

PARTICIPATORY RESEARCH AND GENDER ANALYSIS IN AGRICULTURAL AND NATURAL RESOURCE MANAGEMENT RESEARCH: A SELECTED REVIEW OF THE LITERATURE



CGIAR Systemwide Program on Participatory Research
and Gender Analysis for Technology Development
and Institutional Innovation



FUTURE
HARVEST



**Participatory Research and Gender Analysis in
Agricultural and Natural Resource Management Research:
A Selected Review of the Literature**

Edited by:
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Version 1
October 2006

**CGIAR Systemwide Program on Participatory Research and Gender Analysis for
Technology Development and Institutional Innovation
(PRGA Program)**



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Averill D; Lilja N; Manners G, 2006. *Participatory research and gender analysis in agricultural and natural resource management research: An annotated bibliography of selected literature*. Version 1. Cali, Colombia: CGIAR Systemwide Program on Participatory Research and Gender Analysis for Technology Development and Institutional Innovation (PRGA Program), 59 p.

ISBN 978-958-694-089-4

The PRGA Program is convened by CIAT, and co-sponsored by CIMMYT, ICARDA and IRRI.

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Acknowledgments

The University of Maine Folger Library and the MARVEL Mainedatabases Suite are gratefully acknowledged as the sources for this research.

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Introduction and Methodology

The selected bibliography contained in this publication was conceived both as a “snapshot” view of reported resources in participatory research and gender analysis, and as a prototype for an ongoing resource for researchers. The use of participatory research (PR) and gender analysis (GA) in agricultural and natural-resource management research is a fairly recent development. Although both methods can be traced back to the mid-1970s, there have been few studies that have analyzed the impact of GA in the implementation of research; rather most GA has seemingly focused on the role of women in agricultural development and the impact of agricultural technology on the lives of women. There is, however, a wide variety of researchers reporting their approaches and conclusions in an extensive range of publications. The purpose of this project was to begin to gather the reported evidence of PR and GA, and make it readily available to colleagues throughout the PRGA Program network.

The decision was made at the beginning of the project to initially limit the bibliography to edited, peer-reviewed articles. Therefore, most organizational reports and book chapters are not included. While this narrows the scope of the initial bibliography, it also provides a clear foundation for future expansion of the print prototype into a real-time database accessible via the Internet. A few organization-based reports are included where said reports set precedence for PR and GA work or are cited frequently in the peer-reviewed literature.

The bibliographer consulted a wide range of information databases to identify PR and GA citations. These included Academic Search Premier, Agricola, AGRIS, CAB Direct, EconLit and Kluwer. Because of copyright restrictions, where permission was not granted by the database publisher for use of the abstract, an alternative database location was determined or permission from the author was requested. Time constraints prevented all citations from being included in this first edition of the print bibliography, and further rights and permissions will need to be secured for future editions and eventual online access. At this point, only research available in English has been included.

In addition to using available research databases, the bibliographer made extensive use of search terms and methods to identify appropriate citations. The intention was to locate multiple levels of PR and GA work in natural-resource management and agriculture in developing countries. Participatory research and GA are used in other disciplines and throughout the world, but the focus here was specific to the needs of the PRGA Program and its partners. A flow-chart method of searching was used in each database to include not only identified subject headings and descriptors, but also author-supplied and text-based key words. Also, in many cases, the cited research within articles was analyzed to identify articles, researchers and organizations whose work suggested further inquiry. While this phase of bibliography development is not complete, the desired outcome is the inclusion in a single resource of both historical and ongoing PR and GA efforts worldwide.

Each article was entered into a Microsoft Access database, including the following fields:

1. First five authors listed on the publication
2. Database location (Agricola, CAB, etc.)
3. All specific natural or agricultural resources (e.g. livestock, tomatoes, maize, soil management, water resources)
4. Continent
5. Countries
6. Journal title
7. Year of publication
8. Organizational affiliations (research groups, universities).

The fields have been developed into a print index and will eventually feed into a searchable database.

Articles were divided into four broad categories of PR and GA research:

1. *Impact of PR and GA*
—empirical studies on impact of agricultural technologies that were developed by applying PR and GA research methods.
2. *Practice of PR and GA*
—studies that describe how projects implemented PR and GA, and describe some of their findings or outcomes, but they do not assess the impact of technologies on end-users.
3. *Evaluation of PR and GA methods*
—studies focused on evaluating and discussing the pros and cons of PR and GA methods, and describe specific lessons learned on what works and where.
4. *Use of participatory methods in impact assessment, monitoring and evaluation*
—studies that describe experiences in using participatory methods in project impact assessment, and monitoring and evaluation activities.

It is hoped that this work will continue in order to provide ready access to important professional work in the field of participatory research and gender analysis.

Deborah Averill, Nina Lilja and Guy Manners

Annotated Bibliography

Section A

Impact of Participatory Research and Gender Analysis

- A1. Adalla CB; Alzona FB; Magsino EA, 1993 (issued 1995). Farmer empowerment thru participatory research: The case of integrated nutrient and pest management (INPM) extension and women project. *Philippine Journal of Crop Science* 18 (Supp. 1): 40ff.

Farmer empowerment is being nurtured through a participatory action research cum extension program in IPM (integrated pest management), with gender concerns and rapid composting as added entry points. The 5-year results show a drastic reduction in the frequency of spraying among rice farmers. These farmers were observed to do their own version of regular arthropod population monitoring. On the other hand, despite having shown that the INPM approach markedly reduced input costs, technology adoption among vegetable farmers was very slow. Among the reasons cited are, the better price commanded by damage-free crop and the need to produce at any cost to meet previous arrangements with traders. As regards rapid composting, adoption was higher in Majayjay than in Calamba (Philippines). The major constraint for adoption was the high amount of labor involved. Development support communication efforts for better technology adoption did not produce encouraging results.
(gender analysis, Institute for Economic Growth, Asia)

[AGRIS]

- A2. Franzel S; Wambugu C; Tuwei P, 2003. The adoption and dissemination of fodder shrubs in Central Kenya. *ODI/AGREN Network Paper* No. 131.

Fodder shrubs have great potential for increasing the income of smallholder dairy farmers. This paper documents their uptake in central Kenya and the efforts of a range of institutions to promote their adoption. The successful dissemination of new knowledge-intensive practices such as fodder shrubs requires much more than transfer of knowledge and germplasm; it involves building partnerships with a range of stakeholders, ensuring appropriateness of the practice, assisting local communities to mobilise resources, and ensuring participation of farmers' groups in evaluating the practice. The main challenge of the future is how to make such flows of information and germplasm self-sustaining.
(forage, dairy farming, World Agroforestry Centre, Kenya Forestry Research Institute)

[AgREN Database]

- A3. Holt-Gimenez E, 2002. Measuring farmers' agroecological resistance after Hurricane Mitch in Nicaragua: A case study in participatory, sustainable land management impact monitoring. *Agriculture, Ecosystems and Environment* 93(1-3): 87–105.

A study using a participatory management approach and simple field techniques found significant differences in agroecological resistance between plots on “conventional” and “sustainable” farms in Nicaragua after Hurricane Mitch. On average, agroecological plots on sustainable farms had more topsoil, higher field moisture, more vegetation, less erosion and lower economic losses after the hurricane than control plots on conventional farms. The differences in favor of agroecological plots tended to increase with increasing levels of storm intensity, increasing slope and years under agroecological practices, though the patterns of resistance suggested complex interactions and thresholds. For some indicators agroecological resistance collapsed under extreme stress. With the help of 19 non-governmental organizations (NGOs) and 45 farmer-technician teams, 833 farmers measured key agroecological indicators on 880 plots paired under the same topographical conditions. These paired observations covered 181 communities of smallholders from southern to northern Nicaragua. The broad geographical coverage took into account the diversity of ecological conditions, a variety of practices common to sustainable agriculture in Nicaragua, and moderate, high and extreme levels of hurricane impact. This coverage, and the massive mobilization of farmer–technician field research teams, was made possible by the existence of the *Movimiento Campesino a Campesino* (MCAC) (farmer-to-farmer movement), a widespread smallholders' network for sustainable land management. An approach for measuring agroecological resistance is introduced, and it is suggested that comparatively higher levels of agroecological resistance are an indication of lower vulnerability and higher sustainability. However, the effectiveness of practices appears to be bounded by a combination of steep slopes, maintenance and design of soil conservation structures, and extremely high storm intensity. The study concludes that the participatory research can contribute significantly to the monitoring and development of sustainable land management systems (SLM) among smallholders, and recommends a sustainable, participatory approach to agricultural reconstruction following natural disasters.

(South America)

[Agricola]

- A4. Jewett S, 2000. Unequal knowledges in Jharkhand, India: de-romanticizing women's agroecological expertise. *Development and Change* 31(5): 961–985.

Taking the Jharkhand region of India as a case study, this article uses empirical data to intervene in “women, environment and development” and eco-feminist debates regarding women's environmental knowledge. The article first outlines the adoption of gender and environmental issues into development planning and considers the dangers of overestimating women's agro-ecological knowledge and assuming that they

can participate in development projects. It then highlights the local complexities of environmental knowledge possession and control with reference to gender and other variations in agricultural participation, decision-making and knowledge transfers between villagers' natal and marital places. Particular emphasis is placed on the economic, socio-cultural and "actor" related factors that supplement gender as an influence on task allocation, decision-making, knowledge distribution and knowledge articulation. The article concludes that given the socio-cultural restraints women face in accumulating and vocalizing environmental knowledge, simplistic participatory approaches are unlikely to empower them. Instead, more flexible, site-specific development initiatives (coupled with wider structural change) are required if opportunities are to be created for women to develop and use their agro-ecological knowledge.

(gender analysis, Asia, School of Oriental and African Studies [London])

[Author provided]

- A5. Johnson NL; Lilja N; Ashby JA, 2003. Measuring the impact of user participation in agricultural and natural resource management research. *Agricultural Systems* 78(2): 287–306.

Persistent poverty and environmental degradation demand a constant effort to improve the effectiveness and impact of agricultural and natural-resource management research. Participatory research methods have developed as a way to help researchers better target their work towards the needs and constraints of specific stakeholder groups. Participatory research may also strengthen the capacity of participants to initiate a continuous process of innovation. The capacity of farmers and other end-users of technologies to innovate may be particularly important in poor, marginal environments where conditions are highly variable. This paper assesses the impact of using participatory methods in three agricultural research projects which have a natural-resource management focus. Mixed methods are used to assess technological, economic, human and social impacts, and the cost implications of incorporating beneficiaries into the research process. User participation was found to influence priorities and practices within and beyond the specific projects studied. Participation led to more relevant technologies and greater economic impacts, especially when participation was early in the research process. Impacts on farmer capacity were high when farmers worked intensively with researchers over a period of time. Use of participatory methods changes research costs. When farmers took over tasks that were previously done by researchers, some of the research costs were transferred to farmers. When participatory methods were combined with conventional on-farm research, there were also start-up costs, because researchers and farmers needed to learn new research methods. However, these additional one-time costs were not significant in terms of total research costs.

(soil management, sweet potato, Asia, Africa, North America, Indonesia, Zimbabwe, Malawi, Honduras, CIAT, CGIAR, ICRISAT, CIP)

[Author provided]

- A6. Joshi KD; Witcombe JR, 2003. The impact of participatory plant breeding (PPB) on landrace diversity: A case study for high-altitude rice in Nepal. *Euphytica* 134(1): 117–125.

Participatory plant breeding (PPB) methods were used to develop two farmer-accepted, cold-tolerant rice varieties in Nepal—Machhapuchhre-3 (M-3) and Machhapuchhre-9 (M-9). Both were derived from the cross Fuji 102/Chhomrong Dhan. Following the introduction of these varieties, the changes in the rice landraces and varieties that farmers grew were studied in ten villages. In seven of them for which data were analysed for both 1996 and 1999, adopting farmers grew 18 landraces and four modern varieties of which three, M-3, M-9 and Lumle-2, were the products of PPB. These three varieties covered 10% of the total rice area and 33% of the rice area of the adopting farmers in seven study villages in the 1999 survey. The adoption of the PPB varieties impacted most on the more commonly grown landraces. With the exception of two villages, the varietal richness among adopting farmers was either static or increased, and there was an overall increase in allelic diversity. However, in future, the increasing adoption of M-3 and M-9 could result in significant reductions in varietal richness, although, allelic diversity may not be greatly reduced.

(Asia, Li-Bird, CIMMYT, Centre for Arid Zone Studies)

[Kluwer Database]

- A7. Molinas JR, 1998. The impact of inequality, gender, external acceptance and social capital on local-level cooperation. *World Development* 26(3): 413–431.

This paper uses recent advances in the theory of the analysis of cooperation in an econometric analysis of the determinants of successful collective action. Data were obtained from a survey of 104 peasant cooperative institutions in Paraguay. The analysis showed that: (a) the level of cooperation is not monotonically related to either the degree of inequality of endowments within the community or the level of external assistance; rather, it is of an inverted U-shape form; and (b) cooperation increases with increasing level of women's participation and increasing social capital.

(gender analysis, South America, Universidad Catholica [Paraguay])

- A8. Onduru DD; de Jager A; van der Werf E; Diop JM, 2002. Participatory on-farm comparative assessment of organic and conventional farmers' practices in Kenya. *Biological Agriculture & Horticulture* 19(4): 295–314.

On-farm participatory research was carried out in low and high potential areas of Kenya to assess agronomic and socioeconomic viability of organic and conventional practices and their prospects at farm level. At each site, 20 farms participated in the study, divided equally between organic and conventional farming systems. Agro-economic study of current organic practices of growing maize using compost and liquid manure top dressing in low potential areas showed a significantly higher performance than those

of current conventional farmers' practices of a combined application of manure and mineral fertilizers. Maize grain yields were 11–21% higher than those obtained with conventional practices. Net cash benefits, total net benefits and return to labour were also high. This, however, was the reverse of results obtained from high potential areas, where conventional practices out-performed organic practices in major agro-economic indicators. The study further revealed that current farmers' practices of combining compost and liquid manure had a potential of turning partial negative nitrogen balances into positive ones in low potential areas and making them less negative in high potential areas. This was in contrast to current conventional farmers' application rates of manure and mineral fertilizers. The partial phosphorus balances appeared rather balanced under conventional and organic practices and became more positive with nutrient additions through top dressing using mineral fertilizers and liquid manure. Despite these findings, large scale application of manure and compost are constrained by their availability and quality at farm level, while the use of mineral fertilizers is limited by their escalating costs.

(soil management, compost, Africa)

[Agricola]

- A9. Ortiz O; Garrett KA; Heath JJ; Orrego R; Nelson RJ, 2004. Management of potato late blight in the Peruvian Highlands: Evaluating the benefits of farmer field schools and farmer participatory research. *Plant Disease* 88(5): 565–571.

Farmer field school programs incorporating farmer participatory research (FPR–FFS) have the potential to provide important benefits to their participants and to other farmers who benefit from improved cultivars and management techniques. An FPR–FFS program in San Miguel, Cajamarca, Peru, has been in place since 1999 with an emphasis on management of potato late blight, caused by *Phytophthora infestans*, the most important problem facing Andean potato growers. Farmers' knowledge of late blight was surveyed to determine useful components for an FPR–FFS curriculum. The benefits to participants of FPR–FFS programs were evaluated first by measuring knowledge of late blight management by participants and non-participants. Studies of the Peruvian FPR–FFS program indicated that participants were more knowledgeable and that their expertise further increased after an additional year of participation. The benefits to participants can be evaluated more directly by comparing the productivity of participants' farms with non-participants' farms. For the Peruvian FPR–FFS program, participants had significantly higher average levels of productivity. The benefits of FPR–FFS programs for the development of better cultivars and management techniques become more refined as data from more sites are included in calculating the estimate. A more direct evaluation of benefits from FPR–FFS input may be based on the ability of farmers in FPR–FFS programs to eliminate undesirable genotypes and to recommend desirable genotypes based on criteria in addition to those used by breeders.

(potato, South America, CIP, Kansas State University, Cornell)

[Author provided]

- A10. Pande S; Narayana Rao J; Upadhyaya HD; Lenne JM, 2001. Farmers' participatory integrated management of foliar diseases of groundnut. *International Journal of Pest Management* 47(2): 121–126.

Late leaf spot (LLS) caused by *Phaeoisariopsis personata* [(Berk and Curt) v. Arx = *Cercosporidium personatum* (Berk. & Curt.) Deighton] and rust caused by *Puccinia arachidis* (Speg.) are the two most destructive fungal foliar diseases of groundnut worldwide. Together, these two diseases can cause more than 50% yield loss in groundnut in many countries. Foliar disease management in groundnut often involves indiscriminate use of chemicals or total reliance on host plant resistance (HPR). On-station experiments on integrated disease management (IDM) at ICRISAT – Patancheru, India, have clearly demonstrated that when moderate levels of HPR are combined with seed treatment and affordable levels of chemical control, expected yields and economic returns are higher than obtained with chemical control of susceptible genotypes. We evaluated the performance of this combination in on-farm farmer-participatory research. The groundnut genotypes were ICGV 89104, ICGV 91114, TMV 2 and a local cultivar. Thirty farmers from Anantapur, Kurnool, and Nalgonda districts in the state of Andhra Pradesh, India, conducted the experiments during the 1995 and 1996 rainy seasons. Local agronomic practices were followed. Experiments were conducted under both high disease pressure [nonintegrated disease management (non-IDM) i.e. natural] and low disease pressure [integrated disease management (IDM), i.e. seed treatment and fungicide, chlorothalonil sprayed once at 60 days after sowing, d.a.s.]. The severities of LLS and rust on test genotypes were significantly lower than on TMV 2 and the local cultivar up to 65 d.a.s. The increase in pod yield over the local cultivar and TMV 2 in IDM plots was 60% in ICGV 89104, and 55% in ICGV 91114. Farmers preferred these two genotypes because of their close phenotypic similarity to the local cultivar. Our studies also suggest that any technology developed for groundnut should offer clear yield and foliar disease resistance over farmers' current practices.

(IPM, Asia, ICRISAT, University of Greenwich)

[Agricola]

- A11. Ramdas SR, 2001. Changing livelihoods, livestock and local knowledge systems: Women stake their claim in Andhra Pradesh and Maharashtra. *Indian Journal of Gender Studies* 8(2): 175–194.

This paper discusses women's role, resource access control and decision-making power in the context of rapid changes in rural livelihoods, local knowledge systems and natural-resource management. Participatory research was carried out in collaboration with NGOs and community-based organizations in six distinct agro-ecological regions of Andhra Pradesh and Maharashtra, with a focus on economically and socially marginalized communities. The research revealed that state policies have resulted in dramatic

changes from food to commercial crops. This has threatened food and fodder security, the biodiversity of crops, natural flora, local livestock and poultry breeds, and led to unsustainable extraction of ground water and high levels of indebtedness. Women have borne the brunt of the problems. Women who formerly played key decision-making roles have been marginalized, their knowledge and expertise made valueless. Traditionally women have also been denied access to certain kinds of knowledge that constrain their livelihoods. Participatory research has empowered women to take the lead in movements to challenge mainstream paradigms of sustainable development.
(gender analysis, forage, Asia)

[Author provided]

- A12. Shams N; Ahmed M, 2000. Common and private property linkages in the low-land forest fishery–farming systems of Cambodia. *Journal of Sustainable Agriculture* 15(4): 59–87.

The majority of the population of north west Cambodia is dependent on subsistence farming–foraging systems. Forests, fishery and farming are the main resources-bases. The self-sustaining peasant-type households draw their food and livelihood from a combination of activities such as farming and hunting-gathering of fish, wildlife and wood materials. This system of utilization of common and private property has evolved over centuries and has ensured two things. First, it enabled an optimum utilization of labor within households consisting of men, women and children. Secondly, as the capacity of private property is limited, natural resources act as a buffer and the nature of resource distribution was more equitable. In post civil war Cambodia, after several decades of social and political conflicts, the patterns of dependence on the common property resources does not appear to have changed very significantly. Although, external forces like market, new technologies and development interventions are putting a lot of pressure on the common and private property utilization systems. These interventions are quite large in the context of the post war population boom and increased commercial activities. This paper analyses the impact of some of these interventions in terms of how they will affect the balance in gender participation in household economic activities as well as the income distribution and equity. Increased pressure for exploitation of fishery and forestry resources has already created an imbalance in the traditionally established ecological economic equilibrium of common and private property resource systems. The paper concludes that technological interventions must maintain a balance in the resource–population relationships. There is a strong need to understand existing linkages between private and common property resources and their use in the context of development interventions in the low-land forest–fishery–farming systems.
(agroforestry, Asia, Oxfam, International Center for Living Aquatic Resources Management, ICLARM)

[Agricola]

- A13. Smale M; Bellon MR; Manuel Rosas I; Mendoza J; Solano AM; Martinez R; Ramirez A; Berthaud J, 2003. The economic costs and benefits of a participatory project to conserve maize landraces on farms in Oaxaco, Mexico. *Agricultural Economics* 29: 265–275.

Conventional methods were used to assess the benefits and costs of an unconventional project whose purpose was to test whether participatory crop improvement can encourage Mexican farmers to continue growing maize landraces by enhancing their current use value. Findings suggest that farmers as a group earned a high benefit–cost ratio from participating though from the perspective of the private investor the returns were low. The project also generated social benefits, but these would be difficult (and costly) to measure. There was a gender bias in both participation and benefits distributions, though there is some evidence of a welfare transfer to maize deficit households. Application of other valuation approaches will be necessary in order to assess both the private and social benefits of similar projects.

(North America, IFPRI, IPGRI, CIMMYT, INIFAP)

[Agricola]

- A14. Witcombe JR; Petre R; Jones S; Joshi A, 1999. Farmer participatory crop improvement. IV The spread and impact of a rice variety identified by participatory varietal selection. *Experimental Agriculture* 35: 471–487.

Participatory varietal selection in a development project in western India showed that the rice (*Oryza sativa*) variety Kalinga III was highly preferred by farmers. The spatial diffusion of this variety from three villages (two project and one non-project) was studied. Seed of Kalinga III had spread from the three villages in 1994 to 41 villages by 1996 and is estimated to have reached over 100 widely distributed villages by 1997. Farmer-to-farmer spread was as high from the non-project case study village that received no further seed from the project, possibly because farmers are more likely to spread seed of a new variety to other farmers when they have no assured supply. Project interventions used key villages, informal-sector seed merchants, and non-government organizations in the spread of seed. The project also collaborated with Rajasthan State Agricultural University—Kalinga III has been proposed for release in that state. A financial analysis revealed the very high internal rates of return that are possible from investment in participatory varietal selection.

(India, Asia, Centre for Arid Zone Studies, KRIBP, University of Wales)

[Agricola]

Section B

Practice of Participatory Research and Gender Analysis

- B1. Ayuk ET, 1997. Adoption of agroforestry technology: The case of live hedges in the Central Plateau of Burkina Faso. *Agricultural Systems* 54(2): 189–206.

Off-season farming activities contribute significantly to household income in the central plateau of Burkina Faso. Cattle and small ruminants are also important. The lack of rules regulating animal browsing during the dry season, unlike during the rainy season has created competition for available land resources among the components of the land use sub-system. This study describes traditional practices utilized to protect home gardens from animals, how these practices have evolved over time and examines factors that affect the adoption of live hedges. Informal and formal surveys were undertaken in the study area in 1993. Five types of traditional methods for protecting gardens from animals were identified. A logit model integrating technology, profitability as an explanatory variable was used to study farmers' decision process to live hedges adoption. The results indicate that water availability and the profitability of the technology itself enhance the probability of adopting live hedges. The results provide an insight into conditions that should be taken into consideration when targeting farmers for this agroforestry technology.

(hedgerows, Africa, ICRAF)

[Agricola]

- B2. Bellon MR; Berthaud J; Smale M; Aguirre JA; Taba S; Aragon F; Diaz J; Castro H, 2003. Participatory landrace selection for on-farm conservation: an example from the Central Valleys of Oaxaca, Mexico. *Genetic Resources and Crop Evolution* 50: 401–416.

On-farm conservation is recognized as a key component of a comprehensive strategy to conserve crop genetic resources. A fundamental problem faced by any on-farm conservation project is the identification of crop populations on which efforts should be focused. This paper describes a method to identify a subset of landraces for further conservation efforts from a larger collection representing the diversity found in the Central Valleys of Oaxaca, Mexico. Mexico is a center of origin and diversity for maize (*Zea mays* L.). The 17 landraces selected from an initial collection of 152 satisfy two criteria. First, they represent the diversity present in the larger collection. Second, they appear to serve the interests of farmers in the region. Data for applying the method were elicited through participatory as well as conventional techniques. They incorporate the complementary perspectives of both men and women members of farm households, and of plant breeders and social scientists.

(CIMMYT, IRD, INIFAP, North America)

[Kluwer Database]

- B3. Calheiros DF; Seidl AF; Ferreira CJA, 2000. Participatory research methods in environmental science: Local and scientific knowledge of limnological phenomenon in the Pantanal wetland of Brazil. *Journal of Applied Ecology* 37(4): 684–696.

Participatory research methodologies incorporating local knowledge are important to the success of ecological research and the sustainable management of natural systems. However, methods of this type are not commonly employed in the natural sciences. We adopted a scientifically rigorous ethnographic research methodology to incorporate local knowledge into understanding a natural limnological phenomenon in the Brazilian Patanal. Known locally as *dequada*, the phenomenon is associated with fish kills. Using primarily open-ended questions and semi-structured interviews, 30 older head-of-household men were interviewed, by the same interviewer, in a small community representative of the few local riverside settlements. Their opinions were then contrasted with current scientific knowledge. In concordance with the scientific community, the local community cited decomposition of organic material as the principal cause of fish mortality due to the *dequada*. Local people therefore can have a well-founded understanding of their environment. This study demonstrates the importance of incorporating local knowledge to corroborate and, often, to guide the process of scientific inquiry. In this case, local knowledge added to scientific knowledge by providing a more complete understanding of the management and conservation of a natural system. We recommend that ecologists should be ready to acknowledge that local understanding can be greater than that of “outsiders.”

(ecology, limnology, South America, EMBRAPA-CPAP, EMBRAPA-CNPMA)

[Author provided]

- B4. Carney JA, 1998. Women’s land rights in Gambian irrigated rice schemes: constraints and opportunities. *Agriculture and Human Values* 15(4): 325–336.

This paper discusses the significance of gender-based conflicts for the failure of Gambian irrigated rice projects. In particular, it illustrates how resource control of a gendered crop, rice, shifts from females to males with the development of pump-irrigated rice projects. Irrigation imposes a radically different labor regime on household producers, demanding that they intensify labor for year-round cultivation. Yet, the Gambian farming system evolved for a five month agricultural calendar, in which women were accorded specific land and labor rights. The need to restructure family labor, specifically skilled female labor, to meet the cultivation demands of pump irrigation is crucial for understanding the patten of gender-based conflicts in Gambian rice schemes. The case study illustrates that irrigation involves more than technology transfer. Appropriate irrigation demands sensitivity to the social structure of household production systems. The paper concludes by emphasizing the centrality of gender issues for improving food security in Sub-Saharan Africa.

(gender analysis, The Gambia, University of California)

[Agricola]

- B5. Catley A; Irunga P; Simiyu K; Dadye J; Mwakio W; Kiragu J; Nyamwaro S, 2002. Participatory investigations of bovine trypanosomiasis in Tana River District, Kenya. *Medical and Veterinary Entomology* 16(1): 55–65.

Participatory research on bovine trypanosomiasis was conducted with Orma pastoralists in the Tana River District, Kenya. The use of participatory methods to understand local perceptions of disease signs, disease causes, disease incidence by cattle age group, seasonal pattern of disease and preferences for indigenous and modern control methods are described. Results indicate that local characterization of diseases called *gandi* and *buku* by Orma pastoralists was similar to modern veterinary knowledge on chronic trypanosomiasis and haemorrhagic trypanosomiasis (due to *Trypanosoma vivax*), respectively. The mean incidence of *gandi* varied from 10.2% in calves to 28.6% in adult cattle. The mean incidence of *buku* varied from 3.1% in calves to 9.6% in adults. Pearson correlation coefficients for disease incidence by age group were 0.498 ($P < 0.01$) and 0.396 ($P < 0.05$) for *gandi* and *buku*, respectively. Informants observed cases of trypanosomiasis in 24.1% of cattle (all age groups); these cases accounted for 41.8% of all sick cattle during the preceding 12-month period. Eight indigenous and three modern trypanosomiasis control methods were identified. Results indicated that an integrated approach to trypanosomiasis control based on private, individual action was well established in the assessment area. When presented with four different trypanosomiasis control methods, community representatives selected “better use of trypanocides” as the most preferred intervention and “community-based tsetse control” as the least preferred intervention. This finding prompted researchers to modify the original project activities. Constraints facing the sustainability of community-based tsetse control are discussed. (livestock, disease control, Africa)

[Agricola]

- B6. Chuenpagdee R; Fraga J; Euan-Avila JI, 2004. Progressing toward comanagement through participatory research. *Society and Natural Resources* 17(2): 147–161.

Comanagement, while widely recognized as an important tool for sustainable resource management, is not easily achieved without a process of trial and error. This article reports on participatory research as a means to progress toward comanagement, using a case study of coastal resource management in San Felipe, Yucatan, Mexico. Research methods included geographical information system (GIS) mapping, surveys, interviews, and a community workshop. The results show strong interest from various community groups in the protection of important habitats and in the management of coastal resources. Through this participatory research, community members, scientists, and government officials entered into a dialogue, suggesting potential for a future comanagement regime. (coastal-resource management, NRM, North America, Virginia Institute of Marine Science)

[Agricola]

- B7. Cools N; DePauw E; Deckers J, 2003. Towards an integration of conventional land evaluation methods and farmers' soil suitability assessment: A case study in northwestern Syria. *Agriculture, Ecosystems & Environment* 95(1): 327–342.

Adaptation of land use to the potentialities and constraints of local agro-ecologies is a key principle of sustainable land management. Farmers and land-resource professionals assess the options that optimize the productivity and sustainability of land use through different knowledge systems. Both systems have advantages and drawbacks. Through a case study in a village of northwestern Syria, an approach was developed to integrate the knowledge of both farmers and land-resources experts in order to promote adoption of new land-use systems. This was done by comparing a farmer-led land suitability assessment (FLSA) with the results of an expert-led land suitability assessment (ELSA) so as to evaluate respective comparative advantages and complementarities. The results of the FLSA and ELSA were integrated into a geographical information system (GIS). The farmers compared the results of FLSA and ELSA, and as a result of their input, ELSA was upgraded to suit local circumstances. Some striking differences were observed between FLSA and ELSA, which could be explained by participatory land evaluation. The farmers' knowledge provided a better understanding of the impact of microclimatic variations on crop productivity. This is an important bonus of the participatory approach, because detailed climatic data for long periods are rarely available for most rural communities. The FLSA procedure adequately explained the over-riding weight of socio-economic restraints over biophysical opportunities. A constraint in the participatory approach is that useful and interesting indigenous knowledge is often scarce. GIS was instrumental in the correlation of indigenous and expert land units and in the farmers' validation of land suitability. The benefits of this approach to the researcher were clear. The farmers on the other hand were extremely appreciative of the improved communication with the scientists. The better interaction with the farmers will pay off when it comes to adoption of improved management.
(soil management, Middle East, Institute for Land and Water Management [Belgium], ICARDA)

[Author provided]

- B8. de Jager A; Onduru D; Walaga C, 2004. Facilitated learning in soil fertility management: Assessing potentials of low-external-input technologies in east African farming systems. *Agricultural Systems* 79(2): 205–223.

This paper describes the facilitated learning process of farm households and direct policy makers in addressing the problem of nutrient depletion. The process is applied in a case study in four districts in Kenya and Uganda during the period 1997–1999, where the potentials of low-external input technologies (LEIA) in addressing the soil nutrient depletion problem were assessed. Working through an inclusive process of dialogue, observation, diagnosis, experimentation and exposure to different types of knowledge, participants made a thorough analysis of the current soil fertility situation and tested various LEIA options for improving soil fertility management. In all four research sites

the future agricultural productivity is threatened by soil nutrient depletion. Maximal use of locally available nutrients through LEIA techniques, combined with optimal use of external nutrients appears to be the most appropriate strategy in the existing economic environment. Long-term and intensive collaboration between research institutions on the one hand and extension services, non-government and community based organizations on the other are a prerequisite for a successful and sustainable implementation of a facilitated learning approach. Involvement of stakeholders in the various stages of the research process, including the planning and project formulations is essential for an effective follow-up and implementation of the results. More attention needs to be paid to the development of communication tools to enable an effective interaction between policy makers and researchers.

(soil management, Africa, Agricultural Economics Research Institute (LEI), ETC-East Africa, Environment Alert)

[Agricola]

- B9. Dorward P; Galpin M; Shepherd D, 2003. Participatory farm management methods for assessing the suitability of potential innovations. A case study on green manuring options for tomato producers in Ghana. *Agricultural Systems* 75(1): 97–117.

This paper examines the potential of using participatory farm management methods to examine the suitability of a technology with farmers prior to on-farm trials. A study examining the suitability of green manuring as a technology for use with wet season tomato producers in Ghana is described. Findings from this case study demonstrate that participatory budgeting can be used by farmers and researchers to analyze current cultivation practices, identify the options for including green manures into the system, and explore the direct and wider resource implications of the technology. Scored causal diagrams can be used to identify farmers' perceptions of the relative importance of the problem that the technology seeks to address. The use of the methods in this *ex-ante* evaluation process appears to have the potential to improve the effectiveness and efficiency of the adaptive research process. This ensures that technologies subsequently examined in trials are relevant to farmers' interests, existing systems and resources, thereby increasing the chances of farmer adoption. It is concluded that this process has potential for use with other technologies and in other farming systems.

(Africa, University of Reading [UK])

[Author provided]

- B10. d'Souza M, 1998. Watershed development – creating space for women. *ODI/AgREN Network Paper* No. 88b, pp. 10–15.

Central and State governments, donors and NGOs have all been involved in implementing watershed programmes in India. Although the details vary with different projects, the basic institutional structures are similar. Money flows to a project implementing agency (either a government or non-government organization)

which works closely with a village-level body—a watershed committee—to design and implement project activities. Evidence suggests that certain social groups have consistently been marginalized by watershed development projects. These include the landless, families in the upper levels of catchments, marginalized tribal groups and women. The two papers in this volume assess the level of involvement of women in watershed projects and describe the impact of watershed development on their roles and responsibilities. Both papers emphasise that unless women play a central role in the decision-making process, the long-term sustainability of development efforts is threatened. ... Paper 88b looks in detail at a German-funded project in Maharashtra. It advocates the need for a sectoral approach to meeting women's needs. Both papers provide practical suggestions on how to ensure that watershed development programmes respond to the concerns of women. [Paper 88a at B26.]
(water resources, gender analysis, Asia)

[AgREN Database]

- B11. Fujisaka S, 1991. A set of farmer-based diagnostic methods for setting post 'green-revolution' rice research priorities. *Agricultural Systems* 36: 191–206.

Post "Green-Revolution" collaborative research of the International Rice Research Institute and national programs addresses the low and declining productivity of rainfed and upland rice environments. Greater complexity and human poverty of these—as compared to irrigated—systems mean that understanding such systems is the key to designing research. For environments or regions of a country, a sequence of interdisciplinary, farmer-based diagnostic methods is used to identify problems, causes, and research needs. The key method, the diagnostic survey, examines farmer practice and knowledge; and combines field observation, ethnographic eliciting, enterprise budgets and analysis of systems. Research is prioritized by a simple ranking of criteria. A draft report and presentation immediately at the end of field-work emphasizes that results are an output of national program efforts. Methods and applications to rice research in Bhutan, Cambodia, Laos, Madagascar and Nepal are described.
(Asia, IRRI)

[CAB Direct]

- B12. Fujisaka S, 1997. Research: Help or hindrance to good farmers in high-risk systems? *Agricultural Systems* 54(2): 137–152.

At least some groups of resource-poor farmers in risky environments have developed sound, rational problem-solving practices. In such cases, agricultural research may lead to recommendations that are not superior, or even equal, to farmers' practices. In other cases, research may help to solve specific problems, which farmers were unable to solve and for which potential solutions exist. Careful diagnostic research is needed to understand farmers' systems and, in so doing, to determine: (a) where further research might efficiently and effectively help to solve problems; and (b) where further

research may have few benefits. Diagnostic research may also show that recommended innovations can run counter to farmers' solutions. Case examples discuss dryland farmers in Ethiopia, rain-fed lowland rice farmers in eastern India and bean farmers in the Andes of Ecuador.

(beans, Asia, South America, Africa, CIAT)

[CAB Direct]

- B13. Fujisaka S; Jayson E; Dapusala A, 1994. Trees, grasses, weeds: Species choices in farmed-developed contour hedgerows. *Agroforestry Systems* 25(1): 13–22.

Innovations intended to conserve soils and improve soil nutrient cycling have not been widely adopted because of technical problems and lack of fit with farmers' circumstances. Farmer participatory research in Claveria, Philippines facilitated and monitored farmers' adaptation of contour hedgerows to fit their particular needs. Farmers tested different establishment methods and many hedgerow species. Initial planting included combinations of *Gliricidia sepium*, *Flemingia congesta* (*F. macrophylla*), *Cassia spectabilis* and mulberry (*Morus*) with *Pennisetum purpureum*, *Setaria* and *Panicum maximum*. Later adopters chose fodder grasses (especially *Setaria* spp.) or naturally occurring vegetation in their hedgerows—either solely or in combination with other species, including weeds. The 27 main weeds identified (the 5 most frequently occurring species in 57 hedgerows) are listed in the table, and included species which were crop problems. Other crop, medician and fruit tree species were also included in smaller quantities. Upland rice and maize farmers who adapted contour hedgerows (used as an alley cropping systems) from 1987 to 1991 were interviewed in 1992. Although hedgerow–crop competition, grazing by neighbours' cattle, and added labour were problems, farmers viewed hedgerows as a way to reduce soil erosion and provide fodder. Farmers planting mulberry were disappointed after a silkworm project folded. Farmers now face the problem of soil nutrient depletion, leading to fallowing of fields with hedgerows and moving to other parcels of land. A farmer decision tree model of the minimum necessary criteria for sustainable adoption of contour hedgerows is presented. (soil management, forage, NRM, Asia, IIRRI)

[CAB Direct]

- B14. Fujisaka S; Wortmann C; Adamassu H, 1996. Resource poor farmers with complex technical knowledge in a high risk system in Ethiopia: can research help? *Journal for Farming Systems Research-Extension* 6(2): 1–14.

The purpose of this paper is to consider whether research can provide improvements over existing farmer practices in the Nazret area of the Rift Valley, SE of Addis Ababa, Ethiopia. Farmers in this area are resource poor and must deal with low and uncertain rainfall. Results of structured interviews conducted in four communities in 1995 revealed that farmers have fine-tuned a set of alternatives if rains arrive late, if rains stop after initial rains and sowing, and/or if any crop fails to establish; and they sow a range of

crops and cultivars suited to different land, soil, and moisture conditions as the growing season unfolds. Farmers have changed crop and varietal preferences over time in response to problems and opportunities. Their complex technical knowledge and sound adaptation to circumstances suggest, first, that there may be limited opportunities for additional research-based problem solving; but that, second, any system improvements will require substantial farmer involvement. Using participatory diagnostic techniques, farmers and researchers were able to develop a set of research activities directed towards specific problem areas, largely to intensify use of their more productive lands. Research activities include evaluation of varieties of several crops, improved low-level input use and improved tillage.

(Africa, CIAT)

[CAB Direct]

- B15. Gadgil S; Narahari Rao K; Seshagiri Rao PR, 2002. Use of climate information for farm-level decision-making: Rainfed groundnut in southern India. *Agricultural Systems* 74(3): 431–457.

The production of rainfed crops in semi-arid tropics exhibits large variation in response to the variation in seasonal rainfall. There are several farm-level decisions such as the choice of cropping pattern, whether to invest in fertilizers, pesticides etc., the choice of the period for planting, plant population density etc. for which the appropriate choice (associated with maximum production or minimum risk) depends upon the nature of the rainfall variability or the prediction for a specific year. In this paper, we have addressed the problem of identifying the appropriate strategies for cultivation of rainfed groundnut in the Anantapur region in a semi-arid part of the Indian peninsula. The approach developed involves participatory research with active collaboration with farmers, so that the problems with perceived need are addressed with the modern tools and data sets available. Given the large spatial variation of climate and soil, the appropriate strategies are necessarily location specific. With the approach adopted, it is possible to tap the detailed location specific knowledge of the complex rainfed ecosystem and gain an insight into the variety of options of land use and management practices available to each category of stakeholders. We believe such a participatory approach is essential for identifying strategies that have a favourable cost–benefit ratio over the region considered and hence are associated with a high chance of acceptance by the stakeholders.

(Asia, Center for Atmospheric and Oceanic Sciences [Indian Institute of Science])

[Agricola]

- B16. Haggard J; Ayala A; Diaz B; Uc Reyes C, 2001. Participatory design of agroforestry systems: Developing farmer participatory research methods in Mexico. *Development in Practice* 11(4): 417–424.

Participatory research that combines farmers' and researchers' knowledge promotes the development of a variety of agroforestry options that may meet the various needs

of different farmers, and thus exploits one of the greatest strengths of agroforestry—its plasticity. The design and evaluation of agroforestry systems with eight farmer research groups in south-east Mexico was conducted through surveys of individual production aims and limitations, and through group identification, testing and analysis of production alternatives. Farmer trials were used as a basis for agroforestry development projects implemented by community and government organizations, thus disseminating technologies that had been tested and adapted by local farmers.
(forestry, North America, CATIE [Nicaragua], INIFAP, ICRAF)

[Author provided]

- B17. Harris D; Pathan AK; Gothkar P; Joshi A; Chivasa W; Nyamudeza P, 2001. On-farm seed priming; using participatory methods to revive and refine a key technology. *Agricultural Systems* 69: 151–164.

Participatory rural appraisal techniques were used to identify poor crop establishment as a major constraint on rainfed crop production by farmers in India and Zimbabwe. Some farmers in both countries reported experience of soaking seeds in water before sowing in an attempt to improve establishment but the practice was neither widespread nor regularly followed. Armed with a knowledge of safe limits for soaking, almost 1250 on-farm trials were implemented by farmers in India for maize, upland rice and chickpea between 1995 and 1998 and 91 trials for maize and sorghum in Zimbabwe in 1997–1998. In each trial, farmers were asked to soak seed overnight, surface-dry it then sow it in the normal way in a plot next to a plot with dry seed. The farmers in each village evaluated the trials during farm walks and group discussions. These group methods allowed farmers to assess the effect of seed priming over a wide range of soils and levels of management. Direct benefits in all crops included: faster emergence; better, more uniform stands; less need to re-sow; more vigorous plants; better drought tolerance; earlier flowering; earlier harvest; and higher grain yields. In India, where a post-rainy season crop is often grown on residual soil moisture or using supplementary irrigation, indirect benefits reported were: earlier sowing of following crops; earlier harvesting of those crops, which allowed earlier seasonal migration from the area in search of work for cash; increased willingness to use fertilizers because of reduced risk of crop failure; and use of time saved to grow a third crop (mung bean) instead of migrating. Subsequent uptake of on-farm seed priming by participants in the trial has been almost universal and spread from farmer to farmer exhibits characteristics similar to those of the spread of seed of desirable new varieties. On-farm seed priming is a ‘key’ technology – low cost with low risk to produce an immediate benefit, unlocking the farm system and giving the farmer reasonable access to further benefits.

(Africa, Asia, Centre for Arid Zone Studies, KRIBHCO)

[CAB Direct]

- B18. Heong KL; Escalada MM, 1998. Changing rice farmers' pest management practices through participation in a small-scale experiment. *International Journal of Pest Management* 44(4): 191–197.

Asian rice farmers commonly spray insecticides in the early stages of the crop to control leaf-feeding insects. The most common leaf feeder during this period is the leaf folder. Research shows that these sprays are unnecessary as the damaged crops usually recover. It appears that farmers spray to control leaf folder because of misperceptions. We explored the use of farmer participation to change these misperceptions by inviting farmers to test a simple rule-of-thumb or “heuristic”: Do not spray against leaf folders for the first 30 days after transplanting (or 40 days after sowing). About 77% of the 101 participating farmers reported that yields of rice in their test plots were not significantly different from yields of rice in their control plots. Before participating in the evaluation exercise, about 70% of the farmers applied their first insecticide sprays during the first 30 days after transplanting. In the first year after participation, 20% applied insecticides in the first 30 days and this was further reduced to 11% the second year. The mean number of insecticide sprays was reduced from 3.2 to 2.0. Farmers' attitudes towards leaf-feeding insects has also changed. Before participation, farmers believed these insects cause yield loss (87%), severe damage (77%) and had to be sprayed early in the system (62%). After participation, these were reduced to 9%, 28% and 10% respectively. Through information from research distilled into a ‘high science–low tech’ decision rule, farmers can readily derive a test hypothesis from it, evaluate it using a simple experiment, learn its results and change perceptions and practices.

(IPM, The Philippines, Asia, IRRI, Visayas State College)

[Agricola]

- B19. Johnson N; Lilja N; Ashby JA; Garcia JA, 2004. The practice of participatory research and gender analysis in natural resource management. *Natural Resources Forum* 28: 189–200.

Stakeholder participation is expected to improve the efficiency, equity and sustainability of natural-resource management research and development (R&D) projects by ensuring that research reflects users' priorities, needs, capabilities and constraints. Use of participatory methods and tools is growing rapidly; however, there is little systematic evidence about what participation actually means in practice, or about what difference it makes. Based on an inventory of 59 self-described participatory R&D projects in the area of natural-resource management, this article characterizes the typical project and analyzes how stakeholders are selected, how they participate in the research process, and what their involvement means for project costs and impacts. The results suggest that, while projects are generating a range of direct and indirect benefits for participants, more careful attention needs to be paid to achieving equitable impacts. Current practices may lag behind best practices in key areas, such a power sharing and participant selection, and

may therefore be missing important contributions from women and other marginalized groups.

(NRM, Asia, Africa, Middle East, CIAT, CGIAR, PRGA)

[Author provided]

- B20. Joshi A; Witcombe JR, 1996. Farmer participatory crop improvement. II. Participatory varietal selection, a case study in India. *Experimental Agriculture* 32: 461–477.

Farmer participatory varietal selection (PVS) was used to identify farmer-acceptable cultivars of rice and chickpea. Farmers' requirements in new crop cultivars (varieties) were determined, a search was carried out for released and non-released cultivars that matched these needs, and they were tested in farmer-managed, participatory trials. Farmer-acceptable cultivars were found amongst released materials, but not among the recommended material for the area. Lack of adoption is, therefore, because resource-poor farmers have not been recommended or exposed to the most appropriate cultivars under the existing system of varietal identification and popularization. Adoption rates of cultivars would be improved by increased farmer participation, the systematic testing in zonal trials of locally popular cultivars to define their domains properly, a more liberal release system, and a more open system of providing seeds of new cultivars to farmers. (plant breeding, India, KRIBP, Centre for Arid Zone Studies)

[Agricola]

- B21. Kanmegne J; Degrande A, 2002. From alley cropping to rotational fallow: Farmers' involvement in the development of fallow management techniques in the humid forest zone of Cameroon. *Agroforestry Systems* 54(2): 115–120.

Alley cropping was introduced in the humid forest zone of Cameroon to increase soil fertility in 1987, but until 1992 the adoption rate had remained low. To better understand the reasons behind this, three types of on-farm trials were established from fully researcher controlled to fully farmer controlled. During the evaluation of the technology with farmers a number of modifications were registered. (1) Pruning height and frequency: because of the difficulties to consistently cut back at 30 cm, farmers decided to slash at ground level as they normally do while slashing the natural fallow vegetation. This equally allowed for more flexibility in time of pruning. (2) Cropping intensity and patten: initially, alleys were cropped each year. This however had several shortcomings. Having observed the positive impact of incidental fallow period in a farmer's field, it was decided to introduce a fallow phase of at least one year. During the fallow period the plot can be used for fodder production, bee farming and production of stakes. (3) Residue management: fire went incidentally in a farmer's tree plot after slashing, and the trees were not affected. This gave farmers an alternative way to manage the residue, by controlling the fire, before bringing in other crops such as groundnut

and cassava. (4) Agroforestry species: because *Leucaena leucocephala*, in spite of its soil fertility restoration potential, rapidly became a noxious weed, farmers have asked for a less invasive species. *Calliandra calothyrsus* was introduced for this purpose and became a good bee forage. With these modifications, the original alley cropping system has evolved into a rotational tree fallow with higher adoption potential. From about 15 farmers who were testing the technology in 1992, the number increased to 52 in 1996, 120 in 1997 and 236 in 1998.

(agroforestry, Africa, IRAD, ICRAF)

[Agricola]

- B22. Machado AT; Fernandes MS, 2001. Participatory maize breeding for low nitrogen tolerance. *Euphytica* 122: 567–573.

The local maize variety Sol da Manha has a broad genetic background. It was identified in 1985 in a participatory evaluation trial as being suitable for cultivation under low soil fertility conditions in Sol da Manha, situated in Seropedica, State of Rio de Janeiro, Brazil. The variety was then improved for 6 selection cycles by the formal breeding sector at the experimental station of Embrapa Agrobiologia. There were three cycles of mass selection, one selection cycle between and within half-sib families, one selection cycle within full-sib families, and one selection cycle between and within S1 families. Thereafter, the variety was improved in collaboration with the informal sector, viz. a group of farmers of the agricultural community of Sol da Manha for 6 cycles of mass selection. The variety was evaluated in 1994 in field trials for grain yield and nitrogen use efficiency. Sol da Manha can be characterized as efficient in nitrogen use, under both favourable and unfavourable growing conditions.

(participatory plant breeding, South America, Universidade Federal Rural do Rio de Janeiro)

[CAB Direct]

- B23. Moore KM; Hamilton S; Sarr P; Thiongane S, 2001. Access to technical information and gendered NRM practices: Men and women in rural Senegal. *Agriculture and Human Values* 18: 95–105.

Gender differences in knowledge of NRM [natural-resource management] practices have long been noted in Senegal and throughout Sub-Saharan Africa. An exploration of these differences among a sample of rural Senegalese men and women shows that these differences are, in part, a function of extension agent interventions. The level of knowledge of a set of NRM technologies is associated with contact with three key types of extension agent in rural Senegal: extension team leaders, forestry agents, and women's agents. Analysis of intra-household variation in levels of knowledge shows a degree of interdependence between the knowledge levels of husbands and wives for some practices. However, multivariate analysis, controlling for personal and contextual factors,

clearly demonstrates the independent impact of extension agents on gender differences in rural Senegalese NRM knowledge. It can be concluded that contact with extension agents increases knowledge of NRM practices. In particular, contact with the women's agent is a strong predictor of the level of women's NRM knowledge and, surprisingly, also contributes to the level of men's knowledge. Despite the small number of women's agents in the field, they appear to have significant positive impact on the dissemination of NRM knowledge among rural Senegalese women and men.

(gender analysis, Africa, Virginia Polytechnic Institute, Senagrosol-Consult)

[Agricola]

- B24. Muller D; Langewald J; Gbongboru C; DeGroot H, 2002. Participatory development of a biological control strategy of the variegated grasshopper in the humid tropics of West Africa. *Crop Protection* 21(4): 265–275.

The results of a participatory rural appraisal (PRA) in 3 villages in the Couffo district of Benin show that the variegated grasshopper *Zonocerus variegatus* L. is a major, but recent, crop pest. Farmers' knowledge of grasshopper biology is limited and they have not yet developed indigenous control methods. Villagers were keen to collaborate in a participatory research, testing alternative control methods. A demonstration of biological control of grasshoppers was organized, followed by the training of a group of six farmers per village—the village brigade, who will be in charge of grasshopper control in their village. After the training, where grasshopper biology and the advantages and disadvantages of different control options were discussed, it was agreed to test a biological pesticide, an oil-based formulation of the entomopathogenic fungus *Metarhizium anisopliae* var. *acridum*, in a participatory research program. The village brigades chose to test two different strategies: preventive control by treating the young larval stages and curative control by treating adult grasshoppers, with two different sprayers (flit gun and spinning-disc sprayer). Both strategies were tested at three different doses (2, 20 and 50 g of spores/ha). Results show that the dose can be reduced to 20 g/ha without loss of efficacy, so the cost of the treatment (estimated at \$20/100 g or \$4/ha) is within the farmer's reach. Participatory testing also revealed that treating the uncultivated areas is not a practical strategy. Finally, although battery-powered spinning-disc sprayers are more expensive than the hand-powered flit gun sprayers, their higher efficacy justifies the extra expense. The villagers proposed that grasshopper biological control be organized by village brigades, in close collaboration with the village association of cotton growers, who will provide credit. For the 1998–1999 season, this strategy was proposed and accepted in 18 new villages, and each village organized a brigade, trained by the project. Women, who generally manage their own fields, preferred a separate brigade, and three female brigades have been trained so far.

(IPM, Benin)

[Agricola]

- B25. Norton GW; Rajotte EG; Gapud V, 1999. Participatory research in integrated pest management: Lessons from the IPM CRSP. *Agriculture and Human Values* 16(4): 431–439.

Integrated pest management (IPM) has emerged as an important means of managing agricultural pests. Since the mid-1980s, the emphasis on IPM has shifted towards biologically-intensive and participatory research and extension programs. Finding better means of solving pest problems is high on the agenda for most farmers, and farmers often have significant pest-management knowledge and interest in IPM experimentation. This paper describes an approach to participatory IPM research that is being implemented by the IPM Collaborative Research Support Program (IPM CRSP). The approach emphasizes on-farm research with an extrapolation domain beyond the single farm, and in some cases beyond the local region or country. It considers many factors beyond the farm and research station that influence the generation and adoption of IPM technologies and strategies. It emphasizes linkages among farmers, scientists, consumers, bankers, marketers/processors and policy-makers in IPM research priority-setting, conduct and evaluation. The interdisciplinary approach described in the paper is illustrated with a case study from The Philippines. Lessons and conclusions draw on its recent application in other sites as well.

(pest management, Asia, Virginia Polytechnic Institute, Pennsylvania State University, University of the Philippines)

[Author provided]

- B26. Pangare VL, 1998. Gender issues in watershed development and management in India. *ODI/AgREN Network Paper* No. 88a, pp. 1–8.

Central and State governments, donors and NGOs have all been involved in implementing watershed programmes in India. Although the details vary with different projects, the basic institutional structures are similar. Money flows to a project implementing agency (either a government or non-government organization) which works closely with a village-level body—a watershed committee—to design and implement project activities. Evidence suggests that certain social groups have consistently been marginalized by watershed development projects. These include the landless, families in the upper levels of catchments, marginalized tribal groups and women. The two papers in this volume assess the level of involvement of women in watershed projects and describe the impact of watershed development on their roles and responsibilities. Both papers emphasize that unless women play a central role in the decision-making process, the long-term sustainability of development efforts is threatened. Paper 88a reviews a number of government and non-government projects in the states of Andhra Pradesh and Maharashtra. It argues strongly that unless we progress from a view where women are treated as a “disadvantaged group” to a point where they are treated as integral members of the community, development efforts will continue to

sideline women's concerns. It emphasizes the need to ensure that watershed development activities are compatible with women's livelihood strategies. [Paper #88b at B10.]
(water resources, gender analysis, Asia)

[AgREN Database]

- B27. Peters M; Lascano CE; Roothaert R; de Haan NC, 2003. Linking research on forage germplasm to farmers: the pathway to increased adoption— A CIAT, ILRI and IITA perspective. *Field Crops Research* 84(1/2): 179–188.

The aim of most publicly funded research and development of forages in the subtropics and tropics of the developing world is to improve the livelihoods of small-holder farmers. In order to achieve this goal, technical options are sought which not only contribute to alleviation of poverty and improved food security, but also protect natural resources. This paper argues that in order to enhance adoption of multipurpose forages by small-holder farmers, there is a need to utilize participatory methods and to invest in the development of a range of forage alternatives for different environments and production systems. Approaches linking on-station research to farmer participation are described and examples for pathways to adoption presented.
(forage crops)

[Author provided]

- B28. Phiri D; Franzel S; Mafongoya P; Jere I; Katanga R; Phiri S, 2004. Who is using the new technology? The association of wealth status and gender with the planting of improved tree fallows in Eastern Province, Zambia. *Agricultural Systems* 79: 131–144.

Although there is increasing emphasis on targeting of improved technology towards poor and female farmers, few adoption studies assess the uptake of new practices by these groups in a comprehensive manner. In this study, community members used the wealth ranking method to identify the different wealth groups in their communities, to determine each household's wealth status, and to assess the association of wealth and different types of households with the planting of improved tree fallows, a practice for improving crop yields. There were no significant differences between single women and female heads of households who were married. There was some evidence of association between planting improved fallows and wealth. That 22% of the "poor" group and 16% of the "very poor" group were planting them suggests that there are no barriers preventing low-income households from doing so. Moreover, the proportion of females, poor and very poor people planting improved fallows varied considerably among villages, suggesting that opportunities exist for increasing their use of the technology. Whereas the use of mineral fertilizer is strongly associated with high-income, male farmers, improved fallows appear to be a gender-neutral and wealth-neutral technology. Poor farmers appreciate improved fallows because it permits them to substitute small amounts of land and labour for cash,

their most scarce resource. Finally, the high degree of consistency among different key informants in classifying households among wealth groups confirmed the effectiveness and accuracy of the wealth ranking exercise.

(gender analysis, agroforestry, ICRAF, Africa)

[ScienceDirect–Elsevier]

- B29. Snapp SS; Freeman HA; Simtowe F; Rohrbach DD, 2002. Sustainable soil management options for Malawi: can smallholder farmers grow more legumes? *Agriculture, Ecosystems and Environment* 91(1/3): 159–174.

Sole-cropped, unfertilized maize is the dominant cropping system throughout southern Africa. Yields have become stagnant and legumes are frequently advocated as an affordable option for resource poor farmers, to enhance productivity. Farmer participatory research was employed to test legume intensification as a means to improve maize-based systems in Malawi. A range of options were evaluated, from grain/legume intercrops of long-duration pigeonpea (*Cajanus cajan*) and groundnut (*Arachis hypogaea*) rotated with maize (*Zea mays*), to a relay green manure system of maize with *Tephrosia vogelli* (Fishbean). Two years of on-farm experimentation indicated that under on-farm conditions legume-intensified systems produced residues that contained about 50 kg N/ha per year, two-fold higher than sole-cropped maize residues. Grain yields from legume-intensified systems were comparable to yields from continuous sole maize, even in a dry lakeshore ecology. These preliminary findings were linked to farmer assessment, where farmers participating in the trials expressed strong interest in the technologies. Yet the probability of adoption remains uncertain. Associated surveys outlined constraints and trade-offs underlying technology choice, information that is not usually considered in conjunction with on-farm trials. Although the legumes were highly productive, farmers expressed worries about the marginal loss of maize production. While the trial performance was similar across regions, differences in market condition, farm resources and household composition appear to stimulate different technology choices. Farmers weigh the benefits of weed suppression and potential cash earnings, against the costs of seed, problems of seed access, labor requirements and problems of grain market access and price. Surveyed farmers commonly manage residues by burning. Promotion and experimentation with more efficient use of legume residues may offer higher short-term impacts than efforts to promote adoption of another cash crop. Ultimately, adoption and soil fertility benefits may depend on market returns to legume production. This study documents the value of researchers and farmers partnering in evaluation of technologies, adoption constraints and competing technology choices.

(ICRISAT)

[Agricola]

- B30. Sthapit BR; Joshi KD; Witcombe JR, 1996. Farmer participatory crop improvement. III. Participatory plant breeding, a case study for rice in Nepal. *Experimental Agriculture* 32: 479–496.

A participatory plant breeding (PPB) programme was conducted for the high altitude areas of Nepal. The aim was to breed acceptable varieties with minimum use of resources and to utilize farmers' knowledge in the PPB programme. Farmer participation began at the F₅ stage and progress was followed over two seasons in two villages. Farmers proved to be willing participants and made selections in the segregating material, often with great success. Large differences in farmers' preferences between the F₅ bulks were found and the most preferred were adopted rapidly. The most adopted variety, Machhapuchhre-3, performed well in the formal trials system, and much better than the products from conventional centralized breeding. The PPB programme increased biodiversity in the two participating villages.

(Asia, KRIBP, Centre for Arid Zone Studies)

[Agricola]

- B31. Twomlow S; O'Neill D; Sims B; Ellis-Jones J; Jafry T, 2002. RD – Rural Development: An engineering perspective on sustainable smallholder farming in developing countries. *Biosystems Engineering* 81(3): 355–362.

The low productivity of small-holder farming systems and enterprises is attributed mainly to the limited resources of farming households and to the application of inappropriate skills and practices that can lead to land degradation. Land productivity may be raised by improved soil and water management and by mechanization (considering the whole spectrum of power sources) that make better use of labor and other resources. However, mechanization programs, which facilitate soil and water management, have to consider cultural and social factors as well as the immediate technical and economic issues. The livelihoods approach provides a framework for dealing with such considerations, which can be elicited through the participation of farmers in the research and development activities. Examples are given of participatory research (i.e. research in which scientists and farmers participate as partners) to raise small-holder productivity sustainably in India, Zimbabwe and Latin America. Sustainability is a key issue for economic security in the longer term, and depends on many interacting factors both within and outside the task of crop production. The most significant of these factors are discussed and it is emphasized that involving farmers provides a reliable means of accounting for them and enabling the farmers to apply new knowledge to raise productivity, but within the context of their own livelihood strategies.

(crop production, soil management, Asia, Africa)

[Author provided]

- B32. Virk DS; Singh DN; Prasad SC; Gangwar JS; Witcombe JR, 2003. Collaborative and consultative participatory plant breeding of rice for the rainfed uplands of eastern India. *Euphytica* 132(1): 95–108.

We describe a participatory plant breeding (PPB) programme in rice for the rainfed uplands of eastern India. Collaborative participation (farmers grew and selected in segregating materials in their fields) and consultative participation (farmers selected among progenies in the researchers plots) were used. The PPB was started with only two crosses and, of these, Kalinga III/IR64 was the most successful and produced two releases varieties: Ashoka 200F from collaborative breeding and Ashoka 228 from consultative breeding. Both yielded significantly more than control varieties, including Kalinga III, in research trials and in participatory trials in farmers' fields. Qualitative data from participatory trials was highly informative, statistically analysable, and cheaper to obtain than quantitative data. In low-yielding research-station and on-farm trials the two new upland varieties showed no significant genotype \times environment interaction with the check varieties. However, in higher-yielding All India Coordinated Rice Improvement Project trials, both varieties were more adapted to low yielding environments than the national check variety. Farmers liked the varieties for their early maturity, improved lodging resistance, higher fodder and grain yield, long-slender grains and excellent cooking quality. Before certified seed production, farmer groups have produced large quantities of seed that have spread widely through informal channels. The returns from PPB, compared to conventional breeding, were higher because it cost less, the genetic gains per year were higher, and the benefits to farmers were realized earlier.

(Asia, Centre for Arid Zone Studies, Gramin Vikas Trust)

[Kluwer Database]

- B33. Warner M; Bezkorowajnyj P; Rana RB; Witcombe JR, 1999. Matching livelihood needs to tree selection in high potential farming systems: Lessons from participatory research in Nepal and India. *AgREN Network Paper* no. 89.

A participatory crop improvement project in Gujarat, India and Terai, Nepal, funded by the Department for International Development and co-ordinated by the Centre for Arid Zone Studies, University of Wales, is improving crop production and tree use in areas where people have low incomes, but where the production potential is high. Surveys conducted by the project suggest that the last five years have seen significant changes in certain livelihood strategies, including an increase in biogas and crop residues as a fuel source, a shift from open grazing to stall-feeding and increases in the use of fodder crops and crop residues as livestock feed. The surveys also revealed a marked shortage of fuelwood. Conclusions are drawn on the future viability of "trees on farms" as a strategy to meet the demand for fuel and livestock feed. An associated participatory tree selection methodology is presented. The approach incorporates lessons from the project's initial participatory crop improvement methodology — namely combining local plant material

with a scientific search outside the local area—to improve the chances of introducing trees in ways which are viable as a livelihood strategy.
(agroforestry, Asia, ODI, Li-Bird)

[AgREN Database]

- B34. Witcombe JR; Joshi A; Joshi KD; Sthapit BR, 1996. Farmer participatory crop improvement. I. Varietal selection and breeding methods and their impact on biodiversity. *Experimental Agriculture* 32: 445–460.

Farmer participatory approaches for the identification or breeding of improved crop cultivars can be usefully categorized into participatory varietal selection (PVS) and participatory plant breeding (PPB). Various PVS and PPB methods are reviewed. PVS is a more rapid and cost-effective way of identifying farmer-preferred cultivars if a suitable choice of cultivars exists. If this is impossible, then the more resource-consuming PPB is required. PPB can use, as parents, cultivars that were identified in successful PVS programmes. Compared with conventional plant breeding, PPB is more likely to produce farmer-acceptable products, particularly for marginal environments. The impact of farmer participatory research on biodiversity is considered. The long-term effect of PVS is to increase biodiversity, but where indigenous variability is high it can also reduce it. PPB has a greater effect on increasing biodiversity although its impact may be limited to smaller areas. PPB can be a dynamic form of *in situ* genetic conservation.

(Centre for Arid Zone Studies, KRIBP)

[Agricola]

- B35. Witcombe JR; Joshi KD; Rana RB; Virk DS, 2001. Increasing genetic diversity by participatory varietal selection in high potential production systems in Nepal and India. *Euphytica* 122(3): 575–588.

On-farm varietal biodiversity was studied through household surveys in two high potential production systems in Chitwan and Nawalparasi districts of the Nepal Terai and in Lunawada subdistrict, Gujarat, India using the participatory varietal selection (PVS) or the informal research and development approach. Diversity was extremely low in Chaite rice in the Nepal study area (weighted diversity 0.04) and low in main season rice in the India study area (weighted diversity 0.34). In both areas, one cultivar dominated, CH 45 in Nepal and GR11 in India. In the India study area, biodiversity varied with the socioeconomic group and better-off farmers had a greater varietal diversity. PVS identified new varieties that farmers preferred. Their adoption by farmers increased on-farm varietal biodiversity within the three cropping seasons studied. Despite the commonly assumed uniformity of high potential production systems, the new varieties occupied specific niches in the farming system. Farmers' preferences for different varieties—there were large differences in quality traits and maturity period among the

new varieties—should help to maintain biodiversity. Overall production is expected to increase as each niche becomes occupied increasingly by the best-adapted variety. PVS is a simple and powerful method of increasing food production in the high potential production systems that produce most of the developing world's grain.

(Asia, Centre for Arid Zone Studies, Li-Bird)

[CAB Direct]

- B36. Witcombe JR; Virk DS, 2001. Number of crosses and population size for participatory and classical plant breeding. *Euphytica* 122: 451–462.

In the breeding of self-pollinating crops, crossing creates variation upon which selection is exerted. If the value of crosses cannot be predicted then this uncertainty means that many crosses need to be made. However, since there is a limit to the capacity of a breeding programme, more numerous crosses result in each cross having a small population size, fewer progenies in later generations and a lower probability of recovering good genotypes from each cross. Published theory on the optimum number of crosses in a plant breeding programme, for a predominantly self-pollinating crop, usually assumes that all crosses are of equal value. This overestimates the number of crosses required. When the optimum size of a population in a favourable cross is considered, theory predicts that very large populations are desirable. The required population size is even larger if linkage of loci controlling different traits is also considered. Hence, in a inbreeding crop, one possible strategy is to select a small number of crosses that are considered favourable and produce large populations from them to increase the probability of recovering superior genotypes. In a outbreeding crop, the analogy is a few composites with large population sizes. This low-cross-number strategy is ideally suited to the particular constraints and advantages of participatory plant breeding. Such an approach, although not essential, may still be advantageous in classical breeding. When a breeding programme is based on few crosses, which parents are chosen is crucial and farmer participatory methods are highly effective in narrowing the choice. Modified bulk population breeding methods, and recurrent selection are desirable strategies in the participatory plant breeding of self-pollinating crops when combined with a low-cross-number approach.

(PPB, Centre for Arid Zone Studies)

[CAB Direct]

Section C

Evaluation of Participatory Research and Gender Analysis Methods

- C1. Agarwal B, 2001. Participatory exclusions, community forestry and gender: an analysis for South Asia and a conceptual framework. *World Development* 29(10): 1623–1648.

The idea of people’s participation has long been part of development thinking. But today the management of local natural resources by village communities is largely accepted as an institutional imperative. It is therefore essential to examine how these institutions perform, especially from the perspective of the more disadvantaged. Based on extensive fieldwork among community forestry groups in India and Nepal, and existing case studies, this paper demonstrates how seemingly participatory institutions can exclude significant sections, such as women. It provides a typology of participation, spells out the gender equity and efficiency implications of such exclusions, and analyzes what underlies them. It also outlines a conceptual framework to help analyze the process of gender exclusion and how it might be alleviated.

(agroforestry, gender analysis, Institute of Economic Growth)

[Author provided]

- C2. Allison EH, 2002. Sustainable management of the African Great Lakes: Science for development? *Aquatic Ecosystem Health and Management* 5(3): 315–327.

The African Great Lakes have recently been the subject of several major scientific studies. Many of these studies were undertaken within projects aiming to support management programs to conserve the environment and ensure sustainable resource use. This article argues that such projects could be enhanced by more careful attention to “process” issues. In particular, the article highlights that to have positive management impact, such projects need a clear understanding of what is implied by “sustainable management,” careful attention to participatory research and decision-making processes, and critical analysis of widely-held assumptions about the causes of, and potential solutions to, environmental change in Africa. This shift in emphasis from scientific project outputs (what you do) to the process of linking science to policy and management (the way you do it) could ensure that the management decisions that are made are based on sound science, but also account for issues of equity, livelihood security, and empowerment. This should ensure that science and development agendas are engaged more constructively in efforts towards sustainable management.

(lake management, University of East Anglia, Aquatic Ecosystem Health and Management Society, Malawi)

[Author provided]

- C3. Berardi G, 2002. Commentary of the challenge to change: Participatory research and professional realities. *Society and Natural Resources* 15(9): 847–852.

This commentary outlines traditions of participatory research, and what they imply for professional identity. Participatory methods are not meant to replace, but rather to complement more formal research methodologies.

[Author provided]

- C4. Bernet T; Ortiz O; Estrada RD; Quiroz R; Swinton SM, 2001. Tailoring agricultural extension to different production contexts: a user-friendly farm-household model to improve decision-making for participatory research. *Agricultural Systems* 69: 183–198.

Farmers operate within specific natural and socio-economic settings. When those settings are very diverse, as in mountainous areas, agricultural extension services have often failed to tailor interventions to the specific needs of client farmers. In such settings extensionists need cost-efficient tools or a close link to researchers to evaluate potential strategies and activities to raise farmers' income. This need has become more critical as governments in developing countries downsize expenditure on extension services and donors demand impact from their investments. This paper outlines a flexible computer-based farm-household model designed to assist researchers, extension workers, and policy makers. The model allows the user to define specific production options and resource constraints under different socio-economic and bio-physical settings. Model application in different regions has proven its flexibility to capture and analyze a variety of production systems. When used with site-related input data and effective dialogue on the results among researchers, extensionists, and farmers, the model can be a useful tool for participatory research and extension.

(CIP, CIAT, Michigan State University)

[Agricola]

- C5. Campbell JR, 2001. Participatory rural appraisal as qualitative research: Distinguishing methodology issues from participatory claims. *Human Organization* 60(4): 380–389.

Anthropologists and many others are making increasing use of participatory research methods in a variety of applied contexts. While aware of the potential advantages of such methods, this paper outlines a number of methodological issues that need to be carefully considered. Such issues, when taken together with the problem of combining participatory with qualitative and quantitative research, argue strongly not only for caution in using the methods, but also for the need to undertake basic research on participatory methods themselves. This paper looks at the development of participatory rural appraisal (PRA) in development research, and critically examines three methods—interviewing, visualization and ranking/scoring—in terms of their relation to established qualitative research. It then turns to the problems that arise from using PRA techniques. Finally, the validity and reliability of PRA are discussed in relation to arguments about

sequencing/triangulating research techniques, an argument which is shown to be as problematic as the unexamined use of PRA.

(University of London)

[Author provided]

- C6. Ceccarelli S; Grando S; Bailey E; Amri A; El-Felah M; Nassif F; Rezqui S; Yahyaoui A, 2001. Farmer participation in barley breeding in Syria, Morocco and Tunisia. *Euphytica* 122: 521–536.

The paper describes experiments on farmer participation in plant breeding conducted in three countries (Morocco, Syria and Tunisia) on barley, which is the predominant annual rainfed crop in the most marginal areas of these countries. Trials with different types and number of breeding material were planted both on research stations and in farmers' fields. Selection was done by professional breeders and farmers and data were gathered on breeders' and farmers' selection criteria and selection efficiency. The trials reflected the situation of the crop in the three countries, with high yields on station, low yields in some of the most marginal farmers' fields, and poor correlations between research stations and farmers' fields, as well as between farmers' fields. Grain yield was by far the most commonly used selection criteria by the farmers. However, farmers also made a widespread use of selection criterion not normally used by breeders such as grain filling and straw yield, as well as other characteristics of the straw (color) and of the leaves because of the importance of the crop as source of animal feed. A major difference between the selection criteria used by breeders and farmers was disease resistance, almost entirely neglected by the latter. Farmer selection was effective in identifying some of the highest yielding lines in the farmers' own fields and also in those cases where they performed selection on station. The coincidence between entries selected by the breeder and the farmers was high in Morocco but very low in Syria and Tunisia. There were substantial differences between the lines selected by the breeders on station and those selected by the farmers in their fields. In Syria, decentralized-participatory selection was significantly more efficient in identifying the highest yielding entries in farmers' fields than any other selection strategy. This work demonstrates that it is possible to organize a plant breeding program so that farmers become major actors in the selection of new cultivars.

(PPB, Middle East, Africa, ICARDA, INRAT, INRA)

[Kluwer Database]

- C7. Ceccarelli S; Grando S; Tutwiler R; Baha J; Martini AM; Salahieh H; Goodchild A; Michael M, 2003. A methodological study on participatory plant breeding. II Response to selection. *Euphytica* 133: 185–200.

Farmer participation is increasingly seen as a key to develop technologies which are more relevant to farmers' communities. In plant breeding, farmer participation is seen as key to increase the probability of adoption of new varieties. This paper addresses

the issue of selection efficiency in participatory plant breeding by testing the effect of selection environment and of who did the selection in one cropping season (1997) on the performance of the selected lines in the following cropping season (1998). Selection environment had a larger effect on response to selection than who did the selection, confirming the importance of decentralized selection. Selections made by the breeder and the farmers in 1997, differed in 1998 for a number of traits, but seldom for grain yield. When the difference for grain yield was significant, breeder's selection was more effective on station, while farmers' selection was more effective in farmers' fields. The results of this study indicate that it is possible to organize a plant breeding program with the objective of adapting crops to a multitude of both physical and socio-economic environments: such a breeding program will, at the same time, increase productivity and stability, enhance biodiversity and produce environmentally friendly cultivars. (PPB, barley, ICARDA, DASR)

[Kluwer Database]

- C8. Ceccarelli S; Grando S; Singh M; Michael M; Shikho A; Al Issam M; Al Saleh A; Kaleonjy G; Al Ghanem SM; Al Hasam AL; Dalla H; Basha S; Basha T, 2000. A methodological study on participatory barley plant breeding. I. Selection Phase. *Euphytica* 111: 91–104.

Decentralized selection, defined as selection in the target environment, has been used to emphasize favorable interactions when significant genotype by environment interactions exist. However, crop breeding based on decentralized selection can still miss its objectives if it does not utilize the farmers' knowledge of the crops and the environment, and it may fail to fit crops to the specific needs and uses of farmers' communities unless it becomes participatory. One cycle of decentralized participatory selection was conducted in eleven locations in Syria. 208 barley entries (fixed lines and segregating populations) were planted unreplicated in two research stations and in the fields of nine Syrian (host) farmers, where they were managed (except planting) by the farmers themselves. Visual selection was conducted by a breeder at all locations and by the host farmers on their own fields and on both stations. In five farm locations, there was also a one-time group selection by neighboring farmers. Host farmers were able to handle the large number of entries making observations during the cropping season using different scoring methods. They did not use the performance of entries on station for their final selection and used a higher selection pressure than the breeder. In their own fields, they selected about one tenth the number of entries selected by the breeder, while on station the farmers selected, on average, about half the number of lines selected by the breeder. For some broad attributes, such as modern germplasm versus landraces, selection was mostly driven by environmental effects. Selection for other attributes was partly environmentally driven and partly based on individual farmers' preferences. Selection preferences were similar for fixed or segregating populations. There was wider diversity among farmers' selections in their own fields than among farmers' selections on research stations and among breeder's selections, irrespective of where the selection was conducted. Larger kernels, higher grain yield and biomass, and taller plants (particularly in environmentally

stressed locations) were the characteristics most frequently used as selection criteria by both breeder and farmers. Entries selected by the farmers yielded as much, and in one case significantly more, than those selected by the breeder. Decentralized-participatory selection was significantly more efficient in identifying the highest yielding entries in farmers' fields than any other type of selection. There was also evidence suggesting that the breeder was more efficient in selecting higher yielding entries in the research station in a high rainfall area, while the farmers were more efficient in selecting under stress conditions. The results suggest that farmers can handle selection choices among a large number of lines, and because the farmers' selections are at least as high yielding as breeder's selections, it is possible to transfer the responsibility of selection to the farmers in their fields.

(participatory plant breeding, Syria, Middle East, ICARDA)

[Kluwer Database]

- C9. Courtois B; Bartholome B; Chaudhary D; McLaren G; Misra CH; Mandal NP; Pandey S; Paris T; Piggin C; Prasad K; Roy AT; Sahu RK; Sahu VN; Sarkarung S; Sharma SK; Singh A; Singh HN; Singh ON; Singh NK; Singh RK; Sigh S; Sinha PK; Sisodia BVS, Takhur R, 2001. Comparing farmers and breeders rankings in varietal selection for low-input environments: a case study of rainfed rice in eastern India. *Euphytica* 122: 537–550.

A number of breeding institutions developed a project to assess importance of participatory plant breeding approaches for rainfed rice improvement in eastern India. The results of the first two years of participatory varietal selection are reported here. The objective was to evaluate the respective effects of participation of farmers in varietal evaluation and decentralization of varietal testing from breeding stations to farmers' fields on varietal ranking. Fields representing various hydrological situations were chosen in two to three villages at four rainfed lowland sites and one upland site. Sets of 15 to 25 varieties were tested both in farmers' fields and on-station in 1997 and 1998 and ranked by both farmers and breeders. The effect of participation was judged by comparing the rankings attributed by farmers and breeders to a given set of material in a given trial. The effect of decentralization was determined through comparisons between individual breeders' rankings across trials. Farmers' rankings were not randomly allocated, but agreement within the farmers' group was not always very strong. Except at one site, concordance among breeders' rankings was high, but, because of the limited number of breeders involved, it was seldom significant. In about two-thirds of the trials, there was a good agreement between farmers' and breeders' mean rankings. The consensus was particularly strong when severe constraints induced contrasting behavior in the genotypes. The decentralization effect appeared to be more moderate, but variations due to a breeder effect were recorded. The part of genotype by environment [$G \times E$] interactions for grain yield due to location within one site and year was evaluated through various methods, showing more effect of $G \times E$ interactions at some sites than at others. Crossover interactions inducing Changes in ranks represented a limited part of the yearly $G \times E$ interactions at all sites. Both farmer participation and decentralization of varietal

testing in farmers' field would help in best matching the varieties to the needs, although their combined contribution would be more useful in some sites than in others.

(Asia, IRRI, Central Rice Research Institute)

[Kluwer Database]

- C10. Denning GL, 2001. Realising the potential of agroforestry: Integrating research and development to achieve greater impact. *Development in Practice* 11(4): 407–416.

Investments in process-oriented and farmer-participatory research have led to the emergence of sustainable agroforestry solutions to the problems of land degradation, poverty, and food insecurity in rural areas. Thousands of farmers in diverse ecoregions have taken up innovations that demonstrate the potential of agroforestry. This paper highlights the importance of institutional change through illustrating the approach taken by the International Centre for Research in Agroforestry to scale up adoption and impact of innovations. Eight focal areas of intervention constitute the key elements of a development strategy aimed at providing 80 million poor people in rural areas with better livelihood options by 2010.

(Kenya, Zambia, Africa, ICRAF)

[CAB Direct]

- C11. Douthwaite B; Keating JD; Park JR, 2002. Learning selection: an evolutionary model for understanding, implementing and evaluating participatory technology development. *Agricultural Systems* 72(2): 109–131.

This paper develops a model of the early adoption process that takes into account modifications made by users. The model is based on data from 13 attempts to introduce six postharvest technologies into The Philippines and Vietnam. It is built on an analogy between technology change and Darwinian evolution. At the core of the model is the interactive experiential learning process—learning selection (LS)—that is analogous to natural selection in the living world. In learning selection stakeholders engage with a new technology, individually playing the evolutionary roles of novelty generation and selection, and in their interactions creating recombinations of ideas and experiences and the promulgation of beneficial novelties. Peoples' motivations to engage in learning selection, and its outcomes, are influenced by the interaction between their lifeworlds and their environments. The model has implications for management of agricultural technology change. It suggests the need for a nurturing of new technology during its early adaptation and adoption, until the point where the beneficiary stakeholders (manufacturers and users) are sufficiently numerous and have adequate knowledge to play the evolutionary role themselves. The LS model, while developed with data from agro-mechanical technologies, could provide a theoretical underpinning for participatory technology development.

(Asia, University of Reading, IITA, CGIAR)

[Agricola]

- C12. Gauchan D; Joshi M; Biggs S, 2003. A strategy for strengthening participatory technology development in agricultural and natural resources innovations systems: the case of Nepal. *International Journal of Technology Management and Sustainable Development* 2(1): 39–52.

The underlying features of agricultural and natural-resource research and technology systems operating in low-income countries have changed over the last couple of decades. New actors have emerged in the form of non-governmental and community-based organizations and private-sector agro-entrepreneurs to take part in agricultural technology development and promotion—an area of activity that was generally the preserve of public institutions. This has resulted in the development of alternative institutional models for participatory technology development that involve new types of linkages between actors. The shift of paradigm in the conceptualization of agricultural and natural-resource innovation systems has been occasioned by, among other things, changes in partner–client relationships and funding sources and mechanisms for science and technology systems at local, national and international levels. Set against this background, the paper explores issues that the Nepal Agricultural Research Council (NARC) would need to consider while drawing up and developing new strategies for participatory technology development in Nepal.

(NRM, Asia, CIP, Centre for Arid Zone Studies)

[Author provided]

- C13. Gladwin CH; Peterson J; Mwale C, 2002. The quality of science in participatory research: A case study from Eastern Zambia. *World Development* 30(4): 523–543.

The question of how to maintain and enhance the quality of science in participatory agricultural research has been a subject of recent discussion in the development arena. At the same time, development practitioners and theorists have been discussing how to combine micro-level participatory research–extension efforts with scientific methods that use rigorous and statistical testing techniques. The principal questions raised are: is there a trade-off between the use of micro-level, gender-sensitive, ethnographic participatory methods and a commitment to “the scientific method,” with its conventional assumptions about sampling, data collection, hypothesis testing, and use of standard measures of statistical significance? If there is such a trade-off, which of the two methods should be given the greater attention? Should scientific (and rigorous) testing methods take precedence in agricultural research over the use of farmer-sensitive participatory methods? Should scientific rigor be sacrificed for ethnographic accuracy or vice versa? (Africa, University of Florida, Africare, agroforestry, gender analysis, participatory rural appraisal)

- C14. Hall A; Nahdy S, 1999. New methods and old institutions: the ‘systems context’ of farmer participatory research in national agricultural research systems. The case of Uganda. *ODI/AgREN Network Paper No. 93*.

Farmer participatory research (FPR) methods have been advocated as a means of increasing the client focus of agricultural research in developing countries. The National Agricultural Research Systems (NARS) in these countries have adopted them to varying extents—often as an implicit conditionality of donor supported research projects. This paper seeks to demonstrate that, despite the apparent acceptance of FPR in NARS, the fundamental nature of the relationship between scientists and farmers remains unchanged. FPR has largely failed in its attempts to improve the efficiency of agricultural research by restructuring science/production relations. This failure is the result of the “systems problem” in agricultural research, whereby the complex interrelationship of actors, institutions and resources prevents FPR methods being compatible with NARS. To illustrate the nature of these problems, this paper documents the experiences of participatory needs assessment and technology development research in Uganda. Five problem areas are identified which appear to be representative of the wider context of the research system: researcher/farmer power relationships; the professional identity of scientists; the skill base and available human resources; and perceptions concerning the validity of research methods. It is argued that the difficulties which these factors introduce—particularly in terms of the professional behaviour of scientists—are a result of the historical patterns of institutional development specific to Uganda, as well as the tendency of institutionalized science to perpetuate these problems. The paper concludes by suggesting that these problems are more serious than problems associated with the introduction of a new method. The problems are systemic in nature and are the result of more fundamental issues relating to the structure of agricultural research. The advocacy of participation has been prescriptive and too coercive. Attention needs to be focused on the real impact of these methods and the receptiveness of the institutional settings in which they are advocated. The greatest policy challenge exists in devising structural change within agricultural research, to enable more client-focused activities. Policy should focus on creating sufficient flexibility in NARS and other service providers to allow new structures to evolve which can more efficiently supply “services” to farmers. (Natural Resources Institute [UK], Kawanda Agricultural Research Institute, Africa)

[AgREN Database]

- C15. Hayward C; Simpson L; Wood L, 2004. Still left out in the cold: Problematizing participatory research and development. *Sociologia Ruralis* 44(1): 95–108.

Participatory approaches to research and development have had relatively little academic or practitioner critique, resulting in a mythologizing of the power of participatory methodologies to accomplish problem-solving, emancipation or empowerment. Participation is also presented as evidence of social inclusion and is fostered as a strategy to counteract social exclusion. The purpose of this article therefore is to challenge and critique a range of definitions and perspectives of participation in terms of theory and

practice. The paper focuses on two issues arising from the participatory literature and our own research experiences with communication-technology projects based in rural and remote Queensland, Australia. We propose that non-participation and peripheral participation are valid and legitimate choices exercised by community members that can be seen to be as individually empowering as participation. We also support the view of participation as both the means and the ends of development, a position that reflects the reality of participatory practices as fluid and variable over time. The paper concludes that both theoreticians and practitioners need to recognize and challenge the assumptions that underpin many participatory development projects.

(Queensland University of Technology)

[Author provided]

- C16. Hjorth P, 2001. From insight to action in reservoir management—Lessons from Asia. *Natural Resources Forum* 25(4): 313–320.

The World Commission on Dams (WCD) has now presented its final report on the problems with large dams. Many dam projects were found to be underperforming, especially those built for irrigation purposes. WCD also reports that many projects fail to meet current standards of social equity. A re-allocation of costs and benefits is needed, but entrenched interests make this difficult. This article identifies shortcomings in large Asian irrigation projects; why the problems emerged, and what could be done to improve the performance of existing projects. The article argues that Asian irrigation agencies take mainly an engineering perspective, focusing on the dam itself. In a large number of cases, it takes over 10 years for the infrastructure to be installed and for the water to be delivered to the fields of the command area. Agencies need to improve their competence in dealing with social and environmental issues. This article argues that social and economic infrastructure is often inadequate—there is a need for an integrated view of the role of agriculture in development. Furthermore, adaptive management practices and water-user participation can often be critical elements. To be successful, participation needs to be gender sensitive, and stakeholders at all income levels need to be consulted. To bridge the gulf between rhetoric and action, there is also a need for independent evaluation of dam projects.

(Lund University, water management, reservoirs)

[Author provided]

- C17. Hoddinott J, 2002. Participation and poverty reduction: An analytical framework and overview of the issues. *Journal of African Economies* 11(1): 146–168.

This paper examines the relationship between community participation and the efficacy of interventions designed to reduce poverty. It outlines a simple model that identifies three actors involved in the provision of antipoverty interventions: financiers, providers and beneficiaries. This model is used to illustrate what happens when the poor move from being passive beneficiaries to being the providers of these interventions. Beneficiary

participation has the potential to lower the cost of providing these interventions. It can ensure that they more closely reflect the preferences of the population that they are designed to serve. However, this benefit is contingent on the ability of communities to engage in collective actions. In fractionalized communities, or where trust and/or special capital are weak, there is a risk that community participation may result in the capture of benefits by local elites, to the detriment of the poor. Further, we argue that the failure to delegate true decision-making authority (allowing for *de jure* but not *de facto* participation) may result in beneficiaries being reluctant to act because of concerns that they will be subsequently overruled.

(Africa, Centre for the Study of African Economies, Dalhousie University)

[CAB Direct]

- C18. Humphries S; Gonzales J; Jimenez J; Sierra F, 2000. Searching for sustainable land use practices in Honduras: Lessons from a programme of participatory research with hillside farmers. *ODI/AgREN Network Paper* No. 104.

Participatory Research in Central America (Investigacion Participativa en Centroamerica, IPCA) is a project established by the International Center for Tropical Agriculture and coordinated through the University of Guelph, Canada, to support farmers in community-based agricultural research in the region. Local agricultural research committees, known by the Spanish acronym CIALs (*comites de investigacion agricola local*), are found in eight Latin American countries at the present time. The IPCA project has been monitoring the development of CIALs in Honduras for the past five years. This paper presents the results of the evaluation to date and considers these in light of current debates around farmer participatory research. The experience of IPCA shows that teaching formal research methods to poor hillside farmers is viable and has served to link farmers to formal-sector researchers in innovative technology development programmes that directly meet users' needs. Farmers have not only benefited through access to new technologies, but they have also learnt new ways to manage their environments and have been empowered in the process. However, evaluation of the project has shown that unless research has relatively short-term payoffs, farmers are apt to lose interest. Thus, complex research—in particular research involving natural resource management—needs to be framed within the context of social programmes that can provide more immediate benefit to farmers. Technology-led development must be supported by other development initiatives that aim to build social capital as widely as possible across the community. (maize, beans, NRM, land management, CIAT)

[AgREN Database]

- C19. Joshi KD; Sthapit BR; Witcombe JR, 2001. How narrowly adapted are the products of decentralized breeding? The spread of rice varieties from a participatory breeding programme in Nepal. *Euphytica* 122(3): 589–597.

Acceptable rice varieties for high-altitude areas of Nepal were bred by participatory plant breeding (PPB). One of the most adopted varieties, Machhapuchhre-3 (M-3), performed much better in the formal trials system than the products from centralized breeding and was released in 1996. From 1996 to 1999, the spread of M-3 was monitored in high-altitude villages along with an unreleased variety Machhapuchhre-9 (M-9), derived from the same cross. The study was done by interviewing individual households, groups and field verification. Both M-3 and M-9 spread from farmer-to-farmer and through interventions by non-government organizations (NGOs) and government organizations (GOs). Their adoption had steadily increased and their spread commenced five to six years earlier than would have been the case in a conventional system. The PPB programme was decentralized—all selection was in only two villages in the same valley—but this did not result in specific adaptation. The varieties were adopted in distant villages situated at much lower altitudes to the original PPB sites and the greatest yield advantage of the varieties over the local landraces was also at these lower altitudes. (Li-Bird, IPGRI–APO, Centre for Arid Zone Studies, Asia)

[CAB Direct]

- C20. Joshi KD; Witcombe JR, 2002. Participatory varietal selection in rice in Nepal in favourable agricultural environments – A comparison of methods assessed by variable adoption. *Euphytica* 127: 445–458.

Two participatory approaches to varietal selection were compared in February-sown (Chaite) rice and main-season rice in high potential production systems in Nepal. One method, called farmer managed participatory research (FAMPAR), was researcher intensive, while the other, called informal research and development (IRD), demanded fewer resources. The trials were conducted in 18 villages in high potential production systems in Chitwan and Nawalparasi districts of Nepal. Six new varieties of Chaite rice and 16 of main-season rice were tested in over 300 trials of Chaite rice and nearly 1100 trials of main-season rice over two years in 1997 and 1998. Surveys were done in 1997, 1998 and 1999 to record the extent of adoption and spread of new rice varieties in the study villages. In many cases, farmers tested varieties for two years before deciding whether to adopt or drop them. Varieties were quite widely accepted, adopted for niches in a few villages, or rejected. The two participatory approaches identified the same varieties, but FAMPAR, which used formal survey methods, was more useful for diagnosing reasons for adoption or rejection. However, IRD used much cheaper anecdotal methods of evaluation, so it was more cost-effective. Moreover, farmer-to-farmer seed dissemination was higher in IRD villages, probably because farmers in FAMPAR villages felt that the project would re-supply seed if needed. The benefits from

both approaches are considerable, but to adopt them substantial policy changes in varietal testing, release and extension systems will be required.

(PVS, PPB, Asia, LI-BIRD, Centre for Arid Zone Studies)

[Kluwer Database]

- C21. Malan N, 1999. Participation in research and development at the Tshikonela agricultural project, Northern Province. *Development Southern Africa* 16(3): 501–518.

This article takes to task certain assumptions about participation in research and development, and criticizes them for being decontextualized and ethnographically uninformed. Results of social scientific research at an existing agricultural project in the Northern Province of South Africa are brought to bear on the theory and assumptions of participatory research and development. The study starts with a theoretical account of participatory research. The point is made that there is not necessarily any connection between participatory research and participatory development. It is concluded from the subsequent case study that participation in research and development could be negatively influenced by local power dynamics, by institutional reluctance to experiment with participation, and by policy decisions and circumstances that do not lend themselves to social change. The significance of participation cannot be deduced in isolation from its context of implementation. It is concluded that participation itself would not necessarily lead to these changes.

(Rand Afrikaans University, University of Johannesburg)

[Author provided]

- C22. Manyong VM; Vanlauwe B; Diels J; Makinde KO; Sanginga N, 2001. Fertiliser use and definition of farmer domains for impact-oriented research for the northern Guinea savanna of Nigeria. *Nutrient Cycling in Agroecosystems* 59(2): 129–141.

One of the options to alleviate soil fertility constraints for sustainable agriculture in the savannas of West Africa is to develop soil nutrient management technologies from an adequate supply and feasible share of organic and mineral inputs. This paper makes a diagnosis of farm-level use of organic and inorganic inputs, as a basis for the development of technologies. The results from the diagnosis are then used to develop a framework for characterizing farmers for impact-oriented research on soil nutrient management systems. The survey was carried out with 200 farmers carefully selected in two villages in the northern Guinea savanna of Nigeria. The results showed that more than 90% of farmers in both villages used chemical fertilizers. This is contrary to a general belief that they are not widely applied to food crops by smallholders in African agriculture. However, up to 81% of the fields received less than half of the recommended 120 kg N/ha because of high costs due, probably to removal of subsidies and inefficient marketing systems. Organic inputs such as animal manure were applied in very small quantities (about 8% of the requirements). However, there is evidence of integrated use of inorganic fertilizers and organic manure on some (24%) of the fields. The problem to

be addressed is that of the production (and efficient utilization) of organic inputs in the northern Guinea savanna. Nitrogen deficiency is the most limiting soil nutrient in the cereal-dominated systems of study area. On this basis, farmers were classified into two *a-priori* groups using a threshold of 30 kg N/ha, and multiple quantitative variables were fitted in a discriminant analysis to validate the typology. Results indicated that more than 75% of farmers were well classified into two groups that had the characteristics of the *a-priori* groups. Two others were atypical and included the remaining 25% of farmers. Thus, there are a total of four groups of farmers referred to as farmer domains in this paper. The two domains with 75% of well-classified individuals are suitable for the selection of farmers with whom to conduct applied research or for development activities because they represent the general patterns in the supply and use of soil nutrients in the study area. Although basic research can be done in the four domains, the two atypical groups are most suited for process-level studies to improve the understanding of factors that make the systems either more efficient or less efficient than the two other farmer domains. In either case, representative farmers were easily identified by their highest probability of belonging to a specific domain from the model results. Multivariate models constitute good framework to make a typology of, and to select farmers for, participatory research and extrapolation of the results in the northern Guinea savanna. (soil management, fertilizer)

[Agricola]

- C23. Martin A; Sherington J, 1997. Participatory research methods – Implementation, effectiveness and institutional context. *Agricultural Systems* 55(2): 195–216.

This paper outlines some of the main issues and debates in participatory research and participatory technology development, concentrating on implementation. Arguments in favour of farmer participatory research (FPR) are examined, as are a number of difficulties. An important question is the extent to which the findings generated by location-specific, participatory research are applicable and transferable to similar systems elsewhere. Issues of data analysis and use of statistics in participatory research are discussed. Modern statistical methods have a useful role in participatory research, but knowledge of these is limited due to the lack of suitable texts and, until recently, the lack of easily accessible computer software. Assessing the effectiveness of participatory “methods” is difficult as they are context sensitive. The resources needed for collaborative participatory work are often underestimated and methodologies for monitoring and evaluation have been particularly weak. The development of linkages between participatory research projects and national research organizations is not straightforward, and does not always lead to the institutionalization of participatory approaches. Integration of participatory methods into differing institutional contexts requires management innovation, skill development and new working procedures. Critical areas are: building institutional linkages, maintaining communication, and co-ordination and management and monitoring of participatory research. Significant increases in devolved participatory research approaches are unlikely in the absence of

strong farmers' organizations and intermediary organizations. A number of suggestions for further research are made.

(Natural Resources Institute [UK])

[Agricola]

- C24. Morris ML; Bellon MR, 2004. Participatory plant breeding research: Opportunities and challenges for the international crop improvement system. *Euphytica* 136: 21–35.

This paper describes the current state of international plant breeding research and explains why the centralized global approach to germplasm improvement that was so successful in the past is today being transformed by the incorporation of decentralized local breeding methods designed to better incorporate the perspective of end users into the varietal development process. It describes international breeding efforts for major crops and identifies factors that have contributed to the success of the international breeding system; discusses shortcomings of the global approach to plant breeding and explains why future successes will depend critically on researchers' ability to incorporate the knowledge and preferences of technology users; reviews a number of farmer participatory research methods that are currently being tested by plant breeding programs throughout the developing world; describes synergies that can potentially be achieved by linking centralized global and decentralized local breeding models; and discusses technical, economic, and institutional challenges that will have to be overcome to integrate end user-based participatory approaches in the international plant breeding system.

(PPB, CGIAR, CIMMYT)

[Kluwer Database]

- C25. Probst K; Hagmann J; Fernandez M; Ashby JA, 2003. Understanding participatory research in the context of natural resource management – Paradigms, approaches and typologies." *ODI/AgREN Network Paper* No. 130.

In the field of natural resource management (NRM), which emerged as a new integration domain in the agricultural sciences, participatory research is conceptually and operationally still in its infancy and a range of activities are labeled "participatory research." The paper aims at shedding some light on this confusion. Based on a review of literature and Internet sites, it provides an overview of CGIAR's current NRM research practice, analyzing the impact orientation, research foci, the pathway/strategy to impact and the role of participatory research. The paper also offers a framework which helps differentiate approaches to innovation development and "unpack" the blurred concept of "participatory research." Three prototypical approaches to innovation development and their respective attributes are described and used to interpret current practice.

(University of Hohenheim, Institute for Sustainable Smallholder Production [Peru], CIAT)

[AgREN Database]

- C26. Riley J; Alexander CJ, 1997. Statistical literature for participatory on-farm research. *Experimental Agriculture* 33(1): 73–82.

A review is presented of available documents containing statistical methodology for participatory on-farm research. Further needs in this area of work are commented upon. (participatory research, IACR)

[Agricola]

- C27. Simon D; McGregor DFM; Nsiah-Gyabaah K; Thompson DA, 2003. Poverty elimination, North–South research collaboration, and the politics of participatory development. *Development in Practice* 13(1): 40–56.

This paper reflects critically on issues of North–South collaboration and participatory research arising from a project on participatory and sustainable local-level environmental management in the peri-urban area surrounding Kumasi, Ghana. The pressing problems are rapid immigration, uncoordinated conversion of farmland to housing, intensified resource exploitation, and declining water quality and availability. Collaborative research arrangements with local partners and sustained participatory relations with selected village communities were central to this project. More generally, the paper reflects on institutional issues relating to the dichotomy between research and development assistance projects, and their implications for project evaluation.

(DFID)

[Oxfam Publishing]

- C28. Sperling L; Ashby JA; Smith ME; Weitzen E; McGuire S, 2001. A framework for analyzing participatory plant breeding approaches and results. *Euphytica* 122: 439–450.

Participatory Plant Breeding (PPB) involves scientists, farmers, and others, such as consumers, extensionists, vendors, industry, and rural cooperatives in plant breeding research. It is termed “participatory” because many actors, and especially the users, can have a research role in all major stages of the breeding and selection process. While some have argued that commercial, private sector plant breeding has long been client-driven, or “participatory” under another name, the application of “PPB” to reach poor client groups, to breed for high-stress, heterogeneous environments and to incorporate diverse traits to meet specific client preferences is resulting in fundamental changes in the way plant genetic resources are being managed. PPB merits analysis as a separate approach. The notion of “PPB” is a relatively recent one: detailed inventories show that most of the 65 “longer-term” cases have begun within the last 10 years, whether they were located in public sector or non-governmental crop improvement programs. With such “newness” comes a wealth of terminology and divergent technical, social and organizational strategies under the general rubric of “PPB.” This article aims to set up a framework for differentiating among PPB approaches. Only by discriminating among cases can one

understand how each PPB approach can lead to different outcome, and so be able to make informed choices about which approach to pursue. The key variables explored for discriminating among PPB approaches include: the institutional context, the bio-social environment, the goals set, and the kind of “participation” achieved (including the stage and degree of participation and the roles different actors undertake). It is only when these variables are clearly described that current and potential practitioners can start to link the “type of PPB” employed (method and organizational forms) with the type of impacts achieved. An ending illustration of ongoing PPB programs suggests the practical utility of this “PPB framework.”

(CGIAR, CIAT, PRGA, ICRISAT)

[CAB Direct]

- C29. Stoorvogel JJ; Orlich RA; Bouma J, 2004. Participatory research for systems analysis: Prototyping for a Costa Rican banana plantation. *Agronomy Journal* 96(2): 323–336.

Agricultural research deals with an extremely complex production system. Although a large variety of tools for the analysis of such systems have been developed, agricultural science has only been partially successful in providing solutions to farmers. Systems analysis often has been a synonym for quantitative, modeling exercises. Although these have led to a number of technological solutions for agricultural problems, the level of adoption of these solutions has been low because socioeconomic factors were lacking in the analysis. Farming systems approaches, on the other hand, included these socioeconomic conditions but failed to systematically apply the more technological tools. In this paper, we review the prototyping methodology that integrates participatory, socioeconomic approaches with a more technological approach. This prototyping methodology is composed of four major steps: (i) a thorough analysis of the farming system in close discussion with the farmer, (ii) the identification and execution of necessary biophysical and agronomic research, (iii) feedback of research results to the farmer and discussions on the implementation of the results, and (iv) the extension of the different solutions to other farms. This methodology has been applied for a Costa Rican banana (*Musa* spp.) plantation. Problems identified by the farmer were related to productivity, fertilization and nematode control. Research made use of different approaches varying from monitoring of systems, analysis of problems related to productivity, experimentation to address fertility issues, and mechanistic simulation modeling for nematocide leaching. Research resulted in new prototypes of techniques to map banana yields, soil-specific fertilization, and nematode control.

(Costa Rica, Latin America, Laboratory for Soil Science and Geology [Wageningen, The Netherlands], bananas)

[Agricola]

- C30. Stur WW; Horne PM; Gabunada FA Jr; Phengsavanh P; Kerridge PC, 2002. Forage options for smallholder crop–animal systems in Southeast Asia: working with farmers to find solutions. *Agricultural Systems* 71: 75–98.

Most research and development involving forages in Southeast Asia has been directed towards impacts in commercial farming systems. Little adoption of forages has occurred in smallholder livestock systems, which account for the vast majority of livestock in the region. The main reason for this lack of adoption is the linear processes that have been used to develop forage technologies on research stations leading to the extension of “finished” technology packages. This paper describes existing uses of forages in Southeast Asian farming systems and, using a recent case study, describes the potential for developing smallholder forage systems using participatory approaches to technology development.

(Asia, IRRI, FARMI, CIAT)

[Agricola]

- C31. Temu AE; Due JM, 2000. Participatory appraisal approaches versus sample survey data collection: a case of small-holder farmers well-being ranking in the Njombe District, Tanzania. *Journal of African Economies* 9(1): 44–62.

Social scientists and rural development interventionists in Sub-Saharan Africa in general, and in Tanzania in particular, primarily rely on conventional sample surveys—in part as a legacy of their basic training. Participatory rural appraisal and intervention approaches offer a broader range of methods. Do the results from participatory, rapid appraisals conflict with and differ from those of sample surveys? This paper compares results of surveys designed to establish socio-economic well-being ranks in Njombe district: a Rapid Participatory Rural Appraisal (RPRA, conducted at the end of 1995) and a conventional sample survey (mid-1996). Comparison of the results shows that the RPRA well-being ranks are valid and the approach is reliable. The three quantitatively established well-being ranks differed empirically in many socio-economic indicators, including resource endowment, labor-force size, agricultural land, livestock ownership, forest wood-lot management, perception of food insecurity, technological advances in agricultural production, and natural-resource management systems. The “low well-being” group and female-headed households were disadvantaged. The goal of the parent project (Hifadhi Ya Mazingira-Njombe project) is to develop environmentally sustainable crop and livestock husbandry practices for the district. The well-being ranking exercise has direct implications for the project’s strategy. The authors discuss the adopted methodology and implications. They recommend that development programs and workers in Tanzania and Sub-Saharan Africa should extend their approaches to include more of the participatory, relatively rapid, rural appraisal and intervention techniques. Benefits of doing so may include time-saving, lower costs, quality information, and stakeholder involvement.

(Sokoine University of Agriculture, University of Illinois, Africa)

- C32. Thiele G; van de Fliert E; Campilan D, 2001. What happened to participatory research at the International Potato Center? *Agriculture and Human Values* 18: 429–446.

During the 1980's, when a flexible approach to research, known as farmer-back-to-farmer, was developed, the International Potato Center (CIP) became famous for participatory research. Subsequently it appeared to have lost leadership in this field. This article documents participatory research activities in CIP over the past thirty years to find out what happened. Even in the 1980's, implementation of participatory research was actually limited. Participatory research in the Center grew unevenly, with little clear encouragement from the CGIAR. Decentralization of social scientists in the 1990's led to the fragmentation of participatory research and, in the absence of any clear champion, it seemed that it might wither away. Recently, increasing interest in IPM, donor support, and the recruitment of international staff who have been exposed to other currents of participatory research and training has led to a revival of interest. This needs to be carefully nurtured to ensure that the flexibility for participatory research in CIP earlier gained world renown is retained.

(integrated pest management, potato)

[Agricola]

- C33. van de Fliert E; Braun AR, 2002. Conceptualizing integrative, farmer participatory research for sustainable agriculture: From opportunities to impact. *Agriculture and Human Values* 19(1): 25–38.

This paper offers a conceptual model for participatory research projects that aim to improve the sustainability of agriculture and natural resource management. The purpose of the model is to provide a systematic framework that can guide the design of participatory research projects, their analysis, and the documentation of results. In the model, conceptual boundaries are drawn between research and development, development and extension and between extension and implementation. Objectives, activities, and actors associated with each of these realms need to be carefully selected, monitored and evaluated throughout the course of a project using well-designed indicators. The depth of disciplinary and methodological integration, and quality of participation needed to reach the desired impact effectively and efficiently, however, needs to be determined on a case-by-case basis depending on the context and issues surrounding each particular project.

(NRM, integrated agricultural systems, CIP, CGIAR)

[Agricola]

Section D

Use of Participatory Methods in Impact Assessment, Monitoring and Evaluation

- D1. Baur H; Kradi C, 2001. Integrating participatory research methods in a public agricultural research organization: a partially successful experience in Morocco. *ODI/AgREN Network Paper* No. 109.

This paper reports on a project of institutional capacity development for participatory research, undertaken by the Institut National de la Recherche Agronomique (INRA) in Morocco. The field work comprised a first stage of participatory rapid appraisal (PRA) training and a second stage of developing and testing a locally adjusted methodology for participatory research programme planning. A series of participatory and rapid appraisal exercises were carried out with researchers and development workers in four different locations with the objective of enhancing the knowledge, attitudes and practices of some 70 scientists and extension workers. While the duration of the project was too short for impact to become manifest and measurable, a number of lessons can be drawn with regard to the institutionalisation of participatory methods.

(Africa)

[AgREN Database]

- D2. Campilan D; Prain G; Bagalanon CL, 1999. Evaluation from the inside: Participatory evaluation of agricultural research in The Philippines. *Knowledge, Technology and Policy* 11(4): 114–131.

This paper discusses the experience of a Philippines-based agricultural research program, where participatory evaluation is embedded in a broader, user-centered participatory research approach. Three case projects illustrate and analyze participatory evaluation of agricultural research in a developing country context. Different evaluation types are identified and their use in different phases of the research process is discussed. These field experiences show how “evaluation from the inside” can contribute to effective research planning and implementation, particularly in enhancing sensitivity to user needs and situations.

(UPWARD, Users’ Perspectives With Agricultural Research and Development, Asia, roses, sweet potato, gladiolas, root crops)

[CAB Direct]

- D3. Cramb RA; Purcell T; Ho TCS, 2004. Participatory assessment of rural livelihoods in the Central Highlands of Vietnam. *Agricultural Systems* 81(3): 255–272.

There is a need for improved monitoring and evaluation (M&E) of participatory research with smallholder farmers, in particular to help differentiate between different types

of farm household with different needs. This paper reports some of the results of a study to develop participatory M&E tools for the Forages for Smallholders Project in Southeast Asia, focusing on an upland commune in central Vietnam with a highly diverse crop–livestock system. Participatory rural appraisal techniques were used within a rural livelihoods framework to assess the differing livelihoods of poor, average, and better-off households. There were found to be marked differences in households, particularly in human resources, landholdings, and cattle numbers, affecting the livelihood strategies pursued. The improved understanding of livelihood strategies was gained in a cost-effective way and could be readily used by project participants to monitor the impacts of the introduced forages within the commune, enabling better focusing of the participatory research process on the needs and circumstances of poor farmers.

(University of Queensland, Asia, forage crops)

[Agricola]

- D4. Cromwell E; Kambewa P; Mwanza R; Chirwa R, 2001. Impact assessment using participatory approaches: ‘Starter pack’ and sustainable agriculture in Malawi. *ODI/AgREN Network Paper No. 112*.

This paper is based on a study undertaken as part of the Malawi Starter Pack Evaluation Programme (1999–2000). Focusing on the concept of “sustainable agriculture,” it describes how participatory approaches can be used for impact assessment and the kind of information that emerges from such an approach. The study explored how farmers themselves perceive the concept of sustainable agriculture and how this relates to their livelihoods. Detailed information was collected from 30 villages and was used to determine variations in sustainability across regions, between different households, and trends over the last 30 years. The types of inputs required for increased agricultural sustainability were also ascertained.

(Africa, University of Malawi, Concern Univeral, Chitedze Agricultural Research Station, KWERA)

[AgREN Database]

- D5. Farrington J; Thirtle C; Henderson S, 1997. Methodologies for monitoring and evaluating agricultural and natural resources research. *Agricultural Systems* 55(2): 273–300.

This paper examines the methodology of monitoring and evaluation (M&E) in three distinct contexts. In the Introduction, the particular focus is on methods which are usable given the sparse data in many developing countries. In the following two sections, the strengths and weaknesses of a widely-used monitoring tool—the Project Logical Framework (Logframe) are reviewed. Suggestions are made on how it may be made more relevant at the programme–project interface by the incorporation of criteria used by the private commercial sector. The third section suggests that, with suitable adaptations, the Logframe can be used for monitoring farmer participatory research, but efforts to

make it sensitive to process and to the diverse expectations of different stakeholders also make it increasingly cumbersome, thereby increasing the attraction of alternative, process-based ways of monitoring change.

(Overseas Development Institute, University of Reading, Natural Resources International)

[CAB Direct]

- D6. Fujisaka S, 1994. Learning from six reasons why farmers do not adopt innovations intended to improve sustainability of upland agriculture. *Agricultural Systems* 46(4): 409–425.

Upland agriculture in Southeast Asia has been associated with resource-poor farmers, land degradation, soil and water losses, and increasing pest problems. Research and extension have offered farmers on-farm innovations, often forms of agroforestry, intended to improve sustainability of upland agroecosystems. Farmer adoption, however, has been minimal. Based on case materials, six overlapping reasons why farmers do not adopt are that: (1) farmers do not face the problem targeted by the innovation; (2) farmer practice is equal to or better than the innovation; (3) the innovation does not work; (4) extension fails; (5) the innovation costs too much; and (6) “social” factors. In learning from such reasons, work in The Philippines is hopefully leading to farmers’ adaptation and adoption of contour vegetative strips for soil erosion control.

(soil management, IRRI)

[CAB Direct]

- D7. Goma HC; Riley J; Stein A; Rahim K; Nangendo G, 2001. Participatory studies for agro-ecosystem evaluation. *Agriculture, Ecosystems and Environment* 87(2): 179–190.

Participatory research has emerged as a powerful tool to identify agro-ecosystem indicators in developing countries. Indigenous knowledge, thus generated complements scientific information to the benefit of all stakeholders. This paper demonstrates the value of participating with farmers and hunters to identify indicators at a local level and how these supplement scientific information. Three examples are provided to demonstrate different degrees of participation and different indicator identification tools. The first shows participatory research to determine farmer constraints in Zambia and to explore the use of kraal manure and inorganic fertiliser in a traditional grassmound farming system. The second study concerns participatory research in rural areas of Bangladesh to explore a wide range of new technologies relating primarily to small-scale rice-based systems. The third study concerns participatory rapid rural appraisal to investigate biodiversity in a forest and a grassland area in Uganda. Participatory processes generate traditional knowledge that is broader and more descriptive than scientific information. Such knowledge can also be used to plan future research. The role of the interactive farmer–researcher process is discussed. It is concluded that participatory research has

many benefits provided it is managed tactfully and farmers are encouraged to feel that they own the research process.

(Africa, Asia, fertilizers, PRA, Misamfu Regional Research Centre [Zambia], Bangladesh Rice Research Institute, ITC, IACR, Laboratory for Soil Science and Geology [Wageningen, The Netherlands])

[Agricola]

- D8. Merrill-Sands DM; Biggs SD; Bingen RJ; Elwell PT; McAllister JL; Poats V, 1991. Institutional considerations in strengthening on-farm client-oriented research in national agriculture research systems: Lessons from a nine-country study. *Experimental Agriculture* 27: 343–373.

Many national research systems have launched major on-farm research efforts aimed at generating relevant technologies for resource-poor farmers, but institutional and policy factors have often hindered the effectiveness of these efforts. Experience has shown that on-farm research, linking farmers, researchers, and technology transfer agents, poses special organizational and managerial challenges. Institutional innovations and strong policy commitment are needed if on-farm research is to succeed in meeting the needs of resource-poor farmers. Sound research methods alone are not sufficient. This paper reviews key policy, organizational and managerial considerations for integrating on-farm client-oriented research as an effective and stable component of national agricultural research systems. It summarizes the findings of a major study sponsored by the International Service for National Agricultural Research on institutional factors affecting the performance and sustainability of such research systems. The conclusions are based on the systematic analysis of over 25 discrete on-farm research efforts in nine developing countries. The objective is to provide research managers, on-farm researchers and on-farm research advisors with concrete and practical insights for strengthening on-farm research and its contribution to the generation and transfer of relevant technologies.

(ISNAR, FUNDAGRO, CIP, CIAT)

[Agricola]

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