AEE 5232

FARMING SYSTEMS RESEARCH-EXTENSION METHODS

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SUSTAINABLE DEVELOPMENT OF RURAL LIVELIHOOD SYSTEMS

More and more it is recognized that sustainable development, including conservation of our natural resources, depends on the adaptability of alternative courses of action to very diverse biophysical and socioeconomic situations. More than half of the world's current 6 billion people are resource-poor, rural inhabitants whose livelihoods depend to a large degree on the direct use of the natural resources with which they are in close contact. Their numbers continue to increase (Dixon et al.) at the same time they are becoming subjected to the impacts of outside forces, not the least of which is economic integration and globalization.

Micro adaptability to localized situations helps to maintain the magnificent diversity still present on this planet, but to achieve it is a challenge in the face of the industrial advantage of broadly adaptable alternatives that can be mass produced and commercialized on a massive scale. Commercialization has become an integral aspect of subsistence in rural livelihoods even in the most isolated parts of the world, but these livelihood systems still maintain most of their diversity.

> *The challenge is to help develop and improve the livelihood strategies of the rural poor while at the same time maintaining their diversity and conserving the natural resource base upon which they, and all of us, depend.*

Globally, the most influential drivers of "development" are the donor and implementation agencies of the industrialized countries (such as USAID, GTZ, FINNIDA etc.); the multinational development programs such as the World Bank, the UN/FAO and UNDP; and the increasingly important Non-Governmental Organizations. These entities, and mainly the first two groups, necessarily are influenced by aggregated statistical data that mask the micro diversity at local levels. An unfortunate consequence is the ignorance of local situations by the people who make far-reaching decisions that will have highly differential, but unknown impacts on these diverse rural livelihood systems. Often the most important products of and constraints on these livelihood systems are not even included in the aggregated data upon which the decisions are based. Economists in the donor organizations and different government levels, few of whom have ever been in a resource-poor rural household, make more complex and sophisticated models to help them explain what went wrong when the responses in the countryside were not what were expected from previous models. But the main problem is that the data do not reflect, and the economists do not understand what is going on at the individual rural household livelihood level.

> *Understanding the system is important for identifying problems.*
> *It is even more important for shaping solutions.*
> Michael Collinson

Michael Collinson is one of the persons in widely scattered parts of the world who were developing methodologies for helping shape and adapt solutions to rural livelihood problems in the late 1960s and early 1970s. These activities, taking place in Africa, Asia, and Latin America, were in response to the emerging realization that the majority of small farmers in the world were not benefiting from the Green Revolution technology that had been heralded in the early 1960s as the scale-neutral approach to modernizing agriculture in the Third World. These methodologies have come to be called Farming Systems Research-Extension (FSRE). An excellent history of the development of FSRE is found in Collinson (2000).

WHAT IS "FARMING SYSTEMS RESEARCH-EXTENSION" OR FSRE?

FSRE is a multi-disciplinary, participatory methodology for technology development that merges research and extension efforts. It is often called by other names such as on-farm adaptive research with a farming systems perspective. FSRE is a means of integrating farmers with researchers and extensionists, or with less official NGO personnel, in a systematic procedure for identifying and solving problems associated with attempts to achieve diversified and sustainable agricultural development. Multidisciplinary FSRE teams, comprised of research, extension and other personnel, work with farmers to identify problems and constraints and then create, adapt and test alternative solutions. Solutions are matched to specifically characterized, yet diverse biophysical environments and socioeconomic conditions of farm households and their fields called *Recommendation Domains*. FSRE is a flexible methodology as useful in industrialized countries as in developing countries and is increasingly being used in the broader sphere of conservation and sustainable development.

FSRE field teams identify problems and constraints of farmers in *Research Domains* through rapid survey techniques designed specifically for this purpose. Farmers participate in a search for and testing of options and as much work as possible is carried out on farms rather than on experiment stations. This is necessary to subject technologies being tested to the diverse biophysical and socioeconomic conditions of these farmers rather than just to the highly controlled experimental conditions imposed on stations (see Hildebrand and Russell, Chapter 1). Because of continued farmer participation, and because research and extension activities are combined rather than separated, communication problems are reduced and the lag from problem identification to technology adoption is minimized. In this way, FSRE is a complement to community adaptation, learning and diffusion, which historically has been important in agricultural technology innovation and change (See Bastidas 2001 p. 19) for a schematic representation of this methodology).

Most people in society have become concerned about maintaining the sustainability of agriculture. This concern was fomented by the rapidly increasing consumption of non-renewable natural resources, combined with a deteriorating environment where air, ground and surface water, and our natural ecosystems are being contaminated or disappearing. A movement toward a more diversified and sustainable agriculture will necessarily require a shift of agriculture away from vast, artificially created and relatively homogenous farming systems based on the heavy use of fossil fuels and chemicals to dominate natural biophysical environments and to farming systems more in tune with naturally existing, but quite varied natural environments and ecosystems. Farming systems research and extension evolved in situations where it was necessary to work with the natural variability of existing ecosystems and the different farming systems that farmers developed to survive and hopefully prosper while minimizing the use of off-farm resources. Therefore, FSRE is a valuable procedure for helping in the search for a more sustainable agriculture worldwide.

Recently there has been a renewed interest in farmer-participatory, on-farm research in North America. A number of Non-Governmental Organizations have been created to foment this kind of activity and the USDA, the W.K. Kellogg Foundation and others have been providing support. Many Land Grant universities now have, or are initiating programs to provide support for farmer-initiated and directed research. Much of the methodology in these initiatives flows from that generated by the FSRE practitioners who have been involved with it over the past 25 or more years in developing countries.

AEE 5232: FARMING SYSTEMS RESEARCH AND EXTENSION METHODS

Course Objective

Combine professionals from biological, social, physical and economic backgrounds into smoothly functioning multidisciplinary teams capable of using limited time and other resources in a systematic, farmer-participatory approach to identifying and solving rural family livelihood problems and disseminating relevant information to improve the overall welfare of these families while maintaining the diversity and sustainability of their systems.

Course Goals

1. Understand the FSRE approach to solving rural livelihood problems. This process includes participatory problem diagnosis procedures, stakeholder identification, and the generation, adaptation, validation and diffusion of solutions specific to scale, problem, gender, criteria and location. More broadly, these solutions must also take into account the impact of those global phenomena that more and more affect these livelihoods.

2. Understand and be able to use the biophysical, economic and social science methods required for persons from different disciplines and backgrounds to work together, and with farmers and other stakeholders, in joint problem identification and solution efforts under conditions of urgency and usually with limited institutional resources.

Course Grading (In percent of total)

Individual participation in teams (graded by self and fellow team members)		
Sondeo	15	
On-farm trial	15	
Team reports (graded by professor)		
Sondeo (written and oral)	15	**(Due February 19)**
On-farm trial (written)	15	**(Due April 2)**
Peer review of term papers (graded by students) (5% for each of two papers reviewed)	10	**(Monday April 7)**
Term paper (written) graded by professor (10% off per day for late papers)	15	**(Due April 21)**
Term paper presentation (graded by professor)	15	

Texts

Hildebrand, P.E. (ed). 1986. Perspectives in farming systems research and extension methods. Lynne Rienner Publishers, Inc., Boulder, Colorado.

Hildebrand, P.E. and J.T. Russell. 1996. Adaptability analysis: A method for the design, analysis and interpretation of on-farm research-extension. Iowa State University Press, Ames, Iowa.

Chambers, R. 1997. Whose reality counts? Intermediate Technology Publications, London.

Term Paper

A professional quality term paper will be written during the semester and presented in class beginning Monday, **April 12.** Papers may be presented orally or as a poster, but the professor must approve the method of presentation in advance. Written papers should be limited to 15 double-spaced pages. Figures and bibliography can be additional. Professional quality oral presentations will be 15 minutes in length to be followed by a discussion. Poster presentations will be on display up to 30 minutes. The papers will be on topics of current interest in Farming Systems Research-Extension. **An abstract should be prepared and distributed prior to the presentation.**

Term papers may be part of a paper the student anticipates publishing, or part of a thesis or dissertation. Each term paper will be read, edited and commented on (suggestions and/or corrections) by two other persons in the course on **Monday, April 5**. For those who are not native speakers of English, at least one of the reviewers will be a native English speaker. Names of those who reviewed the report should be listed in a footnote. The author will grade the quality of each review. **If the finished paper requires extensive editing by the professor, the grades of the author and the reviewers will be affected**. Use a standard professional journal format for your discipline so that the paper is in a form ready for submission.

Students will be expected to review current farming systems literature (see list of References, recent Farming Systems Symposia Proceedings, the Journal for Farming Systems Research-Extension, Agricultural Systems, etc. as a point of departure). **Note: the topic must be approved by Monday, January 26. Other due dates:** Outline of paper: **Wednesday, 3/1**; Finished term paper **due Monday April 19.** See course calendar for all deadlines.

COURSE OUTLINE

Jan 7

I. Introduction to course and course requirements

II. Introduction to Farming Systems Research and Extension

- Origin of the term "farming systems research" as applied to technology development for small-scale, limited resource farmers in the Third World **(1965 - 1980)**.
- Formalizing "Farming Systems" -- FSR, FSR&D, FSRE – and confusing the issue **(1975 - 1990)**.
- FSRE and sustainable agriculture **(1985 - 2000)**.
- FSRE and natural resource management (**1995-**)
- FSRE: Farmer participatory systems methodology for sustainable agriculture.
  - Philosophy of on-farm research (OFR)
  - Concept of research, recommendation and diffusion domains
  - Extension strengths in FSRE

Required reading: (See the bibliography for complete references.) **Note:** Suggested and background readings will serve as a guide to extended reading for the term papers.

Perspectives, Preface, Chap. 1.

Suggested: Poats et al., 1986, pp 1-45; Hildebrand, 1988; Hildebrand, 1990b; Hildebrand, 1992a; Hildebrand 2002a; Hildebrand 2002b; Byrnes, 1988; Chapman et al., 1988; EcoGen PRA series; Francis and Hildebrand, 1988; FSSP Newsletter Vol. 2, No. 1, 1984 (pp 4-5); Norman et al., 1994.

Teams: Formation: (Students turn in biographical information)

Background: Andrew and Hildebrand, 1993 (Chapters 1-4); Byerlee, et al., 1982; Byerlee, 1987; Bunting, 1979; Francis and Hildebrand, 1989; Gilbert, et al. 1980 (pp 1-20); Hildebrand, 1982; Hildebrand, 1990a; Jones and Wallace, 1986 (Forward, Chapters 1 and 2); Norman, 1980 (1-10, 20-23); Norman, 1982; Norman and Collinson, 1985; Poats, et al., 1986; Schultz, 1964 (Chapters 2 and 9); Shaner et al., 1982 (Chapters 2, 3); Stevens, 1977 (Chapters 1 and 9); Vallaeys et al., 1987; Whyte, 1977; Whyte and Boynton, 1983 (Chapters 1-3, 12, 13); Zandstra, et al., 1979 (Chapter 1); Collinson , 2000.

Jan 12

III. The small-scale family farm livelihood system

Society as a system
Hierarchical agricultural systems
Defining livelihood systems and farming systems
Household, livestock, crop and market subsystems
Disaggregating the household by gender and age

Required: Perspectives, Ch. 2.

Suggested: Wilk, 1989 (Ch. 12); Feldstein and Poats, 1989 (pp 16-35).
Models from previous classes (**12.055**)

Background: Behnke and Kerven, 1983; Collinson, 1983 (Chapter 2-5); Harmston, 1983; Hayami, 1978 (Chapter 7); Hayami et al., 1987; Low, 1986 (Particularly Chaps. 13 - 14); Moock, 1986 (Forward,

Introduction, Chapter 1); Olayide, 1987; Poats et al. 1987; Poats, 1988; Poats and Feldstein, 1988; Ruthenberg, 1980 (Chapter 1); Turner and Brush. 1987 (Chapter 2); Whyte and Boynton, 1983 (Chapters 10, 11); Wilk, R. R. 1989.

Jan 14-Feb 16

IV. Rapid, Participatory Appraisal

In-depth versus rapid survey methods
Combining disciplines in rapid appraisal:
the Sondeo approach
- Critical observation
- Interviewing techniques
- Processing and sharing information
- Selection of target system(s)
  - Socioeconomic characterization(s)
  - Biophysical characterization(s)
  - Modeling the system(s)
  - Disaggregated activities calendar(s)

Problem formulation and specification within systems
- Definition of problems
- Symptoms versus causes of problems
- Constraints to problem solution
- Problem prioritization

Teams: ***** Field trips: Sat. Jan. 17, Mon. Jan 19 (optional), Sat. Jan 31, and Sat. Feb 7 *****

Conduct transect and sondeo, and prepare sondeo report.

(Sondeo reports due Monday 2/16)

Required reading: Perspectives: Chaps 4 and 5; Tripp and Woolley, 1989; Lightfoot et al., 1989; Chambers, 1997

Background: Andrew and Hildebrand, Chapter 3; Cernea, 1985 (Chapter 13 by Robert Chambers); Chambers, 1983; Chambers, nd; CIMMYT, 1980 (Chapters 6-9); Dahlan et al., 1986; de Zeeuw and van Veldhuizen, 1992; Franzel, 1984; Gladwin, 1979; International Rice Research Institute (IRRI), Kumar, 1993; 1982; Lightfoot et al., 1991a and 1991b; Mascarenhas, nd.; Mutsaers et al. 1986 (Chapters 3, 4); Okali et al. 1994; Schmidt, 1984 (pp 17-29); Schultz, 1964 (Chapters 3, 8); Shaner et al., 1982 (Chapter 5); Sharp, 1952; Spicer, 1952 (Forward and Introduction); Spradley, 1979; Stevens, 1977 (Chapters 6-8); Werge, 1978; Whyte, 1991; Wotowiec et al. 1987.

Feb. 18-Mar 31

V. Analysis and Design of On-Farm Research

Teams Teams will plant and care for a field trial that will simulate multi-environmental, on-farm trials. Each team will be considered a farm family at each of four "villages." Thus the number of farms will be four times the number of teams. The teams will take measurements on their own farms. Analysis will be based on the pooled data from all farms. Each team will analyze and interpret data and write a report on the results from the combined data. *The reports will include a problem statement, hypotheses and objectives.*

***** Reports are due Wednesday Mar. 31 *****

Topics

- Introduction to Adaptability Analysis
- Sources of data
- Single location vs. multi-location research
- Sources of variation
- Location of trials
- Management of the trials
  - Researcher managed
  - Farmer managed
- Site characterization
  - Socioeconomic
  - Biophysical
- Locations versus replications
- Adaptability analysis
- Risk assessment
- Implications for:
  - designing on-farm research
  - crop-livestock interactions
  - livestock on-farm trials
  - agroforestry trials
  - extension functions
  - extension messages
  - institutional organization

Required reading: Perspectives, Chaps. 6-7; Hildebrand and Russell, 1996, especially Chapters 1, 2 and 7 but also look over other chapters.

Suggested: Andrew and Hildebrand, 1993 (Ch. 6); Hildebrand, 1992b; Moock and Rhoades, 1992; Stroup, et al., 1991; Stroup, 1992.

Background: Andrew and Hildebrand, 1993 (Chapters 7-10); Bradley et al., 1988; Cornell and Berger, 1987; FSSP, 1985; Moock and Rhoades, 1992; Mutsaers et al. 1986 (Chapter 5); Rzewnicki et al., 1988; Schultz, 1964 (Chapter 11); Shaner et al., 1982 (Chapter 7); Stucker and Hicks, 1992; Tripp, 1991.

VI Term papers

Apr 5 **Peer review**

Apr 12-19 **Presentations**

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REFERENCES

Andrew, C.O. and P.E. Hildebrand. 1993. Applied agricultural research: Foundations and methodology. Westview Press. Boulder, CO. **PEH.0354**

Ashraf, M, P. Balogun and A. Jibrin. 1985. A case study of on-farm adaptive research in the Bida Agricultural Development Project - Nigeria. IITA OFR Bulletin No. 1. **16.342**

Bastidas, E. P. 2001. Assessing potential response to changes in the livelihood system of diverse, limited-resource farm households in Carchi, Ecuador: Modeling livelihood strategies using participatory methods and linear programming. Ph.D. dissertation, Food and Resource Economics Department, University of Florida.

Behnke, B. and C. Kerven. 1983. FSR and the attempt to understand the goals and motivations of farmers. Culture and Agriculture. No. 19. pp. 9-16. **16.544**

Bodley, John H. 1976. Anthropology and contemporary human problems. Benjamin/Cummings. **66.019**

Bradley, J.P., K.H. Knittle and A.F. Troyer. 1988. Statistical methods in seed corn product selection. J. Prod. Agric. Vol. 1, No. 1. 34-38.

Bunting, A.H. 1979. Science and technology for human needs, rural development and the relief of poverty. International Agricultural Development Service, Occasional Paper, New York. **03.010**

Byerlee, D.L., Harrington and D.L. Winkleman. 1982. Farming systems research: issues in research strategy and technology design. American Journal of Agricultural Economics, Vol. 64, No. 5: (897-904). **16.244**

Byerlee, D. 1987. From adaptive research to farmer recommendations and extension advice. Agric. Admin. & Extension 27:231-244.

Byrnes, J. B. 1988. A review of AID experience: farming systems research and extension (FSRE) projects 1975-1987. Proceedings of Farming Systems Research/Extension Symposium. University of Arkansas. pp. 363-368.

Chambers, R. 1983. Rural development: putting the last first. Longman. Essex, England. **PEH.0337**

_____ 1992. Methods for analysis by farmers: the professional challenge. Institute of Development Studies, University of Sussex, Brighton, UK. **16.739**

_____ nd. How to do participatory mapping. (Handwritten draft) **16.809**

_____ 1997. Whose reality counts? Putting the first last. Intermediate Technology Publications. London.

Chapman, J. A., A. L. Brown and R. J. Castro. 1988. Possible future directions for AID activity in farming systems research: a concept paper. Proceedings of Farming Systems Research/Extension Symposium. University of Arkansas. pp. 369-385.

CIMMYT. 1980. Planning technologies appropriate to farmers: concepts and procedures. Mexico. **15.095**

Collinson, M. 1983. Farm management in peasant agriculture. Westview Press, Boulder, Colorado. **PEH.0313**

_____. (Ed.) 2000. A history of farming systems research. CABI Publishing, CAB International, Wallingford, Oxon, U.K.

Conway, G.R. 1985a. Agroecosystem analysis. Agr. Adm. 20:31-55.

Conway, G.R. 1985b. Agricultural ecology and farming systems research. *In* Remenyi, J. V. Agricultural systems research for developing countries. Australian Centre for International Agricultural Research (ACIAR). Canberra. **PEH.0270**

Cornell, J.A. and R.D. Berger. 1987. Factors that influence the value of the coefficient of determination in simple linear and nonlinear regression models. Phytopathology 77:63-70. **102.001**
Dahlan, M. ; S. Wahyuni; Sunarsedyono; C.E. Van Santen; J. Ph. Van Staveren and L.W. Harrington. 1986. The on-farm program for palawija based farming systems in Malang District, East Java, Indonesia, 1984-1986. *In* Flora, C.B. and M. Tomecek. Selected proceedings of Kansas State University's 1986 Farming Systems Research Symposium -- Farming Systems Research and Extension": Food and Feed. pp. 126-147. **16.545**

de Zeeuw, H. and L. van Veldhuizen. 1992. Learning for participatory technology development: a training guide. Vol. 0 (Introduction) **16.812**, Vol. 1 (Basic orientation and skills) **16.813**, Vol. 2 (LEISA principles and technologies) **16.814**, Vol. 3 (Participatory diagnosis) **16.815**, Vol. 4 (Farmers' experimentation) **16.816**, Vol. 5 (Spreading and consolidating the PTD experience) **16.817**

Dixon, J., A. Gulliver and D. Gibbon. 2001. Global farming systems study: challenges and priorities to 2030. Synthesis and global overview. FAO, Rome.

Doran, M. H. ; A. R. C. Low and R. L. Kemp. 1979. Cattle as a store of wealth in Swaziland: implications for livestock development and overgrazing in eastern and southern Africa. American Journal of Agricultural Economics. 61:41-47.

Ellis, F. 1988. Peasant economics: farm households and agrarian development. Cambridge University Press. Cambridge. **PEH.0304**

Feldstien, J.S. and J. Jiggins (eds). 1994. Tools for the field: methodologies handbook for gender analysis in agriculture. Kumarian Press. Hartford. **PEH.0366**

Feldstein, H. and S.V. Poats (eds). 1990. Working together: gender analysis in agriculture. Kumarian Press. **PEH.0288 AND PEH.0289**

Francis, C. A. and P. E. Hildebrand. 1988. Farming systems research and extension (FSRE) in support of sustainable agriculture. Proceedings of Farming Systems Research/Extension Symposium. University of Arkansas. pp. 391-393.

_____. 1989. Farming systems research/extension and the concepts of sustainability. Presented at the Ninth Annual International Farming Systems Symposium. University of Arkansas. **97.030**

Franzel, S. 1984. Comparing the results of an informal survey with those of a formal survey: a case study of farming systems research/extension (FSRE) in middle Kirinyaga, Kenya. 1984. Farming Systems Symposium, Manhattan, Kansas. **01.327**

Franzel, S. and H. van Houten. 1992. Research with farmers: lessons from Ethiopia. C.A.B. International, Wallingford, UK.

FSSP. 1985. Minimum data set for agronomic trials offers basis for comparison. FSSP Newsletter Vol. 3, No. 2. p. 4.

Gilbert, E.H., D.W. Norman and F.E. Winch. 1980. Farming systems research: a critical appraisal. MSU Rural Development Paper No. 6, Michigan State University, East Lansing. **16.121**

Gladwin, Christina H. 1979. Cognitive strategies and adoption decisions: a case study of non-adoption of an agronomic recommendation. Economic Development and Cultural Change. Vol 28, October. **16.093**

Gladwin, Christina H. 1982. The role of a cognitive anthropologist in an farming systems program that has everything. *In* International Rice Research Institute (IRRI). 1982. Report on an exploratory workshop on "The role of anthropologists and other social scientists in interdisciplinary teams developing improved food production technology". The Philippines. **16.172**

Hansen, A., D. Griffith, J. Butler, S. Powers, E. Gilbert, R. Lauriault, M. Downie, J. Dean and S. Russo. 1981. Farming systems of Alachua County, Florida. An overview with special attention to low resource farmers. **18.002**

Harmston, F. K. 1983. The community as an economic system. The Iowa State University Press. Ames. **PEH.0320**

Hart, R.D. 1979. An ecological conceptual framework for agricultural research and extension. Iowa State University-CATIE-IICA Seminar on Agricultural Production Systems Research. Turrialba, Costa Rica. **16.014**

Hayami, Y.; T. Kawagoe; Y. Morooka and M. Siregar. 1987. Agricultural marketing and processing in upland Java: a perspective from a Sunda village. CGPRT Centre. Bogor, Indonesia. **PEH.0301**

Hayami, Y. et al. 1978. Anatomy of a peasant economy. International Rice Research Institute. Philippines. **PEH.0321**

Hildebrand, P.E. 1981. Combining disciplines in rapid appraisal: the sondeo approach. Agricultural Administration 8:423-432. **16.225**

_____. 1982. Farming systems research: issues in research strategy and technology design: discussion. American Journal of Agricultural Economics, Vol. 64, No. 5: 905-906.

_____. 1988. US vs third world research and extension institutions: their effect on farming systems methodology. Proceedings of Farming Systems Research/Extension Symposium. University of Arkansas. pp. 129-132.

_____. 1990a. Agronomy's role in sustainable agriculture: integrated farming systems. Journal of Production Agriculture 3:285-288.

_____. 1990b. Farming systems research-extension. Chap. 6 *In* Jones, J.G.W. and P.R. Street (Eds.) Systems theory applied to agriculture and the food chain. Elsevier Science Publishers Ltd. Essex and New York. **PEH.0335**

_____. 1992a. The FSRE approach: the meaning and value of FSRE to promote agricultural production and the welfare of rural families. Keynote speech presented at the Southern African Farming Systems Research-Extension Conference "Farming Systems Research-Extension in the 1990s: its relevance as a practical approach to solving the problems faced by farmers in Southern Africa. Johannesburg, RSA, February 25-27. **16.708**

_____. 2002a Technology for small farms: the challenge of diversity. Invited paper presented at the Workshop on No-Till Farming in South Asia's Rice-Wheat System: Experiences from the Rice-Wheat Consortium and the USA, 21 February 2002, Ohio State University, Columbus.

_____. 2002b. Global research challenges: including small holders in rural development. Invited keynote address at the 1st Henry A. Wallace Inter-American Scientific Conference on Globalization of Agricultural Research. CATIE, Turrialba, Costa Rica February 25-27, 2002.

Hildebrand, P.E. and E.P. Bastidas. 1995. Steps in the analysis and interpretation of on-farm research-extension based on adaptability analysis: A training guide. Food and Resource Economics Staff Paper SP95-4R. University of Florida, Gainesville. **16.688**

Hildebrand, P.E. and J.T Russell, 1994. Adaptability analysis for diverse environments. American Society of Agronomy, Seattle. **16.834**

Jones, J.R. and B.J. Wallace (eds.) 1986. Social sciences and farming systems research: Methodological perspectives on agricultural development. Westview Press, Boulder and London. **PEH.0285**

Kramer, M. 1987. Three farms: making milk, meat, and money from the American soil. Harvard University Press. Cambridge and London. **PEH.0317**

Kumar, K. (ed.). 1993. Rapid appraisal methods. The World Bank, Washington, D.C. **PEH.0363**

Lightfoot, C., N. Axinn, P. Singh, A. Bottrall, and G. Conway. 1989. Training Resource book for agro-ecosystem mapping. IRRI/Ford Foundation. **95.056**

Lightfoot, C., R. Noble and R. Morales. 1991a. Training resource book on a participatory method for modeling bioresource flows. ICLARM, Manila.

Lightfoot, C., et al. 1991b. Training resource book for participatory experimental design. ICLARM, Manila.

Low, A. 1986. Agricultural development in Southern African: farm household-economics & the food crisis. James Currey Ltd. London. **PEH.0310**

Mascarenhas, J. nd. Participatory rural appraisals and participatory learning methods: recent experiences from

MYRADA and South India. Forests, Trees and People Newsletter No. 15/16. **16.810**

McDowell, R.E. and P.E. Hildebrand 1980. Integrated crop and animal production: making the most of resources available to small farmers in developing countries. Working Papers. The Rockefeller Foundation, New York. **23.001**

Mellor, J.W. 1969. The subsistence farmer in traditional economies. Chap 7 *In* Wharton, C.R., Jr. 1969. Subsistence agricultural and economic development. Aldine Publishing Co., Chicago. **PEH.0322**

Mellor, J.; C. L. Delgado and M. J. Blackie (eds.). Accelerating food production in Sub-Saharan Africa. The John Hopkins University Press. Baltimore and London. **PEH.0262**

Miracle, M. P. 1968. "Subsistence agriculture": analytical problems and alternative concepts. American Journal of Agricultural Economics. 50:292-310.

Moock, J.L. (ed.) 1986. Understanding Africa's rural households and farming systems. Westview Press, Boulder and London. **PEH.0283**

Moock, J.L. and R.E. Rhoades. 1992. Diversity, farmer knowledge, and sustainability. Cornell University Press, Ithaca. **PEH.0364**

Mutsaers, H.J.W., N.M. Fisher, W.O. Vogel and M.C. Palada. 1986. A field guide for on-farm research. International Institute of Tropical Agriculture. Ibadan, Nigeria. **PEH.0251**

Mutsaers, H.J.W., G.K. Weber, P. Walker and N.M. Fischer. 1997. A field guide for on-farm experimentation. IITA/CTA/ISNAR. **PEH.390**

Norman, D.W. 1980. The farming systems approach: relevancy for the small farmer. MSU Rural development Paper No. 5, Michigan State University, East Lansing. **16.012**

Norman, D. 1982. The farming systems approach to research. Farming Systems Research Symposium "Farming Systems in the Field", Kansas State University, Manhattan, Kansas. **16.241**

Norman, D. and M. Collinson. 1985. Farming systems research and practice. *In* Remenyi, J. V. Agricultural systems research for developing countries. Australian Centre for International Agricultural Research (ACIAR). Canberra. **16.241**

Norman, D.W., T.R. Frankenberger, and P.E. Hildebrand. 1994. Agricultural research in developed countries: past, present and future of farming systems research and extension. J. Prod. Agric. 7:124-131.

Okali, C., J. Sumberg and J. Farrington. 1994. Farmer participatory research. Intermediate Technology Publications, London. **PEH.0375**

Olayide, S. O. and F.S. Idachaba. 1987. Input and output marketing systems: a Nigerian case. chapter 13 *In* Mellor, J.; C. L. Delgado and M. J. Blackie (eds.). Accelerating food production in sub-Saharan Africa. The John Hopkins University Press. Baltimore and London. **PEH.0262**

Ortiz, S.R. 1973. Uncertainties in peasant farming: A Colombian case. The Athalone Press. University of London. **PEH.0315**

Perrot-Maitre and T.F. Weaver. 1992. Indigenous knowledge and fertilizer strategies in Leyte, Philippines: implications for research and demonstration trials. JFSRE 3:21-34.

Poats, S. and H. Feldstein. 1988. Methodologies which enable the inclusion of gender analysis in agricultural research and development. Draft. **12.039**

Poats, S.V. 1988. Gender analysis in farming systems research and extension projects. Paper delivered as the keynote address for the gender issues sub-theme of the Annual Farming Systems Research and Extension Symposium, University of Arkansas, Fayetteville. **12.041**

Poats, S., D. Galt, C. Andrew, L. Walecka, P. Hildebrand, and K. McDermott. 1986. Farming systems research and extension: status and potential in low-resource agriculture. Report submitted to the Office of Technology

Assessment, Congress of the United States. FSSP **01.421**

Poats, S., M. Schmink and Spring, A. (eds.) 1987. Gender issues in farming systems research and extension. Westview Press. Boulder, Colorado. **PEH.0311**

Redfield, Robert. 1962. How human society operates. Human nature and the study of society. Volume I. Edited by Margaret Park Redfield. The University of Chicago Press. **66.020**

Roeleveld, AC.W. and A. van den Broek. 1996. Focusing livestock systems research. Royal Tropical Institute, The Netherlands.

Ruthenberg, H. 1980. (Third edition). Farming systems in the tropics. Clarendon Press. Oxford. **PEH.0290**

Rzewnicki, P. E., R. Thompson, G. W. Lesong, R. W. Elmore, C. A. Francis, A. M. Parkhurst and R. S. Moomaw. 1988. On-farm experiment designs and implications for locating research sites. Am. J. of Alt. Agric. 3:168-173.

Schmidt, D.L. 1984. Synthesis of north Florida farming systems project. University of Florida, 1981-1984. IFAS, Univ. of Florida, Gainesville. **01.237**

Shaner, W.W., P.F. Philipp and W.R. Schmehl (eds). 1982. Farming systems research and development: guidelines for developing countries. Westview Press, Boulder, Colorado. **16.190**

Sharp. L. 1952. Steel axes for stone age Australians. *In* Human problems in technological change: a casebook. Edward H. Spicer, ed. Russell Sage Foundation. New York. **16.667**

Schultz, T.W. 1964. Transforming traditional agriculture. Yale University Press, New Haven or Arno Press, New York. **PEH.0314**

Simpson, J.R. 1988. The economics of livestock systems in developing countries: farm and project level analysis. Westview Press. Boulder and London. **PEH.0294**

Skjonsberg, E.1989. Change in an African village: Kefa speaks. Kumarian Press. Hartford, Conn. **PEH.0287**

Spicer, Edward H. (ed.). 1952. Human problems in technological change: a casebook., Russell Sage Foundation. New York. **66.018**

Spradley, James P. 1979. The ethnographic interview. Holt, Rinehart and Winston: New York, Chicago, San Francisco, Dallas. **PEH.0121**

Stevens, R.D. (ed.). 1977. Tradition and dynamics in small-farm agriculture. Iowa State University Press, Ames. **PEH.0291**

Stroup, W.W., P.E. Hildebrand and C.A. Francis. 1991. Farmer participation for more effective research in sustainable agriculture. p. 153-186. *In* J. Ragland and R. Lal (ed.) Technologies for sustainable agriculture in the tropics. ASA Spec. Publ. 56. ASA, CSSA, and SSSA, Madison, WI. **16.660**

Stroup, W.W. 1992. A perspective on the design and analysis of on-farm trials. Paper presented at the symposium "On-farm research: I. Methodology". American Society of Agronomy meetings, Minneapolis, Minn. Nov. 1-6.

Stucker, R.E. and D.H Hicks. 1992. Some aspects of design and interpretation of row-crop on-farm research. p 125-151. *In* Participatory on-farm research and education for agricultural sustainability. Proc. Conference University of Illinois at Urbana-Champaign, July 30-August 1. **16.837**

Tripp, R. (Ed.) 1991. Planned change in farming systems: progress in on-farm research. John Wiley & Sons, New York. **PEH.0338**

Tripp, R. and J. Woolley. 1989. The planning state of on-farm research: Identifying factors for experimentation. Mexico, D.F. and Cali, Colombia: CIMMYT and CIAT. **16.583**

Troyer, A.F. 1995. Breeding widely-adapted, popular corn hybrids. Presented at the XIV EUCARPIA Meeting on ADAPTATION IN PLANT BREEDING, Jyvaskyla, Finland. **16.890**

Turner II, B.L. and S.B. Brush (eds). 1987. Comparative farming systems. The Guilford Press. New York and London. **PEH.0296**

U.S. Congress, Office of Technology Assessment, Enhancing agriculture in Africa: A role for U.S. Development assistance, OTA-F-356 (Washington, DC: U.S. Government Printing Office, September 1988). **01.553**

Vallaeys, G.; P. Silvestre; M. J. Blackie; and C. Delgado. 1987. Development and extension of agricultural production technology. Chapter 11 *In* Mellor, J.; C. L. Delgado and M. J. Blackie (eds.). Accelerating food production in Sub-Saharan Africa. The John Hopkins University Press. Baltimore and London. **PEH.0262**

Werge, R. 1978. Social science training for regional agricultural development. Paper presented at the Meetings of the Society for Applied Anthropology. Merida, Mexico. **95.005**

Wharton, C.R. (ed.) 1969. Subsistence agriculture and economic development. Aldine Publishing Co. Chicago. **PEH.0322**

Whyte, W.F. 1977. Toward a new strategy for research and development agriculture: helping small farmers in developing countries. Desarrollo Rural en las Americas. Vol. IX, No. 12. **16.060**

_____. 1981. Participatory approaches to agricultural research and development: A state-of-the art paper. Published by the Rural Development Committee, Center for International Studies, Cornell University, Ithaca, New York. **16.151**

_____. 1991. Participatory action research. Sage Publications. Newbury Park. **PEH.0281**

Whyte, W.F. and D. Boynton. 1983. Higher-yielding human systems for agriculture. Cornell Univ. Press, Ithaca and London. **PEH.0277**

Wilk, R.R. (ed). 1989. The household economy: Reconsidering the domestic mode of production. Westview Press. Boulder, Colorado. (266 pp.) **PEH.0306**

Wotowiec, Peter., S. Poats, and P.E. Hildebrand. 1987. Research, recommendation, and diffusion domains: a farming systems approach to targeting. Chapter 6 *In* Poats, S.; Schmink, M. and A. Spring: Gender issues in farming systems research and extension. Westview Press. Boulder, Colorado. **PEH.0311**

Zandstra, H., K. Swanberg, C. Zulberti and B. Nestel. 1979. Caqueza: living rural development. International Development Research Center, Ottawa. **01.051**