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Towards defining a pro-poor Natural Resources Management Strategy in the CGIAR

Conclusions and recommendations from the CGIAR-NGOC Consultation on Natural Resources Management

October 22-23, 1998

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Edited by Miguel Altieri and Marco Barzman
University of California, Berkeley

CGIAR-NGO Committee

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CGIAR-NGO Committee
201 Wellman Hall #3112
Berkeley, CA 94720-3112
e-mail: agroeco3@nature.berkeley.edu
http://www.cnr.berkeley.edu/~agroeco3/

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Goal of the consultation

On October 22-23, 1998, the CGIAR NGO Committee (NGOC) convened a consultation on Natural Resources Management (NRM) involving 45 participants from NGOs, TAC, IARCs, Universities and NARIs. The consultation came as a response to the newly-recognized importance that the CGIAR within its renewed mission has given to NRM, calling it "one of the fundamental research pillars of the CGIAR". The goal of the consultation was to initiate a dialogue among the various partners in order to define an NRM strategy congruent with both the CGIAR mission of poverty alleviation, food security and preservation of the natural resource base, and with a responsiveness to the needs and circumstances of resource-poor households located in marginal or less-favored areas in the developing world.

Key Questions Addressed at the NRM Workshop

- What is the scientific basis underlying a pro-poor NRM technological strategy?
- What are the methodological tools needed for the NRM strategy to be relevant to resource poor farmers?
- How does this NRM strategy fit into the broader goals of a sustainable rural development approach?

The NRM challenges facing the CGIAR

There is widespread agreement on the fact that the Green Revolution was an important strategy to raise grain yields. There is also realization that in the most intensively cropped lands there are observable trends of yield declines (i.e. rice-wheat systems in India and rice under continuous cropping in the Philippines), linked to the cumulative effect of environmental degradation, partly caused by the use of high-input technologies. New approaches to enhance productivity in such high-potential areas will have to depart in significant ways from the Green Revolution, emphasizing resource-conserving technologies (i.e. incorporation of legumes in rotation schemes) that enhance the sustainability of agroecosystems. Biotechnological innovations may provide some tools only if they address constraints relevant to poor farmers (i.e. drought tolerance, soil acidity, etc.). When appropriate, such innovations should be integrated into a broader natural resource management (NRM) strategy which emphasizes environmental rather than gene manipulation.

More challenging however, for the "renewed" CGIAR, is the realization that resource-poor farmers gained very little from the processes of development and technology transfer of the Green Revolution. Many analysts of the Green Revolution have pointed out that the new technologies were not scale-neutral. The farmers with the larger and better-endowed lands gained the most, whereas farmers with fewer resources often lost, and income disparities were often accentuated. Not only were technologies inappropriate for poor farmers, but peasants were excluded from access to credit, information, technical support and other services that would have helped them use and adapt these new inputs. Although subsequent studies have shown that the spread of high-yielding varieties among small farmers occurred in Green

Revolution areas where they had access to irrigation and subsidized agrochemicals, disparities remain. In many countryside areas, intensified social differentiation and concentration of wealth have set in. Perhaps even more significant is that the areas characterized by traditional agriculture remain poorly served by the transfer-of-technology approach, due to its bias in favor of modern scientific knowledge and its neglect of local participation and traditional knowledge. The historical challenge of the GGIAR is therefore to refocus its efforts on marginalized farmers and agroecosystems and assume responsibility for the welfare of their agriculture. The private sector and advanced research institutions have no interest in targeting such groups.

In order to benefit the poor more directly, an NRM approach must be applicable under the highly heterogeneous and diverse conditions in which smallholders live, it must be environmentally sustainable and based on the use of local and indigenous resources. The emphasis must be on improving whole farming systems at the field or watershed level rather than specific commodities. Technological generation must be demand driven which means that research priorities must be based on the socio-economic and environmental needs and circumstances of resource-poor farmers.

The urgent need to combat rural poverty and to conserve and regenerate the deteriorated resource base of small farms requires an active search for new kinds of agricultural research and resource management strategies. NGOs have long argued that a sustainable agricultural development strategy that is environmentally enhancing must be based on agroecological principles and on a more participatory approach for technology development and dissemination. Focused attention to the linkages between agriculture and natural resource management will help greatly in solving the problems of poverty, food insecurity and environmental degradation.

To be of benefit to the rural poor, agricultural research and development should operate on the basis of a "bottom-up" approach, using and building upon the resources already available: local people, their knowledge and their autochthonous natural resources. It must also seriously take into consideration, through participatory approaches, the needs, aspirations and circumstances of smallholders.

New Mission of the CGIAR	**Goals of an NRM Strategy for Poor Farmers**
■ Food security ■ Poverty alleviation ■ Sustainable agricultural research ■ Environmentally sound management of natural resources ■ Partnerships, capacity building, policy dialogue	■ Poverty alleviation ■ Food security and self reliance ■ Ecological management of productive resources ■ Empowerment of rural communities ■ Establishment of supportive policies
Innovation Characteristics Important to Poor Farmers	**Criteria for Developing Technology for Poor Farmers**
■ Input saving and cost reducing ■ Risk reducing ■ Expanding toward marginal-fragile lands ■ Congruent with peasant farming systems ■ Nutrition, health and environment improving	■ Based on indigenous knowledge or rationale ■ Economically viable, accessible and based on local resources ■ Environmentally sound, socially and culturally sensitive ■ Risk averse, adapted to farmer circumstances ■ Enhance total farm productivity and stability

Defining the target population of a pro-poor NRM strategy

Although estimates of the number and location of resource-poor farmers vary considerably, it is estimated that about 1.9 to 2.2 billion people remain directly or indirectly untouched by modern agricultural technology. In Latin America, the rural population is projected to remain stable at 125 million until the year 2000, but over 61% of this population is poor and is expected to increase. The projections for Africa are even more dramatic. The majority of the rural poor (about 370 million of the poorest) live in areas that are resource-poor, highly heterogeneous and risk prone. Their agricultural systems are small scale, complex and diverse. The worst poverty is often located in arid or semi-arid zones, and in mountains and hills that are ecologically vulnerable. These areas are remote from services and roads and agricultural productivity is often low on a crop by crop basis, although total farm output can be significant. Such resource-poor farmers and their complex systems pose special research challenges and demand appropriate technologies.

Characteristics of Poor Small-Holders	**Constraints to which Poor Farmers Are Exposed**
■ Meager holdings or access to land ■ Little or no capital ■ Few off-farm employment opportunities ■ Income strategies are varied and complex ■ Complex and diverse farming systems in fragile environments	■ Heterogeneous and erratic environments ■ Market failures ■ Institutional gaps ■ Public good biases ■ Low access to land and other resources ■ Inappropriate technologies

Agroecology as a fundamental scientific basis for NRM

For years several NGOs in the developing world have been promoting agroecologically-based NRM approaches. Agroecology provides a methodological framework for understanding the nature of farming systems and the principles by which they function. It is the science that

provides ecological principles for the design and management of sustainable and resource-conserving agricultural systems—offering several advantages for the development of farmer-friendly technologies. First, agroecology relies on indigenous farming knowledge and selected modern technologies to manage diversity, incorporate biological principles and resources into farming systems, and intensify agricultural production. Second, it offers the only practical way to restore agricultural lands that have been degraded by conventional agronomic practices. Third, it provides for an environmentally sound and affordable way for smallholders to intensify production in marginal areas. Finally, it has the potential to reverse the anti-peasant bias of strategies that emphasize purchased inputs as opposed to the assets that small farmers already possess, such as their low opportunity costs of labor. Ecological concepts are utilized to favor natural processes and biological interactions that optimize synergies so that diversified farms are able to sponsor their own soil fertility, crop protection and productivity. By assembling crops, animals, trees, soils and other factors in spatial/temporal diversified schemes, several processes are optimized. Such processes are crucial in determining the sustainability of agricultural systems.

Agroecosystem Processes to Optimize

- Organic matter accumulation and nutrient cycling
- Soil biological activity
- Natural control mechanisms (disease suppression, biocontrol of insects, weed interference)
- Resource conservation and regeneration (soil, water, germplasm, etc.)
- General enhancement of agrobiodiversity

Agroecology takes greater advantage of natural processes and beneficial on-farm interactions in order to reduce off-farm input use and to improve the efficiency of farming systems. Technologies emphasized tend to enhance the functional biodiversity of agroecosystems as well as the conservation of existing on-farm resources. Promoted technologies are multi-functional as their adoption usually means favorable changes in various components of the farming systems at the same time.

Multipurpose Technologies

- Cover crops and mulching
- Intercropping
- Rotations
- Organic soil fertilization
- Agroforestry (including social forestry)
- Crop-livestock integrated system (including aquaculture)

For example, cover crops function as an "ecological turntable" which activates and influences key processes and components of the agroecosystem: the complex of beneficial fauna, soil biology, weed suppression, nutrient cycling, etc. Similarly the incorporation of green manures not only provides nutrients, but also increases soil organic matter and hence water retentive capacity, further reducing susceptibility to erosion.

There are many proven and promising agroecological technologies that can be integrated to enhance the sustainability of farming systems. Throughout the developing world, farmer groups in collaboration with NGOs are implementing at the local level hundreds of local agroecologically-based initiatives. Many of theses experiences demonstrate the feasibility of stabilizing yields, regenerating and conserving soils and water, preserving agrobiodiversity and enhancing food security, all based on agroecological technologies and locally available resources.

Documented Benefits of Agroecological Technologies

- Enhancement of total output per unit area of land
- Conservation of soil, water and genetic resources
- Regulated pests at acceptable levels
- Reduced use of agrochemicals
- Improved soil quality
- Conservation and enhancement of general agrobiodiversity

Conclusions from the working groups

Group I: The scientific basis of a pro-poor NRM strategy

Group II: A methodological framework for NRM

Group III: Linking NRM and rural development

Group I

The scientific basis of a pro-poor NRM strategy

Role of Ecology in NRM

The scientific field which is best equipped to address issues that emerge from the interaction of humans and the environment is ecology. Ecological principles of diversity, adaptability, flexibility and stability cross over into the social scientific realm and are useful for understanding the complexity of social systems and their coevolution with natural resource management systems.

Because ecology deals with interactions in complex systems, it can also provide an appropriate framework for a dialogue between scientists and local farmers whose traditional knowledge is also relational and complex in nature. The ecological knowledge and principles emerging from such a dialogue would therefore integrate elements from both modern science and local and traditional sources of knowledge.

Just as genetics and molecular biology provide the scientific basis for integrated gene management, the science of ecology should be the scientific paradigm that provides the principles to manage natural resources (soil, water and biological resources) in a sustainable manner.

The participants identified several fundamental ecological concepts and principles which should be taken into account when devising an NRM strategy. These include:

1. Biodiversity, which is crucial in enhancing productivity, resiliency and ecosystem services.
2. Resource flows, which can be managed to restore and maintain natural, human and capital resources.
3. Productivity, which is directed to ensure a multiplicity of products and services that satisfy ecological, economic and social needs.
4. Ecosystem resilience, which must be maintained or even enhanced so that ecological and economic services and productivity are sustained even when environmental, economic or other conditions change.

These principles interact and have operational implications across different scales in space (field, landscape, watershed) and in time. Their application translate into specific management and technological options that optimize the ecological function of agricultural and forestry systems, depending on environmental, social, cultural and economic factors specific to each target region.

Interactions between ecological factors in NRM

Key Ecological Principles for NRM in Agriculture

1. The ecosystem is the major landscape ecological unit. It contains both biotic and abiotic components through which nutrients are cycled and energy flows.
2. To permit these cycles and flows the ecosystem must possess a number of structured interrelationships among its components (soil, water, nutrients, producers, consumers, and decomposers).
3. The function of ecosystems is related to the flow of energy and the cycling of materials through the structural components of the ecosystem.
4. Ecosystems tend toward maturity. In so doing they pass from a less complex to a more complex state. This directional change is called succession.
5. When an ecosystem is exploited or mismanaged, the maturity and biodiversity of the ecosystem declines and resources become degraded.
6. Working toward sustainability, farmers and researchers should strive as much as possible to use the ecosystem concept in designing and managing the agroecosystem.
7. Energy flow can be designed to depend less on renewable sources, and a better balance achieved between energy used to maintain the internal processes of the system and that which is available for export as harvestable goods.
8. Population regulation mechanisms can depend more on system-level resistance to pests, through an array of mechanisms that range from promoting horizontal resistance and increasing habitat diversity to ensuring the presence of natural enemies and antagonists.
9. As the use of external human inputs for control of agroecosystem processes is reduced, a shift can be expected from systems dependent on synthetic inputs to systems designed to make use of natural ecosystem processes and interactions and materials derived from within the system.
10. An agroecosystem that incorporates the natural ecosystem qualities of resilience, stability, productivity, and balance will better ensure the maintenance of the dynamic equilibrium necessary to establish an ecological basis for sustainability.

Importance of site specificity in NRM

The high variability of ecological processes and their interactions with heterogeneous social, cultural, political, and economic factors generate local systems which are exceptionally unique. When the heterogeneity of the rural poor is considered, the inappropriateness of technological recipes or blueprints becomes obvious. The only way that the specificity of local systems--from regions to watersheds and all the way down to a farmer's field--can be taken into account is through site-specific NRM. However, technologies adapted to specific agroecological conditions may be applicable at ecologically and socially homologous larger scales which can be identified using GIS methods.

Such site-specificity requires an exceptionally large body of knowledge that no single research institution can generate and manage on its

own. This is one reason why workshop participants identified the inclusion of local communities at all stages of projects (design, experimentation, technology development, evaluation, dissemination, etc.) as a key element in successful rural development. The inventive self-reliance of rural populations is a resource that must be urgently and effectively mobilized.

Group II

A methodological framework for NRM

In order for the NRM guiding principles to translate into management options appropriate to poor farmers, methodological mechanisms must be in place so that technologies reach poor farmers and CGIAR goals are achieved.

Such methodological mechanisms include:

- Effective partnerships which include farmer organizations
- Participatory research and development methods
- Empowerment of local communities in defining research agendas
- Scaling-up of successful local sustainable agriculture initiatives
- Development of indicators of sustainable NRM.

Participatory research and development approaches

A key methodological theme that cuts across NRM is how to best integrate the various social actors involved in the process of generation and diffusion of innovations. Much has been said about the potential role of farmer knowledge and experimentation as a critical link in the research process, but there are very few practical examples.

Most development programs that placed the interests of small-scale farmers high on their agenda, fell short in their expectations as they failed to seriously address popular participation. The implication here however is not for researchers to promote participatory approaches so that farmers put to better use already made or new "technological packets". The few existing examples of generation and diffusion of "farmer friendly" technologies suggest that full participation of farmers is essential to the development and dissemination of sustainable agriculture methods and technologies. In such cases horizontal and equitable interaction among actors replaces top-down relations, and promoted initiatives are responsive to farmer needs and ideas. In fact, farmer knowledge is melded with current scientific knowledge.

The existing farmer-to-farmer networks and methods of communication have proven invaluable in the spreading of ideas and innovations. In turn, these participatory arrangements strengthen and empower local farmer and community organizations, and furthers learning and adoption of alternatives.

Partnerships and intercultural dialogue

The site-specific nature of sustainable NRM strategy places farmers, herders, fishermen, and other rural people in a central position. They are the ones with the greatest knowledge of local conditions and needs. Working with farmer organizations, NGOs, and other civil society groups, CGIAR centers can provide some of the tools that will help these groups determine the way in which natural resources are better managed. Thus, the CGIAR centers must develop site-specific NRM strategies in partnership with NGOs and the rural communities they set out to help.

These partnerships will require mutual respect, a common language, a new appreciation of indigenous knowledge and new methodologies. This is an area in which anthropologists and social scientists have much to contribute. They can help biophysical scientists develop truly participatory methodologies and increase their appreciation and understanding of local knowledge and conditions. Local knowledge is in fact considered so valuable that it should in itself become an important topic of research.

Participants also felt that these kinds of partnerships require a complete re-training of scientists. For example, the language ordinarily used by scientific researchers is usually incomprehensible to peasant farmers. Conversely, traditional and agroecological concepts and terminology are not understood by scientists. Here again, cultural anthropologists could help develop a language common to both researchers and community members.

Scaling up of successful local initiatives

Many initiatives promoting agroecologically based NRM have crystallized at the local level, positively impacting a few rural communities in terms of food security, environmental preservation and income generation. In order to extrapolate to a more regional level the full benefits of such sustainable agriculture initiatives, the scaling up of successful local projects is a key requirement. This remains however a major research and methodological challenge and there are no recipes on how to proceed with scaling up. It is known that in order for these efforts to be expanded, major changes need to take place in the areas of institutional partnerships, agricultural policies, research agendas and educational processes.

A possible approach would be to provide through new institutional partnerships, additional methodological or technical ingredients to existing cases that have already reached a certain level of success. This would complement the efforts of local NGOs and communities who are already involved in NRM field work, carrying out networking activities, and engaged in advocacy work to influence research direction and/or policies that will benefit resource-poor farmers.

Group III

Linking NRM and rural development

Although appropriate NRM strategies are key to improving the livelihoods of poor farming communities, effective social organization, empowerment of communities, access to land, and enabling policies are also crucial for an NRM strategy to significantly impact poor farmers of the developing world.

Other roles for social scientists

With the aim of avoiding increasing inequities, social scientists are needed to help foresee the consequences of change on the social fabric of communities before projects or policies are implemented. After intervention, as scientists develop indicators of sustainable NRM using ecological tools, social scientists can assist them by including social criteria.

Many poor rural communities are from indigenous ethnic groups which have traditionally been marginalized. By working with indigenous communities, cultural anthropologists can help empower these groups and provide a bridge between them and scientists.

Empowerment of rural communities

Because rural communities are affected by factors which are in constant flux and because NRM projects have a finite life, it is crucial that the process by which new NRM strategies are developed enhance the ability of rural communities to innovate, to respond to new challenges, and to influence the policies which affect them. This is yet another reason for including members of rural communities in the research process.

The benefits gained from NRM research and development include both the end-product--i.e., new strategies and technology to sustainably manage natural resources--and the process used to arrive at the end-product. By using an empowering methodology, members of rural communities, such as women's groups and indigenous peoples learn not only the technical tools for sustainable NRM but also gain much needed political power and recognition that will ensure enduring results. This process makes use of a methodology in which rural people participate in setting research agendas. For example, members of the communities could be included on the boards of CG centers. Farmers, herders, and fishermen should also determine goals and design of research agendas and be involved in carrying out and evaluation of projects. This can be achieved using approaches such as farmer-to-farmer training, farmer-led research, "land-to-lab extension", and multi-directional technology dissemination instead of one-way technology transfer from lab to land. The ability of rural communities to innovate and to respond to new challenges will then be enhanced and will continue beyond the time period of projects.

Policy

Many of the causes of poverty and environmental degradation have their roots in policies which affect the price of agricultural products and access to good land. If, for example, a rural community is poor because of a history and policies which have forced it into cultivating marginal land, does it make sense to develop ways in which this inherently less productive and fragile land might be improved? Or would it make more sense to promote land reform to eliminate some of the causes of poverty? The NRM consultation participants were faced with this dilemma. Even though the mandate of the CGIAR is not in the realm of policy formulation, the participants arrived at the conclusion that the CGIAR can nevertheless, within the limits of its abilities, bring the "voice" of poor farmers to relevant international fora and attempt to influence the policy-making process. For example, when conducting participatory programs, national and international decision-makers should be included in the process. This would ensure that policy makers are at least kept informed on the evolving situation in rural communities.

Some policy issues which affect the price of agricultural goods and access to land directly affect the goals of poverty alleviation and sustainable management of natural resources. This is why participants felt that the CGIAR, within the limits of its mandate, should support efforts to obtain fair prices for raw agricultural products, land redistribution, and ending trade liberalization, at least in the case of staple foods, which are crucial to food security.

Self-sufficiency

Before the rural poor in marginal areas can be expected to be a part of and compete with powerful and fluctuating global forces, they must build up a minimum level of local self-sufficiency. This prevents them from sinking to levels at which their food security is threatened. The kinds of technologies developed should therefore emphasize as a prerequisite food self-sufficiency and independence from outside resources. Research can help develop these kinds of technologies by using existing production systems as a starting point while reinforcing the innovative characteristics of these local systems.

Similarly, at the level of economics, local agricultural production should gain some independence from global market prices of agricultural goods. This can be done by encouraging local circuits of production and consumption or by linking farmers to export markets mediated by organizations involved in fair-trade schemes.

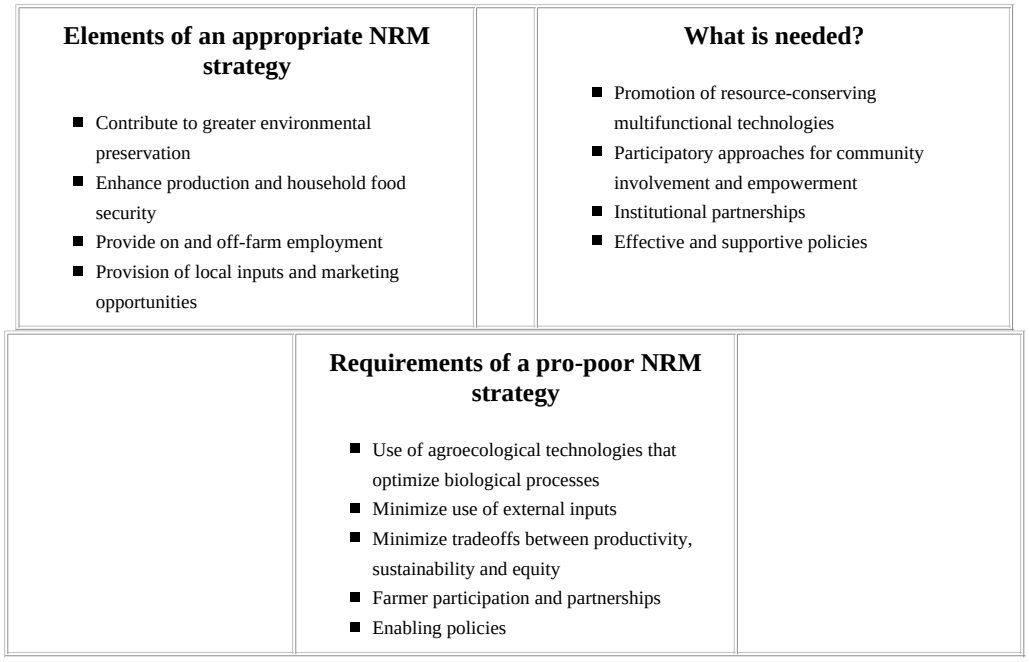
Conclusions

Several conclusions can be drawn from the rich discussions held during the workshop:

1. Improving the management of natural resources is not only linked to the alleviation of poverty but it is also essential to achieving sustainable productivity increases in traditional and ecologically vulnerable areas. For this to happen, the proposed NRM strategy, however, has to deliberately target the poor, and not only aim at increasing production and conserving natural resources, but to create employment, provide access to local inputs and output markets.
2. Researchers and rural development practitioners will need to translate general ecological principles and natural resource management

concepts into practical advice directly relevant to the needs and circumstances of small-holders.

3. The new pro-poor technological agenda must incorporate agroecological perspectives. A focus on resource conserving technologies, that uses labor efficiently, and on diversified farming systems based on natural ecosystem processes will be essential. Technological solutions will be location specific and information intensive rather than capital intensive. The many existing examples of traditional and NGO-led methods of natural resource management provide opportunities to explore the potential of combining local farmer knowledge and skills with those of external agents to develop and/or adapt appropriate farming techniques.
4. Any serious attempt at developing sustainable agricultural technologies must bring to bear local knowledge and skills on the research process. Particular emphasis must be given to involving farmers directly in the formulation of the research agenda and on their active participation in the process of technological innovation and dissemination. The focus should be in strengthening local research and problem-solving capacities. Organizing local people around NRM projects that make effective use of traditional skills and knowledge provides a launching pad for additional learning and organizing, thus improving prospects for community empowerment and self-reliant development.
5. A pro-poor NRM strategy should include delineating an agenda for policy formulation that facilitates participatory natural resource management practice based on both farmer-based traditional innovations and selected external inputs when appropriate. The strengthening of local institutional capacity and widening access of farmers to support services that facilitate use of technologies will be critical. There is also need to increase rural incomes through interventions other than enhancing yields, such as complementary marketing and processing activities. To design and implement such an agenda, cooperation among governments, international agencies, NGOs, committed members of the private sector, and the technical and scientific communities will be required.



List of NRM workshop attendees

Abou Thiam	PAN-Africa, Senegal	panafric@sonatel.senet.net
Alejandro Rojas	U. British Columbia, Canada	arojas@capcollege.bc.ca
Andrés Yurjevic	CLADES, Chile	adm@clades.mic.cl
Anne-Marie Izac	ICRAF, Kenya	a.izac@cgiar.org
Arthur Getz-Escudero	WRI, USA	arthurg@wri.org
Assétou Kanouté	ADAF/Galle, Mali	adaf-galle@datatech.toolnet.org
Bruce Beehler	Counterpart Int., USA	bbeehler@counterpart.org
Carlos Pérez	CARE, USA	perez@care.org
Christian Castellanet	GRET, Francia	castellanet@gret.org
Christie Peacock	Farm-Africa, Reino Unido	farmafricauk@gn.apc.org
Claudia Carr	UC Berkeley, USA	cjcarr@nature.berkeley.edu
Danièle Perrot-Maître	IFPRI, USA	d.perrot-maitre@cgiar.org
Donald Winkelman	CGIAR/TAC, USA	tacwink@newmexico.com

http://nature.berkeley.edu/~agroeco3/cgiar/ngoc_nrm.html

Eduardo Sevilla-Guzmán	U. Cordoba, España	ec1segue@lucano.uco.es
Elias Fereres	CGIAR/TAC, España	ag1fecae@uco.es
Jacqueline Ashby	CIAT, Colombia	j.ashby@cgiar.org
Jane Toll	IPGRI, Italia	j.toll@cgiar.org
Jean-Marc v. d. Weid	AS-PTA, Brasil	aspta@ax.apc.org
Josh Posner	CONDESAN, Perú	j.posner@cgiar.org
Juan Sánchez B.	CIED/CLADES, Perú	juan@cied.org.pe
Julian Gonsalves	IIRR, Filipinas	ovp-iirr@cav.pworld.net.ph
Julio Berdegué	RIMISP, Chile	berdegue@reuna.cl
Larry Harrington	CIMMYT, México	l.harrington@cgiar.org
Lori Ann Thrupp	WRI, USA	athrupp@igc.org
Manuel Lantin	CGIAR, USA	m.lantin@cgiar.org
Marco Barzman	UC Berkeley, USA	barzman@nature.berkeley.edu
Maria João Santos	ISA, Portugal	mariasantos@isa.utl.pt
Maria Fernandez	CIAT, Colombia	m.fernandez@cgiar.org
Mariana Purnell	ARC, Sud Africa	arcusa@mindspring.com
Miguel Altieri	UC Berkeley, USA	agroeco3@nature.berkeley.edu
Mike Swift	TSBF, Kenya	mike.swift@tsbf.unon.org
Mohan Saxena	ICARDA, Siria	m.saxena@cgiar.org
Nils Christoffersen	ART, USA	nilsatart@aol.com
Norman Uphoff	U. Cornell, USA	ntu1@cornell.edu
Peter Hazell	IFPRI, USA	p.hazell@cgiar.org
Peter Rosset	Food First, USA	rosset@socrates.berkeley.edu
Rafaralahy Sébastien	Tefy Saina, Madagascar	ntu1@cornell.edu
Ralph von Kaufmann	ILRI, Africa	r.von-kaufmann@cgiar.org
Ranil Senanayake	NRC, Sri Lanka	100232.3435@compuserve.com
Richard Harwood	Michigan State U., USA	rharwood@pilot.msu.edu
Robert Hart	SANREM CRSP, USA	rdhart@arches.usa.edu
Rolando Bunch	COSECHA, Honduras	rolando%cosecha@sdnhon.org.hn
Susana Hecht	UCLA, USA	sbhecht@ucla.edu
Victor Toledo	U.Nacioal de México, México	vtoledo@oikos.unam.mx
Yuexin Du	CICETE, China	ydu@public.un.org