

## II FARMING SYSTEMS RESEARCH AND DEVELOPMENT

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Farming systems research and development  
Africa, Ghana, farming system, cocoa production, food crops,  
profitability analysis  
BOATENG, M.  
Profitability analysis of a farming system in Africa.  
Agric. Systems, 24, 1987, pp. 81-93

This analysis questions the assumptions that, in a traditional farming system, food production is primarily for home consumption and is not competitive with export crop (cocoa) production. Government planners and policy makers must look at the operation of a farmer to understand the role of food crop production. In the case of Ghana in 1981, they needed to seek ways to make cocoa production relatively more profitable if the goal of increased cocoa production from small farms were to succeed. The analysis indicates why farmers was devoting scarce resources, particularly labor, to producing food crops in Ghana in 1981. Food crops were the most profitable both 1) in 1981 and 2) when the flow of income from the life of the trees was considered. Clearly, the farmers were demonstrating that they were rational economic men.

In order to get an idea of what price cocoa must bring for it to be as profitable as the food crop system, the price of cocoa was varied with all other prices held constant. The price of cocoa would have had to be ca. \$400 per load of 30 kg in 1981. The government purchase price was \$120 per load. Not surprisingly, cocoa production in Ghana was declining steadily.  
Author's summary

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Farming systems research and development  
Review, proceedings, workshop, FSR, CGIAR, IARC's, reviews,  
ICRISAT  
Proceedings of a Workshop on Farming Systems Research.  
ICRISAT Center, 1987, 153 pp., ISBN 92-9066-119-4, ICR 86-0034,  
US\$ 24.00 plus postage; available from: Information Services,  
ICRISAT, Patancheru, AP 502324, India

Farming Systems Research (FSR) comprises a study of the agricultural systems of groups of farmers, and of the various factors - socioeconomic as well as technical - that influence farmers' decisions. The need for this is well understood; any proposed change to a farmer's system that involves more than a simple innovation requires careful consideration of implications of such changes for the farmer, his production systems and his society.

In recent years, the Consultative Group on International Agricultural Research (CGIAR) has provided strong leadership in FSR through the establishment of research programs at several International Agricultural Research Centers (IARCs) and the sponsoring of reviews and workshops on the philosophy and concepts of FSR. Many other institutions outside the CGIAR system, in developing as well as in developed countries, have also evinced interest in FSR. This interest has led to a widening in the views of what constitutes FSR, which in turn has created uncertainties about the definition of this area of agricultural research. Differences of approach, subject matter and terminology have recently become obvious where researchers from more than one IARC have initiated FSR from differing perspectives in a particular country, or have followed one another in country research programs. The Technical Advisory Committee of the CGIAR and the Center Directors therefore agreed that consultations should be arranged in order to harmonize the approaches to FSR. The workshop objectives were: 1) to develop an understanding of the relevance and approaches to FSR in IARCs; 2) to indicate the roles of international and national research agencies in FSR; 3) to harmonize the recommendations of previous reviews on FSR into an IARC framework; 4) to discuss the results of case studies to assist in assessing the relevance and priority of such research for creating an impact on national systems; and 5) to outline the further aims of FSR in the CGIAR system.

Two key papers presented at the workshop, the reviews and chairmen's summaries are published in full texts. The other papers are published as summaries.

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Farming systems research and development  
Africa, Nigeria, subhumid conditions, development, resource use,  
pastoral systems  
BAYER, W. et al.  
Resource use and strategies for development of pastoral systems in subhumid West Africa: the case of Nigeria.  
Quart. J. Int. Agric., 26, 1987, pp. 58-71

In semiarid and subhumid West Africa, the large majority of cattle are kept by pastoralists, who derive their living mainly from grazing animals. In the case of Nigeria, Fulani pastoralists keep 80-90% of the total cattle population. In recent years, anthropological research has highlighted the ecological fine-tuning of many pastoral systems and the rationale behind herd mobility. However, many development planners still regard sedentarization of pastoralists as a prerequisite for any form of livestock development and provision of social services. Some even advocate the complete replacement of existing production systems. Despite considerable expenditures, livestock development efforts in sub-Saharan Africa have had little impact on production. Disregard of existing production systems may be a main reason for this failure.

Detailed studies of pastoral production in central Nigeria reveal that a variety of grazing resources are used, including crop residues, fallow fields, floodplains, upland range, and browse trees and shrubs. Effects of differences in quality and seasonal availability of these resources on cattle productivity in settled and transhumant herds are discussed.

Establishment of reserves for year-round grazing not only spatially separates farmers and herders but also does not increase production per animal, primarily because of reduced availability of crop residues which offer a better quality diet than rangeland in the early dry season. Introduction of ranching may increase beef production per head but not per unit area; when milk and manure production are taken into account, also production per head is lower than in pastoral herds. Rather than try to replace or greatly alter the existing pastoral system, development efforts should be based on it. Experiments conducted together with Fulani pastoralists showed that small improved pastures can be integrated into the existing system as an additional grazing resource. Implications of this innovation for productivity and land-use policy are briefly discussed.

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#### Farming system research and development

Asia, Thailand, review, crop research, highlands, ecology, farming systems, framework conditions, agro-economic assessment, nutritional aspects, crops, livestock, soil conservation, extension, research proposals

SCHUBERT, B. et al.

Proposals for farming systems-oriented crop research of Wawi Highland Agricultural Research Station in Northern Thailand. Schriftenreihe des FB Internationale Agrarentwicklung der TU Berlin, No. 101, 1986, 323 pp., ISSN 0177-6673, ISBN 3-924333-63-7; Distributor: Verlag J. Margraf, Postf. 105, D-6992 Weikersheim, FRG, DM 19.00 plus postage

This report is the result of a three-month survey carried out by a study team from the Center of Advanced Training in Agricultural Development of the Technical University of Berlin.

The team was composed of two agronomists, one animal production specialist, one soil scientist, one nutritionist, two agricultural economists and one general economist. The study was conducted on request in close cooperation with Thai-German Development Programme and the Highland Agricultural Research Office of the Department of Agriculture.

Rapidly changing framework conditions have created a number of interrelated problems for farm families in the highlands of Tambon Wawi. The main causes are:

- . an increasing population pressure which leads to scarcity of land, decreasing fallow periods, decline of soil fertility and declining yields of field crops;
- . the prohibition of poppy cultivation, which was a highly profitable cash crop cultivated in the dry season, fitting perfectly

into the land and labor economy of the farming systems.

The effects of these changes are:

- . declining self sufficiency in upland-rice which together with a declining availability of nutritious vegetables leads to malnutrition with serious implication for vulnerable groups;
  - . decreasing farm incomes impoverishing farm families to the extent that many of them are no longer able to fulfil their basic needs;
  - . severe erosion caused by increasingly cultivating field crops on steep slopes without using soil conservation methods;
  - . decreased availability of natural pastures for cattle raising.
- A fast transition from shifting cultivation to profitable and ecologically sustainable permanent agriculture is urgently required to avoid further deterioration. However, farm families as well as the organizations engaged in agricultural research and extension do not have experience in permanent cultivation in the highlands and do not know of a proven feasible alternative to shifting cultivation which could be adopted by the majority of highland farmers.

To solve this problem by generating know-how on appropriate cropping systems for areas with an altitude of more than 800 m is the task of the newly established Wawi Highland Agricultural Research Station of the Department of Agriculture located in the East Zone of Tambon Wawi.

The objective of this report is to make research proposals for Wawi Station which take into account framework conditions, resource endowment, objectives and problems of farm families, which are well coordinated with the research and extension activities of other organizations, and are feasible within the mandate and capacities of Wawi Station. These proposals should enable the station to contribute significantly to the required transition from shifting cultivation to permanent agriculture.

To arrive at research proposals, a farming-systems oriented approach was used which is holistic and interdisciplinary, relies heavily on local expertise and secondary data, and uses mainly informal surveys for primary data collection.

The study starts with a situation analysis of the farm family's physical, biological, sociocultural, socioeconomic and political framework conditions and the marketing problems and potentials. Three types of farming systems have developed under these framework conditions:

- . Most farmers are subsistence-oriented, growing upland rice, maize, local beans and some vegetables.
- . Some farmers are more market-oriented. In addition to upland rice and maize they have started to grow red kidney beans and coffee. Tomato production is rapidly expanding, using fields which are near roads and where water is available.
- . In upper Wawi there is an established market-oriented system based on the production and processing of wild tea, with some upland rice and maize for subsistence.

Research proposals have been worked out for upland rice, maize, legumes, arabica coffee, nuts, castor, amaranth, buckwheat, leaf vegetables (for subsistence) and fodder crops. For each of these areas:

- . A brief summary of the main constraints is given.
  - . On-going research activities and results are reviewed and assessed as to how far they contribute to solve these problems.
  - . Research objectives are formulated which address gaps in knowledge not covered by on-going research.
  - . Research proposals for Wawi Station are made, taking the mandate and capacity of the Station into account.
  - . For research requirements which cannot be covered by Wawi Station, some research proposals for other organizations are made.
- All research proposals are preliminary in the sense that additional information (e.g. on research results which have escaped the attention of the study group or major changes in agricultural product prices) would require a review of the proposals.

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#### Farming systems research and development

Review, developing countries, institutional constraints, extension, women farmers  
BERGER, M.

Agricultural extension for women farmers in developing countries: institutional constraints.  
Quart. J. Int. Agric., 26, 1987, pp. 28-45

Women in developing countries are actively involved in agriculture and urgently need assistance to improve farming practices, purchase more productive inputs, decrease their workloads, and improve the processing, storage, and marketing activities they perform. Despite their critical role in agricultural production, women have been virtually ignored by agricultural extension units. When women do receive visits from extension agents or attend training courses, they are frequently taught home economics rather than agricultural topics. In order to explain women's lack of access to extension services, it is necessary to examine the orientation and structure of institutions providing agricultural extension services, the kind of services provided, the types of delivery programs utilized, and the staffing of these institutions - all of which have crucial impact on the ability to provide effective assistance to women farmers. This paper focuses on the implementing institutions in agricultural extension in an attempt to examine the institutional constraints limiting women's participation in agricultural extension programs and possible remedies for these conditions.

Different types of agricultural extension organizations can be found in every nation state, but these can be classified into four distinct institutional models: general, government extension agencies; crop-specific organizations; extension services within integrated rural development projects; and extension services specifically for women. Because of the characteristics of many women farmers, those institutional models that seem to have the greatest potential for assisting women are the general programs (not crop-specific), the integrated rural development projects, and agencies that focus on food crops.

Perhaps the most important issue in improving women's access to extension services is whether a women-specific or an integrated institution is most appropriate for assisting women farmers. In some cases, cultural and social norms dictate a women-specific approach. However, although they are most likely to reach women, many women-only programs have a low potential for training women in farming techniques, because of their home economics orientation. In addition, these programs are more likely to view women's farming activities from a subsistence or nutritional, rather than a commercial perspective, thus limiting their effectiveness for raising the efficiency and incomes of women farmers.

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88 - 2/6

#### Farming systems research and development

Africa, Ghana, study, socioeconomic, hoe and bullock farming systems

PANIN, A.

Socioeconomic study on hoe and bullock farming systems in the Nakpanduri area.

Rep. Nyankpala Agric. Exp. Station, CRI/GTZ Joint Project, Tamale, Ghana, 1985/86, pp. 83-84

An assessment was made of the impact of bullock traction technology on the farming systems of rural communities. The data were collected in 1982 and 1983. Data analysis is now completed and a comprehensive report will soon be published. Some of the major findings are summarized here.

Assessed from the overall resource base, bullock farmers are better equipped with land, capital and labor than hoe farmers. Comparing all bullock-farming households with hoe-farming households, there was little impact of traction technology on total cultivated area (5.58 and 3.56 ha, respectively), but the effect was more pronounced in the subsamples with short traction experience. Farmers with long experience reduced their cultivated area again. Over all bullock-farming households, there was little change in the cropping system, but substantial changes were recorded in subsamples with longer traction experience. These changes took the form of a systematic shift from major food crops to cash crops: while the proportion of area covered by the former decreased, that of the latter increased. The increase in cash crop production was positively correlated to the change which took place in the area allocated to groundnut production.

The impact of bullock traction technology on the mixed cropping systems practised in the area was similar to that described above. Whereas in the early years of bullock traction the farmers tended toward crop mixtures and diversification, in later years they tended toward sole cropping.

Unlike the hand-hoe farmers, substantial increases in total output per ha were achieved among the bullock traction users. The level of the increase achieved was positively correlated to traction experience.

The introduction of bullock traction brought substantial changes in the pattern of labor demand and supply. The average labor input per ha for all major farming operations together increased with the introduction of bullock traction. The increase in labor input per ha was also positively correlated to the years of bullock traction experience. As regards labor requirements per ha for individual farming operations, the use of bullock traction increased those of clearing, weeding and harvesting, and reduced those of ridging and planting. Bullock traction also had different effects in terms of labor use for the different cropping patterns. Whereas it raised the labor intensity for some crop mixtures (e.g. groundnut/grains), it reduced it for others (e.g. maize/late millet/beans).

Survey data also indicate a reduction in annual field labor by small children of 6-9 years (both male and female), adult women, and household heads in bullock-farming households. However, annual labor input contributed by boys, male adults, and elderly women and men increased with the adoption of bullock traction, and labor input per man-equivalent of household labor also increased. The impact of bullock traction technology on the shares of harvested crops that were consumed, sold and given away by bullock-farming households compared with hoe-farming households was insignificant. However, bullock-farming households realized greater crop sales in absolute terms. They also derived more income from livestock sales than hoe-farming households. Furthermore, members of bullock-farming households had a higher calorie supply from crop yields than in hoe-farming households.

The impact of bullock traction on total crop yields as revealed by production function analysis was also positive. On average, bullock-farming households achieved higher crop production output than their hoe-farming counterparts.

The overall income (income from capital and labor) rose faster in bullock-farming than hoe-farming households, due to the remarkable growth in factor output and productivity.

Since bullock traction has led to increased output, income and employment, it can be regarded as an appropriate technology for all areas with characteristics similar to those of the study area.

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Farming systems research and development  
Africa, Nigeria, on-farm adaptive research, trials, cropping  
systems, farmer acceptance, technology introduction  
IITA

On-farm adaptive research in four cropping systems and farmers' responses to new technologies.

IITA Research Highlights Farming Systems Program 1981-1984, pp. 82-85, ISBN 978-131-007-3

Three years of experience with on-farm adaptive research in the Bida Agricultural Development Project (BADP) in Niger State, Nigeria have shown the possibilities of quickly identifying areas

of improvement in local farming systems and the willingness of farmers to accept practical new technologies.

The adaptive research strategy used by IITA and the agronomy section of BADP includes five stages: 1) diagnosis of constraints and opportunities; 2) design or identification of improved technologies that fit into local farming systems; 3) testing and evaluating the technologies under farmer conditions; 4) dissemination of information to farmers; and 5) reporting back to research stations those technologies that should receive further refinement. After areal reconnaissance of the project area (17,000 km<sup>2</sup>) and an agro-economic survey of 225 farmers, four dominant cropping systems were designated for on-farm adaptive trials: lowland rice-based, upland yam-based, upland cassava-based, and upland sorghum/millet-based.

Among the four cropping systems, farm productivity measured in terms of caloric value of food produced, total farm income, and returns to farm inputs varied considerably. The root crop-based systems of yams and cassava yielded greater quantities of food compared with the rice- and sorghum/millet-based system. Farmers growing root crops contributed not only more to the market (about 45% of the total food produced) but still had more food available per capita than farmers in the rice and sorghum/millet-based systems.

Results of trials in the lowland rice-based systems showed the importance of an earlier planting date for rice. In a season when the rains came late and planting was delayed 2-3 weeks, yields of improved varieties were less than those of local determinate varieties which averaged 2.3 t/ha. However, at one site where water management was good and irrigation through seepage water continued after the rains ceased, yields of the improved varieties were 32-40% higher. Farmers reported that they liked the grain color, size and cooking quality of the improved varieties and would plant them on part of their land where water control was better and weeds less of a problem.

Although increasing rice plant density from 100,000 to 150,000 per ha at trial sites which did not have a flooding problem produced an extra 300 kg/ha of paddy rice, farmers' reaction were mixed. Some feared that the practice would reduce tillering and that closer spacing would make it more difficult to weed crop with their wide hoes. Smaller hoes are not easily available in the area.

One of the most successful innovations in the lowland fields of the project area has been the planting of early-maturing cowpeas after season. Confined flow of seepage water from surrounding uplands into the inland swamps (fadamas) during the dry season offered the possibility of increasing food production by growing a "catch crop" using the residual moisture. Furthermore, surplus labor in the dry season and a minimum spray regime for insect control were "plus features".

Farmers said they welcomed any innovation that would increase their food supply by using slack period resources. In a survey sample of 85 farmers, 76% planted dry season cowpeas in 1984/85 compared with only 45% the year before and none in 1982. Demand for seed exceeded the supply.

Total crop value of the two early varieties planted in the 1983/84 dry season trials averaged \$1.096/ha. Yields ranged from 600 to 700 kg/ha with two sprayings for insects.

With the success of dry season cowpeas in the lowland rice-based systems, farmers in the other cropping systems showed increasing interest in growing the crop in the main season. During the 1984 main season, about 25% of all project farmers grew cowpeas. Those in the cassava- and sorghum/millet-based systems planted the crop in July/August using surplus labor, and reported an average yield of approximately 600 kg/ha for IT 82E-60 (popularly known as 60-day cowpea) and 700 kg/ha for TVx 3236. Several farmers in the four cropping systems expressed the view that the early-maturing cowpea varieties might be a crop that can reduce hunger.

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Farming systems research and development

Africa, Sierra Leone, book, review, rice farming systems, soil types, food shortage, indigenous agriculture, development  
RICHARDS, P.

Coping with hunger: hazard and experiment in an African rice-farming system.

London Res. Series in Geography 11; Allen & Unwin Publishers, London, 1986, 176 pp.

Why have agricultural development initiatives in Africa so often missed the mark as far as poor, hazard-prone farmers have been concerned? This question is the point of departure in Richards' study of the Mende farmers in Central Sierra Leone, where a mixed system of upland and swamp rice cultivation is being practised. The study starts with an historical account of about 90 years of almost fruitless effort to introduce the 'Asian option': the development of polder irrigation schemes as the answer of the colonial government to face the recurring food shortages and consequent periods of hunger. The purpose of the study has been to explore and demonstrate the logic of indigenous solutions, in spite of obvious shortcomings. In his description of the Mende farming year, Richards gives an impressive amount of information about the extent of the local knowledge as well as the results of the indigenous Research & Development (R & D) system. Farmers aptly classify soils according to both physical and chemical characteristics; tree species are mentioned as indicators for agricultural suitability of sites; more than 40 rice varieties have been developed and adapted to the local ecological conditions etc. In the course of Richards' account, one cannot help admiring the sophisticated use farmers make of the different soil types, often in catenary sequence, for agricultural purposes. By planting a mixture of precocious rice on moisture-retentive soils, medium-duration rice cultivars on upland parts of the farm and flood-tolerant rice cultivars in valley swamps, households are able to cope with two important facts of life: risk and shortage of labor. It is precisely the increased labor requirement associated with

the improved method that makes the Green Revolution package inappropriate under local conditions.

For all fieldworkers who are less-talented observers than Richards, the book provides insights that could be of help to better appreciate and understand one's own field situation. This book, unique from many points of view, wisely does not tackle the question how modern technology could successfully supplement indigenous achievements to solve the recurring threat of hunger. The idea is that solutions must come from an R & D program which follows a 'farmer-first-and-last' scenario. We can only hope that Richards will be on the spot to document the dynamics of such a program once it takes off.

Abstract by A. Budelman, Wageningen

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88 - 2/9

Farming systems research and development

Review, FSR, OFR/FSP, NFSD, cash crops, perennial plants  
SIMMONDS, N.W.

A short review of farming systems research in the tropics.  
Expl. Agric., 22, 1986, pp. 1-13

Farming systems research (FSR) has come to prominence as a part of tropical agricultural research in the past decade or so. The main stimulus was the growing realization that small farmers are 'economically rational' and agricultural economists have been the leading agents in developing FSR ideas. Three broad aspects are distinguished: 1) FSR *sensu stricto*, the deep analysis of farming systems as they exist, which is essentially an academic activity; 2) OFR/FSP ('on-farm research with farming systems perspective'); and 3) NFSD ('new farming systems development'), which seeks to develop complex, radical change rather than the stepwise change characteristic of OFR/FSP. The technical components of NFSD are probably mostly available but the necessary transdisciplinary, synthetic thinking is not. Research on perennial plants in tropical agriculture has been rather neglected but there are signs of growing concern; they must be an important feature on any NFSD for the wetter areas.

Author's summary

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88 - 2/10

Farming systems research and development

Africa, Malawi, FSR, extension, training, case study  
SPRING, A.

Trials and errors: using farming systems research to reach farmers who are often neglected.

Farming Systems Research Paper Series, 9, 1986, pp. 84-96

Although a large percentage of subsistence farming is conducted by women, agricultural extension and training programs have traditionally neglected them. This report suggests that because FSR is

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Although a large percentage of subsistence farming is conducted by women, agricultural extension and training programs have traditionally neglected them. This report suggests that because FSR is

farmer-based, it may help researchers to recognize women's contributions to overall agricultural productivity.

In-depth analysis is made of soybean demonstrations and farmer trials in Malawi, where 50-70% of all smallholder farm operations are conducted by women. Farmers were instructed in soybean cultivation techniques, and the level of acceptance and effects of the new technology were assessed. Constraints such as poorly adapted seeds and ineffective inoculants affected all farmers equally; however, women had poorer crop yields than male farmers due, it is argued, to the lack of agronomic training given to women. The soybean project demonstrated: 1) that women are agriculturists and interested in new technologies; 2) the importance of interaction between research and extension, farmer-oriented technical information, and an instruction methodology involving demonstrations and corrections; and 3) that further work is needed to include female farmers in agricultural development and training programs and to improve working relationships between female farmers and extension agents.

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Farming systems research and development  
Book, review, Green Revolution, critique, alternatives  
GLAESER, B.  
The Green Revolution revisited: critique and alternatives.  
Unwin Hyman Ltd., London, 1987, 206 pp.

The Green Revolution and its emphasis on high yields produced by a highly capital-intensive package including access to ample water, power, fertilizer, pesticides and "miracle seeds" has long been questioned by development experts. Undoubtedly, it has contributed to creating food surpluses even in poor developing countries. But the Green Revolution has also discriminated against the poor farmers, and food produced in this capital-intensive way is often outside the purchasing power of the poor sectors of the population. In addition, ecological damage due to irrigation and overexploitation of soils is growing. This book looks at alternative policies that have been implemented successfully in various parts of the Third World. A notable example for a low-input, ecologically sound farming system comes from Rwanda, where the German Agency for Technical Cooperation started a highly successful project in eco-farming. The author states in his preface that it is not the intention of the book to "stigmatize the one or the other school of agricultural theory", but in his conclusion argues for a second Green Revolution which gives priority to less energy-intensive and, at the same time, more energy-efficient food production. Energy and cost could also be saved by cutting down transport costs through increasing local self-reliance on food. The book supports systems aiming at ecological sustainability, which could be a combination of traditional and extremely sophisticated modern methods. This is a valuable book which deserves a wide readership.

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Farming systems research and development  
Africa, Nigeria, IITA, on-farm research, organization of workshops  
MUTSAERS, H.J.W.  
An approach to organization of on-farm research training workshops.  
OFR Bulletin, 3, IITA, Nigeria, 1985, 38 pp.

Over the past few years IITA has organized several short in-country training workshops on methods of on-farm research (OFR) for scientists and development workers. Based on these experiences this module was prepared in the hope that it would be useful for other trainers, particularly in Africa. It complements the "Field Guide for On-Farm Research", published simultaneously by IITA. The "Field Guide" contains the body of the training materials, whereas this module describes how the material can best be offered to an audience of scientists and development workers. Most of the data sheets presented in this module can be found in the "Field Guide" in a broader context.

Workshops of two weeks' duration cannot adequately treat complex subjects. They are an introduction that should enable the participants to grasp the underlining ideas and to develop those further in the context of their own work.

The general objectives of the workshops are:

- to introduce the concepts and procedures of on-farm research to researchers and development workers of at least M.Sc. level; and
  - to demonstrate the OFR process in a real farming environment.
- The term "workshop" is used in its undiluted sense, meaning that the participants conduct the activities of OFR on a "laboratory" scale.

OFR embraces:

- choosing a target area and a representative pilot research area;
- collecting and analyzing existing information;
- conducting an informal exploratory survey;
- drawing up a list of priority constraints and opportunities for improvement;
- choosing innovations for on-farm testing;
- designing on-farm trials;
- conducting, analyzing and evaluating the trials.

The choice of a target and pilot research area can hardly be left to the participants, mainly for logistical reasons. Therefore, the survey villages are chosen by the host team, keeping in mind that the villages should be within 30 minutes' travel from the workshop premises and that they should represent a reasonably homogeneous target area. The execution, analysis and evaluation of trials, although the main menu of OFR, can only be treated in a sketchy manner and should be more fully addressed in a separate workshop. Formal presentations are kept to a minimum - only what is required as guidance for the workshop. The basis concept is to help participants feel their way through the complexities of existing farming systems and to come up with innovative ideas of their own.

The distinction between participants and "resource persons" should fade away in the course of this process.

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Farming systems research and development  
Africa, Kenya, review, subsistence farming, FSA, agronomy research  
NADAR, H.M.  
Developing an agronomy research programme to serve the needs of  
subsistence farmers: the Kenyan experience.  
East Afr. Agric. and Forestry J., Special Issue, 44, 1987

Concentrated efforts are needed to develop technologies suitable for subsistence farmers. Developing a successful research program to cater to the needs of those farmers, is not an easy process. Many technologies were developed with the intention of improving farm production in developing countries, but few of them were adopted by the farmers. The main idea behind the planning of the agronomy research program was to have it compatible with the farming system. This is called the farming-systems approach (FSA), to distinguish it from other research programs which do not take into consideration the overall farming system in the process of planning research. Any kind of research can be called applied or adaptive research as long as its results can directly fit within a known farming system. FSA is a method of planning any kind of biological research with the specific purpose of solving an identified farm-production problem. The solution to that problem has to be compatible with the farming system(s) it was developed to serve. These results should also fit within that system without disturbing other farm activities of the system. The first step in developing an FSA-oriented research program is to identify the socioeconomic status of the target farmers. This requires the early involvement of the agricultural economist and social scientist with the biological scientist in the process of research planning. All the specialists must be involved in setting the research priorities, determining the economic and social feasibility of the research findings, and determining the compatibility of these findings with the existing farming systems under actual farm conditions.

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Farming systems research and development  
Africa, Sudan, Nuba Mountains, agronomical research, cropping  
alternatives, smallholder mechanized farming, project  
KIENE, W. et al.  
Cropping alternatives for smallholder mechanized farming in the  
Nuba Mountain.  
GTZ-Nuba Mountain Agric. Corp., Rep. No. 3, 1985, 147 pp.

The overall objective of the Pilot Project for Agricultural Development in the Nuba Mountains Region (NMPP) has been to develop a

viable and improved alternative to existing smallholder mechanized farming system.

In order to achieve optimum utilization of available precipitation and soil potential, it was necessary to identify the most suitable crop rotation, land preparation and agronomical practices. As regards 2-course cotton-sorghum rotation schemes, the improved crop management of the NMPP scheme has succeeded in achieving cotton and sorghum yields which were twice those currently achieved in established Nuba Mountains Agricultural Corporation (NMAC) schemes. Systematic research has identified the 4-course rotation pattern cotton-legume-sorghum-sesame as producing the highest yields of all tested crop sequences. However, all of the results obtained point to the fact that the aim of permanent cropping under local conditions cannot be achieved by means of crop rotation and land preparation techniques alone. Long-term, careful observation must be carried out to determine whether soil depletion occurs after several rotational cycles have been completed, which in the long run would have to be compensated for by the use of fertilizers.

For the recommended 4-course rotation system, NMPP research then concentrated on developing a land preparation approach which would permit the following: 1) improvement of the physical, chemical and biological properties of the soil in general, and soil air and moisture in particular; 2) elimination of weed competition; 3) sufficiently early land preparation in order for sowing to be done in time; 4) reduction of erosion by wind and water; and 5) good utilization of tractor capacities in order to minimize costs. The combined land preparation system which was developed and tested involves the use of chisel ploughs for post-harvest preparation and alternately discs for pre-sowing preparation. Although this approach certainly does not represent an optimum solution as regards all of the points listed above, all considered, it is nevertheless the most promising compromise.

It must be stressed that the wide seasonal variations in amount and distribution of rainfall make it necessary to repeat experiments over a period of many years in order to obtain reliable results. Although the NMPP research activities conducted during the past 4 years produced reasonably satisfactory results, these findings must be regarded as being of a preliminary nature. Some of the conclusions and recommendations arrived at will certainly need to be corrected and modified over a period of years as experience with them is gained in practical farming situations. However, even at this stage, it can be reliably stated that a basic concept of crop management has been found which promises to bring considerable improvement of rainfed cultivation under local conditions.



## Farming systems research and development

Africa, case studies, farming systems, traditional farming, projects, irrigation, small farms, tenure systems, plantations  
MORAN, E.F.

Changing agricultural systems in Africa.

Studies in Third World Societies, 8, ix + 138 pp., 1979, USA

The papers in this collection focus on the responses of West, East and Southern African populations to both internally and externally generated agricultural change. They examine farmers' decision-making processes and the institutional/political structure, and provide social analysis of development. They cover large-scale projects, centrally organized development efforts, and local institutional cooperation and internal development.

S.P. Dettwyler deals with the organizational problems of agrarian development in large-scale irrigation in the Sudan (Khasm El Girba). Farmers use hired labor for cotton and cash crops, and work their own subsistence crops. Problems result from lack of goals, of understanding of traditional farming practices, of infrastructure and of technical management. S.L. Johnson provides data from Western Kenya which show that, while the majority of farmers tried hybrid maize varieties, most discontinued its use.

S.W. Almy shows how the Imenti in Eastern Kenya have successfully intensified their agricultural system in response to population density and outside market intrusions. A. Massing, on land use in tropical forest areas of West Africa, shows that government policies favoring large-scale plantations and logging operations are rational (and profitable to government) in the short run, but small farmer agriculture and small-scale plantations provide greater income to farmers in the long-run. J.C. Riddell examines the historical marginalization through tenure systems of the Shona and Ndebelle in Zimbabwe. Several papers question who pays the price of development, and whether planning adequately considers long-term consequences. Moran provides an introduction to African agriculture, while L.W. Bennett draws some anthropological conclusions from the papers.

Abstract from WAERSA

## Farming systems research and development

Book, farming systems, on-farm agronomic trials, extension  
HILDEBRAND, P.E. and POEY, F.

On-farm agronomic trials in Farming Systems Research and Extension.

Lynne Rienner Publ. Inc., Boulder, Colorado, 1985, 162 pp.

The main purpose of the authors is to provide sound and practical guidance on the conduct, analysis and interpretation of agricultural research activities conducted with the active participation of farmers on their own land. Some general considerations related

to on-farm trials, such as location, experimental design and the management of field data, lead into chapters dealing with different kinds of trials. The emphasis throughout is on understanding and dealing with the issues that arise when research and trials are undertaken in conditions which lack the degree of control that can be imposed at research and experimental stations. There are numerous examples and good presentation of data, which give the book a closely argued and logically developed character.

This main purpose, and the main body of the next, is enclosed within an important preface and a final chapter on initiating and managing Farming Systems Research and Extension programs. The argument for a new approach to the relationship between research and the generation of new and improved technology for use in agriculture (and for resource-limited farmers as well as those more favored by access to the conditions needed for better farming), and for stronger links between research and extension and users of new information, is well-made and convincing. It is, in fact, a combination of a sound and methodical approach at a theoretical level together with the presentation of a great deal of practical and carefully considered experience that gives this book its particular value. It makes an important contribution to the ideas that are currently producing new approaches to the generation, adaptation and integration of innovative technology for farmers who have often been excluded from development by attempts to disseminate information about changes that are inappropriate to a majority of smaller-scale farmers.

Abstract by M. J. Rolls

## Farming systems research and development

Handbook, review, farming systems research, training manual, economics, agronomic data, farmer recommendations

CIMMYT

From agronomic data to farmer recommendations: an economics training manual.

CIMMYT, 1988, 79 pp., ISBN 968-6127-18-6; CIMMYT, Lisboa 27, Aptd. 6-641, 06600 Mexico D.F., Mexico

This manual presents a set of procedures for the economic analysis of on-farm experiments. It is intended for use by agricultural scientists as they develop recommendations for farmers from agronomic data.

This document is a completely revised version of the CIMMYT Economics Program manual: From agronomic data to farmer recommendations: an economics training manual, written by Richard Perrin, Donald Winkelmann, Edgardo Moscardi and Jock Anderson. Since its publication in 1976, the manual has been through six printings and has been translated into six languages. The agronomic data upon which the recommendations are based must be relevant to the farmers' own agroecological conditions, and the evaluation of those data must be consistent with the farmers' goals and socioeconomic circumstances.

The stages of an on-farm research program are shown. The first step is diagnosis. The information from the diagnosis is used in planning an experimental research program that includes experiments in farmers' fields. The on-farm experiments should be planted on the fields of representative farmers. After the first year, the experimental results form an important part of the information used for planning research in subsequent crop cycles. Other diagnostic work continues during the management of the experimental program as researchers continue to seek information about farmers' conditions and problems which will be useful in planning future experiments.

To make good recommendations for farmers, researchers must be able to evaluate alternative technologies from the farmers' point of view. The premises of this manual are:

- Farmers are concerned with the benefits and costs of particular technologies.
- They usually adopt innovations in a stepwise fashion.
- They will consider the risks involved in adopting new practices.

Part Two describes the construction of a partial budget, which is used to calculate net benefits. Part Three presents the techniques of marginal analysis. This is a way of evaluating the changes from one technology to another by comparing the changes in costs and net benefits associated with each treatment. Part Four describes ways of dealing with the variability that is characteristic of farmers' environments. Variability in results from location to location and from year to year, and in the costs of the inputs and prices of crops, is of concern to farmers as they make production decisions. Part Five summarizes the first four sections and provides general guidelines for reporting research results. This manual is recommended for persons involved in research, practical application and farmer recommendations.

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Farming systems research and development

Book, review, economics, farm management, small farmers, accounting, cash flow, gross margin analysis, investment appraisal, crops, livestock, mechanization, farm development, farm credit, government policy

MAKEHAM, J.P. and MALCOLM, L.R.

The economics of tropical farm management.

Cambridge University Press, UK, 1986, £ 6.95

The reviewer's first reaction was to question the need for such a book, particularly one that started from first principles. A survey of library and personal bookshelves reveals, however, that such a need does indeed exist - and on balance this new text goes some of the way towards filling the gap. This is an applied economics text in the real sense of that phrase. Aimed specifically at those who directly affect the lives of small farmers in the tropics, it requires no background in economics and aims to build directly on the technical agricultural and livestock knowledge of the reader.

The early chapters are concerned with identifying the main requirements for effective farm-level management and explaining the main principles of production. The next progresses directly from this point into farm accounting, cash flow and gross margin analysis, followed in Chapters 9 and 10 by investment appraisal (discounted cash flow) and partial and complete budgeting. Chapters 11 and 12 are concentrated on crops and livestock and both include a review of the main technical variables followed by some more specific budgeting applications - although in the chapter on animals these are rather less developed than for the crops subsector.

The chapter on mechanization (13) concisely covers the key methodological areas of scale, type and cost of mechanization and includes a clear explanation of the use of budgets in choosing between alternatives. The wider ranging implications of mechanization on rural employment and rural urban migration are not picked up in this chapter oriented towards techniques, but are noted in the final chapter of the book.

The short chapter (14) on farm development could, with advantage, have been incorporated into the earlier investment appraisal chapters and covers no new methodological ground. The chapter on farm credit and finance (15) is particularly useful, especially as this is an area often ignored or badly handled in farm management texts. The final chapter 'Beyond the Farm' provides a helpful, if somewhat simplistic, discussion of key issues of government policy in relation to prices and markets, land tenure, technology, credit, education and training.

There are useful appendices providing compounding, discounting and capital recovery factors and a comprehensive metric conversion chart. A helpful glossary covers 87 terms in common use in farm management economics. It is unfortunate that no list of further reading is provided, especially of key texts. This would be particularly helpful if it could include material produced in a range of tropical countries or regions. Each chapter has a set of general questions at the end of the text. These could provide a starting point for a teacher reviewing each part of the subject, but would probably be equally helpful for the individual reading the book independently.

Overall, this is a useful text book for diploma level or first/second year of tropical agriculture degree courses. A future edition could, with advantage, incorporate more case examples, especially in the early chapters. This is a text to help the student and teacher but not to be followed page by page. In approach it remains somewhat abstract from the small farmer and suffers, in some part, from the same problem as earlier books on a similar theme, i.e., it starts from the commercially oriented farm model and adjusts the methodology (slightly) to fit the management needs of the mass of rural producers. Perhaps we are still waiting for the textbook that starts with the problems and explores appropriate concepts and methods to first understand and then try to improve the situation. However, there is much here for the discerning user and the paperback price of £ 6.95 is good value. Abstract by F.A. Wilson