harvest index. In 2000 wet season, a severe drought year, only fields with interceptors were able to produce any grain yields; others had a total crop failure.

On-farm interceptors therefore provide a practical way of achieving a higher and stable crop productivity in complex social and physiologically unfavorable situations. Other details of this technology on crop, soil and hydrological parameters are provided in the poster.

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Engaging Stakeholders and Transforming Institutions through Participative Learning -- Experiences from Research and Extension

N. Sriskandarajah, J. Jennings, M. Ison, R. Packham and M. Friend

With the widening acknowledgment of the multifunctional nature of agriculture and landscape and the linking of food production to environmental protection, there seems to be a greater recognition of the need for farming systems researchers to broaden perspectives, co-operate across boundaries and build closer links with multiple levels of stakeholders. For researchers and organisations within traditional agricultural knowledge systems, these new demands are already presenting immense challenges in how they refashion their skills, attitudes and worldviews towards inter-disciplinary and inter-institutional cooperation. For progress to be made in this arena, changes in the approach and disposition of the research and extension professional have to be accompanied by changes in the agencies which support the research and extension, particularly public sector agencies and producer bodies that have traditionally funded such activities. Also, stakeholders themselves have to become actively orientated to the level and quality of engagement expected of them in the process.

This paper discusses the present situation by drawing examples from farming systems research and extension activities in the field and also proposes ways of enhancing institutional learning.

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Long-term Agronomic and Environmental Effects of Rock Wall Terraces in Southern Honduras

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The steeplands of Honduras are home to more than 40% of the country’s population and yield 73% of the country’s basic grains. As the steeplands are cleared of the native forest cover, their susceptibility to landslides increases 20 to 31 fold, leading to degradation of the production potential of the field and resulting in sedimentation problems downstream. Soil characteristics and crop production on 30% to 60% slope steeplands in southern Honduras was evaluated for the period 10 to 13 years after rock wall terraces had been installed. The soil characteristics on the terraced sites were significantly better (e.g., deeper A horizon, more organic carbon) than on adjacent non-terraced sites. This was associated with sorghum and maize yield being significantly better on the terraced sites than on adjacent non-terraced sites. The difference in sorghum yield between the local variety and region’s best-producing hybrid (DVM-198) was greater on terraced sites than the difference between the local variety and the hybrid on adjacent non-terraced sites, indicating that application of hybrid technology paid greater dividends on the terraced sites. Terraces moderated the impacts of drought in the context of maize production.

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Rural Development Planning with Community-Involved Verification Projects

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It is important to consider capacity of target beneficiaries and sustainability of rural development as well as community participation when formulating a master plan (M/P). There has, however, been no real consensus as to what community participation is, and how to carry out such an approach. JICA conducted a “Development Study” to formulate a M/P that centers on improving the living standard of the target beneficiaries in Arid and Semi-Arid Land Area (ASAL) with Verification Projects in Kenya from 1999 to 2001 offering a chance to try out various participatory approaches.

The study employed both top down and bottom up approaches. Besides a conventional sector wise planning, the study integrated three participatory tools, 1) Rapid Rural Appraisal (RRA) to work for the people, 2) Project Cycle Management (PCM) workshop to plan projects with the people, and 3) Participatory Rural Appraisal (PRA) for development by the people. Considering different local conditions, especially its vulnerability and risk-proneness in ASAL, a Basket of Choices by R. Chambers was proposed as the development approach together with inter-village monitoring tour. The tour so motivated the participants that each side became willing to try the other’s activities from the basket with various project components that could meet the different local conditions. Improved Jiko (stove), rainwater harvesting and buck (breeding goat) schemes were evaluated high performance among several Verification Project components.

The Verification Projects, selected from the basket, provided the procedure and constraints, so-called How and Limit, in their implementation. The inter-village monitoring tour played a great role of extending a project to other areas through people-to-people extension. These outputs were utilized in refining the M/P. Throughout the Verification Projects, ownership of the community in project implementation was nurtured. It is concluded that a people-centered approach in project planning with the Verification Projects, could be the core of remedial measures for improving rural living standards.

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THEME 3
FARMING SYSTEMS KNOWLEDGE AND INFORMATION SYSTEMS POSTER ABSTRACTS

Listed in alphabetical order by presenting author.
Presenting authors appear in bold.
Mining Agricultural Information Through Metadata Repositories

Carlos Caldeira
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With the rapid expansion of the agricultural information base and the user community in the decision support system area, efficient and effective discovery and use of the resources in the global information network has become an important issue in the research into agricultural information systems.

The first major challenge of an agronomic information system is the diversity of agricultural related information: books, papers, technical reports, images, weather data, soil data, commercial data, geographical data, and many other types of information.

Since users have the full freedom to link whatever information they believe useful, the global information base is huge, heterogeneous, in multimedia form, mostly unstructured, dynamic and inconsistent, which creates great difficulty in systematic management and retrieval in comparison with the structured data in most relational databases applications.

In this paper, is proposed a data mining approach to facilitate information discovery in agricultural information base, i.e., to turn mountains of data into strategic information. Data analysis and management tools typically have not supported the documentation of data (metadata), so scientists must manually maintain all information pertaining to the context of their work. This metadata is critical to the effective retrieval and use of the masses of archived data, yet little of it exists in an accessible format.

An information management system has been designed and developed to gather agricultural data as a graphical interface between the user and decision support systems. Its infrastructure can be used for a great variety of different applications. A relational database management system was developed for use in an IBM-compatible microcomputer with Microsoft Windows environment and using Microsoft Access. This database, called AGROSYS, is intended to replace the ordinary plain file system by a structured information system. The prototype provides an easier to use source of input data then ASCII file system because it is structured on a relational database. Its GUI interface has greatly improved the accessibility and usability of many types of data.

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A Generic Household Model for Assessing the Impact of Interventions in Crop-Livestock Systems

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A generic bio-economic mathematical programming household model was developed with the objective of assessing the impact of management interventions on the performance of tropical smallholder farming systems and the livelihoods of farm families depending from them. The model is designed to run for a period of one year in monthly timesteps and can deal with multiple objectives of the farm household. (i.e. maximise gross margins, minimise nutrient losses or minimise risk amongst others). The model explicitly incorporates on and off farm resources (land, livestock, crops, forests) and their seasonal management, farm household food security, off-farm income generation, labour constraints and risk. Results from crop/dairy systems in Bolivia and Kenya suggest that the structure of the model can accommodate a wide variety of systems descriptions and that it is sensitive to the constraints usually faced by smallholders in the tropics. This makes the tool ideal for trans-regional systems comparisons, for studying trade-offs in the use of resources in smallholder systems and for identifying the most sensitive variables determining the performance of farming systems in the tropics.

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An Integrated Modelling Platform for Animal-Crop Systems

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A tool was developed to provide a unifying modelling framework with the necessary tools/methods for assessing the impacts of alternative management practices or policy interventions on the livelihoods of smallholders and their systems. Information was collected on the minimum data required for characterising and analysing mixed farming systems. This activity was based on data collection protocols previously developed and subsequently modified for representing a wider range of agro-ecological systems. The major types of information collected relate to the characteristics of the farm households (household size, labour time budgets, off-farm income and food security) as well as the physical components of mixed farming systems (land, crops, soils, pastures, labour availability, number of plots, etc) and their management practices. Data were also collected on prices of inputs and outputs and nutrient composition (at present only nitrogen) of all resources in order to represent economic and nutrient flows for each system.

A computer programme was designed on the basis of this information with user-friendly interfaces for storing worldwide descriptions of farming systems in easily accessible databases. This forms the core module of the IMPACT tool and it is designed so that it will generate standard data files for running a variety of both detailed crop (eg DSSAT) and livestock models for testing alternative management scenarios and their effects at the whole system level. The tool also generates the necessary data for whole farm household optimisation studies and can be used for comparing different features of farming systems throughout the world.

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Agricultural Technology and Poverty - Socio-Economic Constraints and Opportunities for Generation and Dissemination of New Technology among Poor Farmers (ATP)

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Center for Development Research.

*Bernard Bashaasha* and *Richard Miiro*
Makarere University, Kampala, Uganda.

*Faustin Maganga, Cosmas Sokoni* and *Shekania Bisanda*
University of Dar es Salaam, Tanzania

The ATP research programme aims to critically examine the background, logic, implementation, and effectiveness of participatory approaches to technology development and thereby to enhance the understanding of socio-economic constraints and opportunities for generation and dissemination of technology among poor farmers. ATP aim to assess the relevance of the new approaches to generation and dissemination of technology for poor farmers, in terms of increased productivity and improved household food security among poor farmers, together with locally adapted and environmentally sustainable solutions to agricultural problems. ATP seeks to enhance the understanding of the social, economic, political and institutional constraints and opportunities for new approaches to generation and dissemination of technology among poor farmers in East and Southern Africa.

ATP provides a common framework for research for a group of senior researchers and PhD students from Denmark, Uganda, Tanzania, Kenya and Zimbabwe.

**Conceptual model for the ATP research programme**

![Conceptual model for the ATP research programme](image)

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Small Scale / Small Field Conservation

Arnold D. King and Lynn Betts
Natural Resources Conservation Service, Ecological Sciences Division, Washington, DC, USA

Natural resource problems occur on land units of all sizes. The new publication "Small Scale / Small Field Conservation is intended to help solve natural resource problems using simple conservation practices and concepts. Meant for small fields, or relatively small-scale operations, the practices featured can be designed and installed with a small investment of time and money. The booklet should serve to give the basics - additional technical help may be necessary from the Natural Resources Conservation Service at the local USDA Service Center.

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Exploring Impact Assessment Methodology for FSR&D

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Musleh Uddin Ahmed
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The history of Farming Systems Research and Development (FSRD) is over two decades old in most of the countries and impact is common demand by most donors in many countries. Currently, there are several projects in many national agricultural systems related to FSRD. However, national and international funding agencies frequently inquire about the effectiveness of these projects. Even though, most projects have been evaluated and the output of the project is known, the final outcome is not well documented. This occurs mainly due to the complexity of the impact study. There is a lack of concrete and appropriate methodology for an accurate FSRD impact study because it is a newer innovation in the area of agriculture R&D. An effort to develop a methodology for better documentation was tested by the Thana Cereal Technology Transfer and Identification project in 2000/01. To correctly describe the process, critical differences in terminology, such as output, outcome, indicators, impact, and evaluation were defined for clarity purposed. Along with this, tools, techniques, selection criteria, and the various levels for impact study were explained unambiguously. This methodology, Participatory Rural Appraisal (PRA), was helpful for selecting impact assessment indicators at various levels with explicit illustrations of qualitative and quantitative standards. Details of the methodology and assorted results of the study are illustrated on this poster, so that it may serve as a guideline for other projects in the world. Stakeholders should select indicators for assessment at the time of project design. This should be done because few impact assessment indicators are common in different crop production projects. Examples of this include: yield sizes of different crops in comparison to farmers’ plots, increase of production with additional crops, value addition of produced crops, coverage of new crops or varieties, total increase of income and nutritive values, training for NGO, entrepreneurs, extension, research and others officers, stakeholders, and other such indicators which depend on objectives and location. The results of a case study of the impact assessments that TCTTI conducted at various levels are illustrated:

Some of the Indicators:

<table>
<thead>
<tr>
<th>Promoting sustainable agriculture</th>
<th>Safeguarding the environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promoting integrated water</td>
<td>Improving performance of</td>
</tr>
<tr>
<td>management</td>
<td>agricultural research</td>
</tr>
<tr>
<td>Promoting women’ roles</td>
<td>Increased production of</td>
</tr>
<tr>
<td></td>
<td>seeds and food</td>
</tr>
<tr>
<td>Promoting integrated pest</td>
<td>Building information</td>
</tr>
<tr>
<td>management</td>
<td>resources</td>
</tr>
<tr>
<td>Strengthening country level</td>
<td>Varying impacts at personal,</td>
</tr>
<tr>
<td>shortage impacts and country</td>
<td>family,</td>
</tr>
<tr>
<td>success in global context</td>
<td>village, union, upazila, and national levels</td>
</tr>
</tbody>
</table>

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Integrated Farming Systems for Sustainability in Agriculture. - A Review

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Integrated farming system approach is one of the ways where in the risk in dealing with component can be through effective recycling. Long term studies in many integrated farming systems have clearly indicated that farming system approach using farm pond water judiciously have clearly shown that horticultural component with dry land Ber could provide an income of Rs. 35 to 40 thousand/ha followed by mulberry cultivation Rs. 20,000/ha and pasture management Rs. 8,000/ha as against Rs. 4,000 to 5000/ha from best arable cropping system. It is also increased cropping intensity to 300 per cent as against 200 per cent. The ploy culture fingerlings studious revealed that the net in come under the integrated farming system was Rs. 15,145/acre (0.4 ha) while Rs. 9.010/acre (0.4ha) was obtained from the cropping system, rice-rice-green manure. In commercial poultry farm, cost of production per egg will be around 42 paise. By way of reducing the feed cost, the cost of production per egg under integrated farming system was reduced to 19 paise. The employment opportunity generated due to integrated was 73 man-days and 246 women days while in pure cropping it was 68 man-days and 180 women days. It was been quantified that 500 layer chicks are sufficient to provide required quantum of excreta to meet the feed requirement of 7500 ploy culture fingerlings in a hectare of ponded water. The feasibility of inducing dairy as an enterprises was studied that the additional income generated from farming system over the existing cropping system done was Rs. 11,478 per year. The additional employment generated with cattle was 309 man day over existing cropping system.

Another studies under rice-rice-azolla plus fish farming revealed that there was slight reduction in rice yield under rice-rice-azolla plus fish farming due to the presence of fish trenches, which occupied 10% of the area. The soil fertility status indicated that in general there was an increase in the available nutrient after completion of cycle. This might be due to degradation of azolla, fish manure and fish feed under these system. Under the studies of agro-forestry management observed that agro-forestry systems invariability give higher economic returns over pure arable crops. The monitory returns of pure crops like groundnut (Rs. 5,330), pearl millet (Rs. 300/ha), Pigeonpea (Rs.616/Leucaena (Rs. 6117/ha) were lower than crops grown in alleys with Leucaena. highest being with leucaena alley + ground nut (Rs. 6489/ha).

The farming system experiments conducted at University of Agricultural Sciences, Dharwad (Karnataka) for 10 years. Resulted indicated that average net returns, compound income, net returns, compound income, net present value (NPV) and interval rate of returns (IRR) are all higher in agro-forestry system as compared to growing only agricultural crops. Similarly, benefit cost ratio (BCR) as 11.13 in agro forestry treatment with arable crops plus teak plus papaya with pay back period (PEP) of 1.15 year as against 9.48 BCR and 0.5 year PEP in only agricultural crops. This paper critically reviews the existing information on different components of integrated farming systems supply and management of input and output integrated farming systems for sustainability in agriculture in India and indicates the possibilities of mobilizing non traditional farming system towards increasing over all production in agriculture.

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Farming Crop Information Systems

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The European Union’s common agricultural policy (CAP) was changed in 1992; the subsidies of production were replaced by area based subsidies. This led in Denmark to the construction of a control system based on a national register of agricultural information (GAR/CHR) and a field block map, both managed by the Danish Ministry of Food, Agriculture and Fisheries. This register stores among other things the yearly claims for subsidy from more than 60,000 farmers, information on husbandry and fertilization etc. In 1996 this control system was taken into use for the first time. The Remote Sensing Unit at DIAS has since 1992 performed a part of the control of the area based subsidies by remote sensing. After 1996, new digital topographic information became available, which changed and improved the used techniques. These techniques are still being improved. This paper describes how the identification of the agricultural crops is performed using these new opportunities and the utilization of the new register for an annual land use mapping.

The LPIS also changed the Controls with Remote Sensing. DIAS has now built a system CABS that are totally based on the use of the LPIS. Farmer drawings directly using the Internet would ease the controls, since these digital lines can be used directly in the remote sensing controls. In many cases the LPIS-blocks only contain one field and one crop type with well-defined digital outer limits. No digitization is needed in these cases and the information on the crop types can ease the collecting of reference data. Due to the LPIS it is now possible to use information on the crop types placed long away from public roads without disturbing the farmers and direct the collecting work on less dominating crops.

As an extra benefit the subsidy data based on LPIS now find use in research and decision support systems in Denmark. It is now possible to use this register for an annual land use map giving 95% accuracy 95% of the time, nearly without field work.

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Using Household Survey Data to Define Farming System Strategies in Uganda

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Better information about the nature and extent of farming and livestock management systems in Uganda is key to the development of sound policies for sustainable agricultural growth. An important step in building this information base is to determine what are the different farm system strategies and where are they being implemented. Identifying spatially explicit farming system strategies can help both policymakers and stakeholders to make more informed and targeted decisions that result in improved human welfare, enhanced competitiveness, and sound use of environmental resources.

The increased availability of information-rich, geographically-referenced household survey datasets at national or near-national scales makes this task achievable through the use of spatial statistics and analytical techniques utilized in geographic information systems (GIS). We explore the implementation of these methods through analyzing data from the 1999-2000 Uganda National Household Survey. This work places emphasis on methodological considerations deriving explicitly from this dataset, especially those considerations that are likely to be relevant for similar projects elsewhere.

The results of this study show how researchers can take advantage of the wealth of information available in geographically-referenced survey data to better understand the associations and spatial dimensions of agricultural livelihood choices practiced in the developing world. Further work in this area includes comparing the estimated farming system extents with measures of natural resource availability and other environmental and geographic characteristics of the landscape of Uganda in order to provide a stronger information base for policymakers and stakeholders to draw on.

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The Agroecology As a Reproduction Strategy of the Family Units and the Building of a New Environmental Perception: The Case of Rio Braço Do Norte Basin in Santa Catarina State, Brazil

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In the cities of Rio Fortuna, Santa Rosa de Lima e Anitápolis, situated on the hillsides of Serra Geral, Santa Catarina state, we can observe the presence of two local visibly antagonistic development plans. One of them was conceived in a developmental proposal which is based on conventional agriculture activities as horticulture, production of tabacco and charcoal, monocultures of the Pinus and Eucaliptus, industrial poultry and pig breeding, as in the presence of relationships with agroindustries from the region. The other is based on a project of sustainable development from the association of people, from the solidary credit and integration of activities like the agroecologic production, the little agroindustries and the agroturism. From semi-structured interviews and field appraisal, it’s searched to know the viewpoint on environmental by farmers and the strategies of reproduction of the familiar units. It’s also searched to establish the relation between the strategy of living together adopted and the option for one or other development proposal. Farmers’ perception on environmental impacts resulting from climactic changing and anthropics actions in the environment, as the deforestation and forest fires, about social-culture aspects, economic and other related to the ambient legislation and the forms of use of the land are presented and analyzed. The forests monocultures and organic agriculture are discussed as examples of strategies and opposing conceptions of development. One becomes related and one opposes these perceptions to available technician - scientific information on the region, searching to identify to convergences and divergences. From these analysis, the main identified convergences points are the increasing reduction of the rural population in the region; the establishment of relations between the presence of forest and the streamflow reduction; forest monoculture influencing waters resources depletion, and expansion of vegetal coverage. Thus, one concludes that the proposal of the agroecology in development in the region, inserted inside of a plan of sustainable and solidarity development, it constitutes in a strategy that favors the attainment for the family farmer without the negative ambient impacts. The demographic situation of the city of Santa Rosa de Lima, seat of the Association of Ecological Farmers of the Hillsides of Serra Geral, that shows up a tax of annual growth positive and upper to Rio Fortuna and Anitápolis; the observed ambiental perception in some of the partners, and the growth of the agroecology in the region constitutes indicative of that the principles that move the adepts of this proposal are contributing for a new perception of the environment and for the rescue of the quality of life of the farmers.

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Listed in alphabetical order by presenting author. Presenting authors appear in bold.
Drip Irrigation Technology for Small Holder Farmers in the Dry Lands

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Bucket Irrigation systems is simple, water saving and very effective way to irrigate small gardens in the dry lands, water flows into the drip lines from a bucket placed 1 to 1.5 metre above the ground to provide pressure.

Within the drip lines are small holes (Drip outlets) which are already made at the factory. Water leaks through them in droplets and is then absorbed by the soil without any erosion.

The purpose of this technology is used in the dryland were water is very scarce and there is need for food and Conservation to the existing resources. It is environmentally friendly in that it does not cause any erosion.

More about this technology will be presented in my final poster. Slides photo’s and Video showing the experience of Cetrud in Uganda will be shown during the conference

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Ph.D. Programme “Agricultural Economics and Related Sciences” -- A Programme Especially for Students from the Tropics and Subtropics

*Marion Moser* and *Werner Doppler*

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In many developing countries, well-educated professionals, lecturers, researchers and managers are searching for avenues of further qualification in their fields. In their home countries they may have limited or no access to professional development, or the standard of further qualification opportunities may be low due to poorly trained lecturers or marginal research facilities. In the more developed countries, the topics of further education are often not oriented towards the needs of developing countries. Within the framework of traditional Ph.D. programs, there is a dearth of post-graduate training related specifically to the realities of life in the tropics and subtropics. In order to contribute to the enhancement of human resources world-wide by increasing the number of highly-trained local professionals and by improving their skills and capabilities, the Universities of Hohenheim has established a Ph.D. program especially for students from the tropics and subtropics where special emphasis is placed on the problems of developing countries. Students are strongly encouraged to develop application-orientated methods which can subsequently be implemented in their home countries. The University of Hohenheim has a long history of work experience in the tropics and subtropics and has established intensive collaborations with universities from these regions. Therefore the University is familiar with the present education situation there and with problems facing countries in the tropics and subtropics. Twelve professors focus their research solely on the tropics and subtropics and 15 further professors have research topics in these regions. The Tropical Centre of the University, with over twenty years experience in the tropics and subtropics, is unique in Germany and co-ordinates Hohenheim’s joint research and teaching activities and its international scientific and academic co-operations.

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People Improving Growth for Swine in Micronesia

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Engly Ioanis  
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Government workers involved in swine production program lack basic knowledge and skills to deliver programs and services to hog producers in Micronesia. The educational background of extension agents of Land Grant Institutions, livestock personnel of state agricultural agencies ranges from having college or high school graduates. These individuals have never had the chance to attend training and staff development in swine production and management after employment with the agencies. As a result, poor services to hog producers are encountered.

A grant by the Professional Development Program (PDP) of the Sustainable Agriculture and Research Education funded a two year training program through correspondence and workshops for hog producers and livestock personnel. Factsheets on various topics on swine production were developed. Text were simplified to fit clientele and photos used were taken from local farms around the region. All these factsheets were formatted for desktop publications, print-on-demand. Twenty four factsheets were produced and mailed to 60 participants. Piglet management posters translated to Yapese, Chuuk and Pohnpeian dialects were distributed.

Eighteen participants from the different islands were selected to attend a training workshop at the University of Guam. Participants were chosen based on their written examination results and full participation in the program. These participants were able to see well-managed farms on Guam and experienced hands-on husbandry skills.

Evaluations and feedback from participants indicated a high rate of acceptance of the "localized" factsheets. Clients related better to the information and photos to their situation. Workshop participants gained deeper understanding of the significance of crates and stalls. These participants conducted village meetings to share knowledge and experience from the workshop.

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Voices of Those Behind the Hoe: Organic Coffee Production in Chiapas, Mexico

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More than any other Mexican state, Chiapas dedicates the most hectares to certified organic coffee production, providing a critical means of survival for indigenous farmers. Organic certification provides 20% above conventional coffee prices, yet requires that farmers follow specific production norms set forth by certification agencies. Although farmers have been certified for over ten years, little is known about their opinions of organic production. This study investigates farmer perspectives on organic coffee production from 31 semi-structured interviews conducted in 3 coffee producing communities, Majosik, Tenejapa; Poconichim, Chenalhó; and Tziscao, Trinitaria. Transcribed texts were coded and analyzed for common themes. Overall, farmers held a positive opinion of organic production, despite increased labor requirements and occasional lack of markets. They noted advantages of producing organically to be improved coffee production (42%), soil quality (19%), and personal health (10%). Farmers had established criteria by which to describe ‘good’ and ‘bad’ soils; most commonly by color, second by organic matter content, and third by moisture, texture, and quality of plants. The majority of coffee in Chiapas is grown under trees of the leguminous genus *Inga*, which farmers claimed to produce fertile soil (93%) and healthier coffee plants (48%). Farmers attributed soil health improvement to reduced erosion by terracing, leaf litter deposition, and encouragement of soil biota through reduced agrochemical use. Farmers are acutely aware of agroecosystem changes as they alter management practices, thus on-farm experimentation and training for ecosystem understanding should be promoted.

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Human Capacity Development Project in South Africa  
(Part of the Bi-National Commission between the United States and the Republic of South Africa)

**Barbara A. Hughes**  
Seminole County Cooperative Extension Service, UF/IFAS, Sanford Florida, USA

**Objectives:** Conduct assessment in rural communities in Kwazulu-Natal and Northern Province in South Africa. Provide training and assistance for programs based on those assessments.

**Methodology:** Initial directive by USDA in Washington; teach leadership development, priority and goal setting skills, and networking. Meetings were held with the National Department of Agriculture, Provincial Governments, Tribal Leaders, and Extension Administration. Their highest priority was food preservation skills.

**Results:** 36 hour Train the Trainer classes were provided to 70 rural leaders. Classes were given on how to make and use a solar oven, how to dry and preserve foods, and water bath canning techniques. Extension offices were given basic equipment, handouts, and book resources. Leaders made a commitment to teach five more families in each subject. Approximately 1,050 hands on training programs could be provided. A solar project book was developed and a cookbook made up in Zulu and English.

**Conclusion:** Women were given the opportunity to take on leadership roles and supported by tribal leaders. Our IFAS and other Extension websites offer much to developing countries throughout the world. Culture, learning needs, resources and expectations are important when determining programs. The pilot project has been introduced into other rural areas of South Africa.

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Overcoming the Challenges of Interdisciplinary Education: Sustainable Agriculture at Iowa State University

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The poster highlights the value of interdisciplinary learning in sustainable agriculture and the way in which Iowa State University’s (ISU) Graduate Program in Sustainable Agriculture (GPSA) is structured to accommodate this need. The GPSA at ISU was developed to offer an interdisciplinary approach to educating systems thinkers on how to address environmental, social, and agronomic challenges facing agriculture in the 21st Century. Iowa is an ideal site for an innovative educational approach addressing the future of agriculture. As a worldwide leader in agricultural production and innovation, a wealth of resources is available for student research, case studies, and fieldwork. Also, excellent opportunities exist for experiential learning in association with one of the nation’s largest groups of faculty in sustainable agriculture.

An interdisciplinary approach to sustainable agriculture will build bridges between diverse fields of knowledge developing sustainable solutions to current and future agricultural issues. One of the most challenging aspects of the program’s first year has been tailoring the level of detail for mixtures of students and faculty with varied academic backgrounds and expertise. Important to the success of interdisciplinary programs is the creation of strong learning communities that foster the needed skills and understandings to truly teach and learn in an interdisciplinary manner.

Since the inauguration of the GPSA in August 2001, a total of 30 students have been admitted into the program in any one of the participating ten academic ‘home’ departments. Currently the GPSA hosts students from Asia, Latin America, Africa, and the U.S. International interests are growing in the program with many domestic students pursuing research interests in developing nations. At the same time, international students offer diverse perspectives to all students and faculty during interactive, team-taught core courses and weekly colloquia attended by all GPSA faculty and students.

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The ‘Farmers’ Project: Using Adaptive Management for Ecosystem and Community-Based Rodent Management in Cambodia

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Food security in Cambodia is based on rice production. In some areas rodent pests cause chronic and acute damage to rice crops and jeopardise this security for subsistence farmers and their families (Jahn et al. 1999). For example, Jahn et al. reported an outbreak in 1996 that destroyed rice sufficient to feed over 50,000 people for one year. Although traditional research has advanced the understanding of rodent ecology the predominant extension model has been Transfer of Technology (ToT). Due to the inability of ToT to address complex systems management, it has frequently led to inappropriate, irrelevant and unequally distributed technologies and unrepresentative decision making (King, 2000).

Cambodia’s rice farming systems can be characterised as complex in that they are small scale, subsistence farming, common property resource based, and often unpredictable (due to poor food distribution, rat outbreaks and food shortages). In the past, the Trap Barrier System (TBS) has been posed as a possible technological solution to rodent control. While much has been learned of the ecological properties of the TBS, the economic and social aspects of this technology are poorly understood. What is clear however is that the use of the TBS will be less than socially optimal if managed by individual decision-makers acting in isolation.

Adaptive Management is one methodology that has been developed for complex eco-systems management (Jiggins and Röling, 1999) which is currently being implemented within the FARMERS project in Cambodia to couple technological aspects with social arrangements. It is community-based, allows for the inherent uncertainty and surprise associated with complex systems, has a strategic learning focus, and links policy to practice change. FARMERS (Farmer-based Adaptive Rodent Management, Extension and Research System) is a collaborative project between farmers of Samraong Commune, the Kampong Cham Office of Agricultural Extension (OAE), the Cambodian Agricultural Research and Development Institute (CARDI) and The University of Queensland (UQ) funded by the Australian Centre for International Agricultural Research (ACIAR). The project is based in Kampong Cham Province, Cambodia, and has been in operation since July 2001.

The FARMERS Project proposes that the management of lowland rice could improve dramatically if uncertainty were not only acknowledged, but also incorporated as an integral part of the decision-making process. The definition of Adaptive Management within the context of the FARMERS project is based on an action research model and is an integrated, problem-solving approach, which operates on continuous learning and action cycles, with community participation in all phases of the planning, implementing, monitoring, interpretation and evaluation of the research. Although further understanding of the complexities in facilitating such a process is needed, the application of AM to managing the lowland rice rats in Cambodia is showing promise.


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Challenges in Farming: Bangladesh Perspective Institute for Environment and Development Studies-IEDS

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Bangladesh with its extremely fertile soils still has a food deficit. It is a matter of regret that Bangladesh cannot adequately feed her people. Historically, the fertile soils of East Bengal used to provide food for much of the subcontinent. The tropical climate makes a high production of biomass possible. The climate is suitable for a huge variety of both tropical and temperate crops. Bangladesh has a huge potential for agriculture. Then what are the obstacles in attaining self-sufficiency in food and other agriculture crops? What is wrong with the once so fertile soil?

Farmers Trapped in Green Revolution: To find the answers one needs to look back into developments of the past 30 years. In the late 1960s the Green Revolution was introduced in what is now Bangladesh. The technologies introduced were replicated from the west. High yielding seeds, chemical fertilizers and pesticides, large scale irrigation and mechanization were the sky elements of the Green Revolution. The new technologies ignored the traditional agricultural practices and were promoted unscrupulously by the industrialized countries as well as large chemical agribusinesses. In the initial years of the revolution, the government heavily subsidized the inputs. Yields increased initially and the Green Revolution was proclaimed as the solution to food insecurity. But at a later stage framers realized that they were trapped. Green Revolution made them abandon their traditional practices and chemical inputs shot up dramatically. The "modern" technologies crushed traditional roles and practices in agriculture.

A Threat to Bio-diversity: The Green Revolution, which promoted mono-cultures, high yielding varieties (HYVs) and hybrid seeds has led to an erosion of bio diversity. Today the agriculture is at great risk, since it is dependent on few homogeneous varieties. Preservation of seeds is the heart of agriculture and traditionally used to be handled by the women. Following the promotion of high yielding varieties, multinational companies largely varieties; multinational companies largely took over distribution and sale of the seeds. The women do handle the seeds as they did not in the past and the farming households have largely lost control over the seeds. Small and marginal farmers are no more self-sufficient as they were before. Instead of cultivating a variety of crops, they are now compelled to rely largely on mono-cropping of rice. Three decades ago there were around 8,000 local rice varieties in Bangladesh. Today there are merely 1,500 left in gene banks and less in practical use on the fields. The genetic resources, if lost for once are lost forever!

The farmers have to apply more and more fertilizers in the soil every year but still the yields decrease. Farmers in Tangail(a district of Bangladesh) say that they used to get one maund (approximately 37.32 kg) of rice from one decimal of land twenty years ago. Today they get between 20 and 30 kg per decimal. Use of too much Urea fertilizer instead of balanced composition of fertilizer contributes to the loss of several nutrients in the soil.

The residual efforts of agro-chemicals also hit other protein sources of the farmers. One major protein sources is fish. Several fish varieties commonly found 10 years ago, have now disappeared. Loss of different fish species has lessened the protein intake of the villagers.

Poisonous Pesticides: The monocultures create pest problem. Pests not seen in the traditional diverse cropping systems are now widely attacking the rice fields. With the use of ever stranger pesticides, the pests are becoming resistant to the chemicals. Developed countries have kept on dumping hazardous pesticides, banned in the West, in Third World countries.
The pesticides cause health problems. Agricultural products contain pesticide residues, which ultimately accumulate in the body through the food chain. Animals are also affected. The farmers who spray pesticides in the fields, are directly exposed to the pesticides poison. Many of them complain of skin diseases and other problems. Most farmers spray pesticides without wearing masks, gloves and other proper clothes. A number of the "dirty dozen" and other highly toxic pesticides, banned in the North, are still sold and used in Bangladesh.

Farmers are the Victims: at the household level the economy of the farmers has been wrecked. The modern agriculture neglected the total system yield. The dependence on single crop as well as on the market to obtain the inputs, put the farmers in an extremely vulnerable position. Today they have no control over the agricultural inputs. The production cost has increased, since they need more and more fertilizer and pesticides, prices of which are rising steadily.

The "modern" agricultural practices are totally anti-nature. For a solution to the problems created by destructive chemical agriculture, there must be a shift towards a low input sustainable agricultural system. It can be defined as "ecological agricultural". Agriculture should not be seen as a mere productive sector, but as a way of life. Agriculture has to be seen with a holistic view, taking into account qualitative, cultural and ethical aspects. Ecological agriculture takes its examples from the natural forest. The forest shows us that it is possible to produce a huge amount of biomass in a natural way.

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November 17-20, 2002 ● Lake Buena Vista, Florida

People and the Planet: Meeting the Challenges of the New Millennium -- Interdisciplinary Ecology and Farming Systems at the University of Florida

Amy J. Sullivan, Victor Cabrera, Carlton Pomeroy and Norman Breuer
University of Florida, Gainesville, FL, USA

Students in the College of Natural Resources and Environment at the University of Florida are addressing the emerging challenges of conservation and development with a flexible multidisciplinary perspective. The curriculum spans the range of human knowledge needed to solve complex environmental problems not amenable to narrowly based solutions. Graduate students structure their degree program to satisfy their own professional interests. They are guided by an advisory committee selected from approximately 290 members of the University of Florida faculty of 11 other colleges and have access to over 200 courses taught in 56 departments.

The master’s and doctoral degrees in Interdisciplinary Ecology promote interdisciplinary thinking in natural resources and the environment by combining (1) coursework in the basic and applied science of ecology and the social, political, and economic sciences with (2) competence in an approved program in one of these fields of study. The curriculum combines the basic and applied sciences needed to diagnose problems, the engineering needed to devise solutions, and the social sciences of human processes and institutions needed to take action.

Among the concentrations offered in the degree program is Farming Systems. This course of study allows students to focus on client-centered approaches to research, development and extension. Courses in this concentration include: Farming Systems Research and Extension Methods; Economic Analysis of Small Farm Livelihood Systems; Agricultural Development Administration or Development Administration; and Agriculture’s Role in Latin America and Africa or Women and Development or Agricultural Ecology.

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University of Florida Extension International Training Program

*Dr. Pete Vergot*
University of Florida Extension, Gainesville, Florida, USA

University of Florida Extension was proud to begin a program to provide professional development opportunities for Extension Faculty in International Extension work. In the 2002 program year, eight county extension faculty members were selected for the training program.

As a professional development opportunity, the International Extension Training Program seeks to: Prepare County Extension Faculty to develop International outreach programs for local clientele. Be better able to respond to the needs of individuals and communities impacted by cultural diversity and global interdependence. Recognize ways to provide international trade and development education programs to Extension clientele. Involve Extension clientele in understanding how international linkages/interdependencies affect our daily lives. Provide County Extension Faculty with the opportunity to become involved in overseas projects and U.S. development education efforts. Improve local county programs by helping County Extension Faculty apply their expanded knowledge and increased cultural sensitivity to local problems and programs.

**Expected Benefits**

*For Extension Personnel:* An exciting opportunity to test oneself and grow personally and professionally. Continuing contact with international issues and programs. A chance to view one’s work and career from different perspectives. Experience developing resource materials for international programs.

*For the Extension System:* County Extension Faculty better prepared to respond to international program involvement, to the needs of people of diverse cultural, economic and social situations. A cadre of professionals with increased energy and commitment to improve Extension efforts domestically and internationally.

*For Local Florida Programs and People:* Professionals better prepared to serve local needs. Increased understanding of how international issues affect daily life.

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Agri-Economics Training Course Improvement in Russia

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Volgograd State Agricultural Academy (VSAA) is one of the most widely recognized agricultural institutions in Russia. Through ACDI/VOCA and the Farmer-to-Farmer Consortium, activities were undertaken to assist VSAA in updating and improving its current curriculum. In April 2002, fourteen 2-hour seminars were presented representing 13 different courses in 3 departments. Approximately 1,010 students participated in these seminars. Course materials were designed to provide students and instructors with a better understanding of the capitalist ideology, factors that affect profitability and performance in agricultural production, competitive pricing mechanisms, agricultural investment and agricultural policy. Course material also focused on human resource development and management, and agricultural production practices. A variety of teaching styles, techniques, and philosophies were demonstrated during these lectures. Student interaction was very high and positive.

Additionally, two 2-hour workshops on advance teaching methods were conducted. Thirty-five instructors from VSAA and the University of Customer Cooperation (Moscow), Volgograd branch participated. Teacher workshops consisted of one formal presentation on advanced teaching methods and one discussion/roundtable meeting on methods of assessing student performance, teaching and learning styles, faculty evaluations, and course content. Many additional informal discussions were held over the two-week period on these matters, as well as distance education, overall curriculum and the need to update course titles.

Students and instructors had the opportunity to learn more about market forces in agriculture, U.S. agriculture and applications to Russian agribusiness. Barriers to agribusiness investment were also discussed. Instructors benefited from both seeing advanced teaching methods in action and learning about them in formal and informal workshops.

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Enhancing Farmer Knowledge in Nigeria: An Experience in Extension Program Development

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The African nation of Nigeria produces many tropical and sub-tropical commodities. Lack of a working infrastructure, quality standards and extremely competitive markets prevents the rapid movement of agricultural commodities within the country and diminishes export opportunities. As a result, 20-50% of farm production is lost post-harvest each year. Post-harvest losses can be reduced dramatically through simple changes in product packaging, shipping and marketing.

Two 3-day Train-the-Trainer workshops were conducted in Nigeria to provide training to agriculture extension personnel in the areas of marketing and postharvest technology in order to reduce storage losses and improve marketing efficiency of perishable crops. The objective of the workshops was to empower the agriculture extension agents with knowledge and techniques appropriate for transferring to their stakeholder clientele and farmers in their respective states. Specific suggestions and recommendations were provided on how to use appropriate technologies to improve Nigerian farmer’s capacity to provide the domestic and export markets with consistent supplies of high quality product. Two training manuals were developed and provided to each workshop participant.

Over 150 agricultural extension personnel attended the workshops, representing the 36 Nigerian states and the Federal Ministry in Abuja. Results indicate that over 20,000 extension agents and farmers were trained as a result of the first workshop. Participants report the intention to train an additional 22,000 agents and farmers as a result of the second workshop. This represents a significant impact obtained from the workshops. Development of supporting technical fact sheets and bulletins appropriate for Nigerian farmers and stakeholders, made specific to the Nigeria situation and focused on the most important crops and commodities to the country, is now underway.

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Development of the Model of Certification of Organic Food Products in Brazil

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Flávia Muradas Bulhões
Secretaria da Agricultura e Abastecimento, Santa Maria, RS, BRAZIL

This article aims to present some characteristics of the Brazilian certification model of organic food products, as well as to discuss the main controversies that accompanied its regulation and implementation. The certification of organic food products in Brazil is regulated by Normative Instruction 7 as of May 1999, and it was the outcome of a discussion process and disputes, which had started in 1992.

This article is the result of research which resorted information, such as, documents, bibliographies, and interviews with 25 key informants representing organizations linked to the discussion process and norm elaboration as well as representatives of the sectors interested in its regulation. Before the regulation the certification of organic products was based on two systems parallels: one geared towards the local and regional markets, involving relationships of trust generation among Non-Governmental Organizations (NGOs), producers and consumers, in which the certificators assist the producers technically, organizationally and commercially, a system called network of generation of trust, and another one based on international certification systems, also geared towards the foreign markets, in which there is no involvement of the certificator with producers or consumers (external audit). We demonstrate in this article that the normativeness of the certification of organic products kept these two forms of certification. We also demonstrate that the regulation of the certification did not occur consensually. There was some conceptual consensus as to what should be considered “organic”, and there was accord as to the techniques related to the organic production. The divergencies, however, occurred in two other fields: (1) as to the merit of the certification, that is, if it was necessary or even convenient to regulate the certification of organic products; and (2) as to the model of certification, which established to define who should be the certificators and which would be the best process of certification. These divergencies occurred mainly in the debate among NGOs, since the public organizations and private enterprises represented little participation in the sector. As to the merit of the certification, the opinions of the NGOs were basically divided into two, the ones which were against the certification and the normativeness, and the ones which favored them. Along process of norm establishment, however, the regulation of the certification became inevitable and the discussion moved from the area of the merit of the certification to area of the model of certification. The new position of the entities against the certification was that, since the certification had become inevitable, it should be participative and democratic, thus preventing the exclude organic producers who could not afford the expense of the process. The federal establishment of norms expresses the hegemony of the NGOs in the sector of the organic agriculture in Brazil, that they do not only monopolized the debate on the regulation of the system of certification to be adopted, but also guaranteed that it should have important and unique characteristics that meet their demands, such as: (a) equal space with the public power in the federal and state department of certification; (b) autonomy to appoint their representatives in these departments; (c) impossibility that foreign entities and private enterprises apply for the position of certificators; (d) and, probably the most important, the guarantee that the process of certification may be suited to the local realities of each region.

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Relevance of Indigenous/local Agricultural Knowledge: Its Importance in Food Security

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Indigenous/local knowledge (IK/LK) has been gaining ground in the academic world, both within the social and natural sciences. This paper discusses the different definitions on this topic, and examines its growing importance inside the social sciences and the Research and Development (R&D) projects. IK appears truly important to the research on sustainable development. It is also relevant for addressing issues of protection of biodiversity, the effects of Intellectual Property Rights over the rural communities and the fact that IK must be used as the starting point in the construction of a truly alternative agriculture. Likewise, there is a real concern in the scientific world about the implications -on the global food security- of standardization, privatization and appropriation, issues that characterize the Transnational Corporations (TNC) based agro-food industry. It is important to recognize that indigenous/local knowledge guarantees the survival of cultural and biological diversity. This knowledge must be seen as a threshold to an alternative agricultural science that takes into account the needs and experiences of the resource users. To illustrate our argument, we are including some examples from Latin America (The Andes and Mexico).

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Multi-Stakeholder Learning and Collective Action in Australia’s Pastoral Industries: Enhancing Ecological Sustainability and Food Safety and Quality across the Supply Chain

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EcoRange is a project aimed at developing environmental management and assurance (EMA) schemes for pastoral industries in Australia. It is a collaborative project between the Department of Primary Industries, Queensland (QDPI) and CSIRO Sustainable Ecosystems that is funded by the Rural Industries Research and Development Corporation (RIRDC), QDPI and the Natural Heritage Trust (NHT). This includes issues related to Environmental Management Systems, environmental labelling, food safety and quality, and factors arising from research with consumers, customers and stakeholders. The project recognises that all segments of the product chain, from producer to consumer play important roles in achieving desirable environmental and social outcomes and therefore is taking a multi-stakeholder learning approach to achieve its outcomes. Multi-stakeholder collective learning has been suggested as a way forward in enhancing ‘development’ and/or ‘ecological sustainability’ (Leeuwis and Pyburn, 2002).

As part of this project, the exploration of the different perceptions of industry, conservation and consumer groups about EMA was carried out using a qualitative research process known as Convergent Interviewing. This is a technique that uses paired interviews, which are conducted as structured dialogue. The aim is to create a dialectic (Dick, 1993). After each pair of interviews, the interviewers work together to compare the data and information they have received. Idiosyncratic information is discarded and probing questions are devised to structure the dialogue in the next pair of interviews, with other members of the group, in order to test convergent information and explore and explain divergent information. Dick (1993) notes that the later interviews are purposefully different from earlier interviews in that the interviewers can be “suspicious” of emerging interpretations and may refine interview techniques and questions over time. In this sense, each pair of interviews becomes one cycle in an action research spiral. The process was used for each of the three groups, industry, conservation and consumer. Organisations represented included:

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Results from the research (King, 2002) were then presented at a multi-stakeholder workshop aimed at enabling participants themselves to interpret the results, come to their own conclusions, and negotiate ways of moving forward in relation to environmental certification. As a result of the workshop, a variety of participants have formed an on-going multi-stakeholder group to develop and pilot an eco-labelling and environmental assurance scheme across the supply-chain for the Queensland Mulga Pastoral region.


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Defining Rules for Organic Poultry Production and Small Farmers Sharing of Organic Eggs Market: The Case of Small Farmers from Santa Rosa De Lima, SC

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This paper discusses rules and certification procedures for poultry organic products based on technical issues and the experience of small farmers from Santa Catarina, Brazil, a group that has been implementing a project for production and packing of organic eggs. The results of a participatory appraisal carried out in Santa Rosa de Lima, a review of different approaches applied to organic production, and rules applied to poultry production were considered during the analysis. The results pointed out some constraints to implement the proposal, indicating some incompatibility between the project and the particularities of agroecology and family agriculture. Based on the Santa Rosa de Lima experience, failures in the regulatory system and its application by small farmers were discussed. However, the study indicated that certification is an essential tool to protect consumers and farmers in extended chain markets. Nevertheless, an effective regulatory system depends on the recognition and participation of the different stakeholders. Likewise a closer relationship between consumers and farmers is necessary to diversify market options and to develop participatory certification systems.

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Citizen Panel on Genetically Modified Food Calls for Changes in the Food System

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The University of New Hampshire Office of Sustainability Programs and Cooperative Extension convened a citizen panel on genetically modified food. The citizen panel was based on a participatory technology assessment approach developed in Denmark, but significant format changes were made. The goal was to link the principles of democracy with the food system by involving ordinary people in the debate over the use of a new agricultural technology and by putting food system expert knowledge in the service of citizen deliberation.

The panel of volunteers of all ages and from all walks of life participated in a six-month learning process that involved multi-day retreats, extensive reading, and a two-day consultation with experts. The panel found that non-GMO agriculture presently supplies sufficient, safe, and nutritious food and that small, diversified farms make a strong contribution to this supply. They recommended that every effort should be made to assure that organic and other farmers could farm without impingement from GMO agriculture. They also suggested that patent laws and intellectual property rights governing GMO technology should be modified to relieve farmers of the threat of lawsuits for unintentional use of proprietary genes. In addition they advised to significantly increase funding for research into agricultural systems that do not involve the use of GMOs.

A post panel survey revealed significant changes in knowledge of panel participants in the complex issues of genetically modified food, food production systems, and food marketing. Attitudes toward local food production as well as behavior in the marketplace also changed considerably as a result of the participation in the panel. The panel continues its work with little institutional support by presenting their findings and recommendation to food system stakeholders such as legislators, farmers, and consumers. The citizen panel was an effective participatory learning approach that resulted in tangible short and long-term changes toward the development of a sustainable food system.

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Utilization of Conventional Technologies by the Marginal and Small Tribal Farmers for their Food Security

G. K. Shrivastava, R. Lakpale and M. L. Sharma
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Farmers of all over the world have adopted their own systems of farming and this is within the framework of local possibilities and limitation of available resources. Within the each farming system there are number of conventional technologies or Indigenous technologies are in practice since ancient time. The newly borne Chhattisgarh State of India having more than 50 % by tribal population. Since this chunk of population is still far away from the modernized world and even today they are dependent on agriculture and forest products for their livelihood, most of them belonging to marginal and small stakeholders. Several traditional agro-practices are still followed and preserved in its natural form. In view of these facts the present study was designed to assess the utilization pattern of these traditional technologies in agriculture and rational for its utilization towards their food security. The findings of this study are based on survey based primary data collected from 150 tribal farm families of 10 villages from Bastar and Surguja districts of Chhattisgarh state.

The findings reveals that agriculture was the main occupation beside other like labour, forest product collection and animal husbandry which were practiced by the majority of the farmers. Agriculture came out as the major source of income followed by labour work and forest products. Majority of the farmers utilized several indigenous technologies right from seed selection to storage of agricultural and allied produces. Some of these technologies like use of local made implements, sun drying, salt solution for the selection healthy seeds, bushening operation for weed control local seed germination test, use of Mahua cake as bio-fertilizer, spray of carocine or soil solution and use of plants/herbs for controlling the rice pests, use of mud, cow dung and rice husk to make storage bins and use of Neem leaves as insect repellent etc. were found as the widely adopted local practices by the tribal community. Hence, this paper deals with the extent of utilization of indigenous technologies along with their scientific rationale and mechanism for refinement and their consideration while planning, development and recommendation of location specific technologies for food security and sustainable development in future.

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Losing Traditional Seed Management Systems: A Threat to Small Farmers’ Food Security in Nepal

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An access to and control over seed management system influences food security of small framers. This paper discusses the current situation of traditional seed management system in Nepal and its potential impacts to the food security of small farmers. Based on the field study, the paper demonstrates the growing risks of replacement of traditional seed management systems by the private seed companies and its negative effects to farmers’ food security in Nepal. There is a great risk of extinction of genetic resources from the shifting control of seed management from farmers to profit making companies. This paper concludes that farmers are alienated from their own seed production and protection systems, and therefore an urgent attention is needed to ensure food security of small farmers and conservation of genetic resources in Nepal.

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TOOL BAZAAR
POSTER ABSTRACTS

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Presenting authors appear in **bold**.
Training Tools for Ecologically-Based Participatory Implementation of IPM and Coffee Agroforestry in Nicaragua and Central America

Falguni Guhuray, Charles Staver, Pascal Chaput and Jeremy Haggar
CATIE, Managua, Nicaragua

The regional program for Integrated Pest Management and Agroforestry aims to create capacity in project managers, crop specialists, field extensionists and farmers in participatory methods for ecological based decision-making in crop management. The program has developed different tools and publications for these different actors.

To inform project managers and government officials publications presenting the concepts of methodology of implementation (MIP en Manos de Familias Rurales) and the experiences and impacts (La Caficultura Postmoderna) of these methods have been published short books. The technical knowledge about crop diagnostic tools, crop management and methods for their implementation are published in manuals (e.g. Manual MIP en Café) and as articles in regional journals (Revista Manejo Integral de Plagas y Agroforestería en Las Américas), which are available free to immediate collaborators but also function to transfer information to a wider technical audience. These materials are also made available to field extensionists but are complemented with workbooks that present series of field or “class room” exercises (eight workbooks in the case of coffee e.g. Cuaderno de Diseño Participativo de Sistema Agroforestal con Café o Manejo Integral de Broca). These are designed to facilitate the identification of the ecological processes that affect pest, crop or tree performance. Under development is an electronic guide for extensionists to develop the curriculum for farmer training, which includes basic information on crop ecology, plus a guide to the formulation of a training program and example training sessions. The dissemination of experiences of innovator farmers have been promoted though the publication of their testimonies in simple language in the magazine “Enlace” which is distributed to small farmers across Nicaragua.

These publications are in the process of being distributed to 9000 farmers, 450 extensionists, 100 crop specialists, and 100 decision makers across Nicaragua and Central America.

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Seeds of Hope: Achieving Food Security through Community-Based Food Systems

Oran B. Hesterman
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Despite international efforts to eradicate hunger and a commitment by national governments to achieve universal food security, it is estimated that more than 780 million people, most of them children, do not have access to adequate nutrition. Various approaches to achieving food security have been attempted – from improved agricultural techniques, to the introduction of new technologies, to the creation of national and international policies that focus on human and sustainable development. One particularly successful strategy for improving food security is the creation and expansion of community-based food systems; it provides not only poor families and children with access to adequate food supplies, but adds economic value to families in these communities. This paper focuses on successful community-based food systems that are increasing health and nutrition in underserved communities around the world, and which are also promoting the health of local economies.

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Smile©: A Simulation And Scenario-Testing Tool For Supporting Decision Making On Rehabilitation And Transfer Of Smallholder Irrigation Schemes

Sylvain Perret
University of Pretoria, Department of Agricultural Economics / CIRAD, Pretoria, South Africa

The tool bazaar presentation will consist of a laptop-based demonstration of the software Smile©. The approach aims at investigating the economic viability of smallholder irrigation schemes in a context of rehabilitation and management transfer.

The software allows for easy and flexible data capture and storage on infrastructures and equipment, cropping systems, farmers’ practices and strategies, water demand and supply. A module allows for testing options on a water charging system. Finally, simulations can be run, focussing on scenario-testing and participatory investigations on the schemes’ prospects and the sustainability issues.

The demonstration links up with an oral presentation on November 18, at 11:20 AM, on the same topic.

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Using Small-Scale On-Farm Weather Monitoring Equipment As a Tool for Understanding Farmer Rationales and Management in Response to Climatic Risk

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National Agricultural Research Center for Tohoku Region, Morioka, Iwate, Japan

John S. Caldwell, Kiyoshi Ozawa and Takeshi Sakurai
Japan International Research Center for Agricultural Sciences (JIRCAS), Tsukuba, Ibaragi, Japan

Abdouramane Yorote, Abou Berthé and Mamadou Doumbia
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Farmer decision making and management are highly influenced by climate, especially uncertain rainfall, in rainfed agriculture in areas such as Mali, West Africa. We have used small-scale, automated weather monitoring equipment on farm as a tool for understanding farmer rationales in response to climatic risk. Precipitation, air and soil temperature recording stations equipped with a data logger (Onset, HOBO) that can record over a long time period without maintenance (Fig.1) were placed on 15 collaborating farmers’ fields in each of two villages chosen in a reconnaissance. Using farmer-defined land units (terroirs), farmers indicated areas on maps with early rainfall, and this empirical knowledge was supported by the distribution of early rainfall measured by the stations (Fig.2). We will show the equipment and results of analysis of temporal and spatial rainfall variability compared with farmer management monitored weekly, particularly dry seeding.

Fig.1  Photo of HOBO station

Fig.2  Rainfall map

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