Abstracts on Sustainable Agriculture

Compiled by Jürgen Carls

VOLUME 5

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PREFACE

This is the fifth GTZ publication to bear the title "Abstracts on Sustainable Agriculture".

These Abstracts grew out of the supraregional intercropping project financed by the German Federal Ministry for Economic Cooperation (BMZ). Once the main objective has been reached the project itself was disbanded, but the Abstracts continued to be published, due to the high, and increasing interest of the users.

Intercropping, however, is just one of the many facets of sustainable agriculture, and it has thus been decided to expand the Abstracts to deal with a broader field. To do justice to the new, enlarged subject matter they have been renamed "Abstracts on Sustainable Agriculture".

The Abstracts are more comprehensive than the usual type of annoted bibliography but they cannot substitute the original publication. For details we advise the reader to refer to the original.

We hope that the Abstracts have a valuable role to play as part of the external input in the drafting of extension programmes. They make no claim however to offer tailor-made solutions. The responsibility for adapting the Abstracts to suit local conditions rests with the reader.

Readers interested in the Abstracts are asked to adress their request to:

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Eschborn, Februar 1993 Jürgen Carls

CONTENTS

GUIDE TO READERS

Selection of literature for the abstracts has been based on the following criteria:

- Ecological Aspects
  - . Sustainability
  - . Resource stability
  - . Soil fertility
  - . Diversity

- Socioeconomic Factors
  - . Promotion of smallholders
  - . Integrated systems (Animal-Man-Plant)
  - . Transfer of knowledge
  - . Low-external-input agriculture
  - . Sociocultural aspects

- Locational Factors
  - . Regional- and site-specific
  - . Practice-oriented
  - . Alternative uses

THE ABSTRACTS ARE SET UP IN THE FOLLOWING WAY:

(1) Abstract number

(2) Principal key-word: traditional land-use systems, cropping systems agroecology, agroforestry, farming systems research and development etc.

(3) Key-words; if relevant, the geographical demarcation (continent, country) or the agroecological zone is given; the key words "review", "field trial", "field study" or "farm survey" indicate the nature of the paper; common names of field crops, soil fertility, pests, diseases, socioeconomic aspects etc. are used.

(4) Author's name.

(5) Title in the original language.

The subject index, based on the key-words, and the geographical indices are intended to help the reader to quickly find abstracts on specific aspects or areas of sustainable agriculture. The index of authors is intended to help the reader to find all publications by a particular author.

I TRADITIONAL LAND-USE SYSTEMS

1030 92 - 1/69

Traditional land-use systems
Review, Africa, Sub-Sahara, sustainable agriculture, soil productivity, indigenous measures, research results, methodologies, GTZ

HAILU, Z. and A. RUNGE-METZGER

**SUSTAINABILITY OF LAND USE SYSTEMS:
THE POTENTIAL OF INDIGENOUS MEASURES FOR THE MAINTENANCE OF SOIL PRODUCTIVITY IN SUB-SAHARA AFRICAN AGRICULTURE.**

Publ. of the Inst. of Agricultural Economics, Univ. of Göttingen, F.R.G., 1991, 111 p.

The primary aim of this paper is to develop a multidisciplinary research design to examine the sustainability of prevailing land use systems in selected agroecological zones in Africa. Therefore special attention is paid to the understanding and assessment of the systems' dynamics and the potentials embodied in indigenous measures by which farmers try to adjust to changing situations.
The question of sustainable agricultural development has increasingly drawn the attention of many international development research institutions and scholars particularly concerned with the challenge imposed on prevailing production systems in the developing world. The main objective is twofold: the incorporation of sustainability as an objective in the traditional set of goals of agricultural development research; and to develop and use sustainability as a measurement criterion to design and evaluate alternative systems by investigating and analyzing the reasons why existing systems are no more capable of perpetuating agricultural growth.
Conventional research approaches, both in their general objective and choice of performance criteria, very seldom put emphasis on the long-term performance of the systems they investigated.
Most studies describe the process of physical, chemical or economic degradation. Consequently, measures to combat the process of degradation were mainly technical solutions which very often failed completely. This is primarily due to the failure to include sociological and political influential factors which directly or indirectly determine the decision making process of rural farm households. Because of this misconception decisive variables have been neglected in the analysis of production functions. Socio-economic variables like
- tenure arrangements (common property problem),
- externalities (free rider problem),
- national and international price policies (wrong incentives),

- institutional and organizational arrangements and
- intergenerational equity (determination of the correct discounting rate) as well as
- personal awareness and subjective judgements

also have an impact on the choice of technologies and the productivity of a land use system. Therefore, a research program designed to assess the problem of land degradation should not limit itself to the investigation of the physical changes as such, but must go further and identify the root causes that lead to these physical changes.

Agricultural production systems should be viewed as complex dynamic agroecosystems that are determined by the interaction of a set of geophysical, biological, socio-economic and cultural factors.

A sustainable agroecosystem is one that
- maintains or enhances environmental quality,
- satisfies future demands of society for food and fibres, and
- assures the economic and social well-being of producers.

An assessment of sustainability should simultaneously consider all important dimensions of an agroecosystem - namely the environmental, economic and social aspects with the view of exploring the factors that make a system unsustainable in the long run. This simultaneous consideration should be based on a thorough understanding of the interdependencies and pattern of interaction between the different aspects in specific areas and development stages. Most of all, the interrelationships between the natural environment and the agricultural production process need to be well understood.

An important aspect of the sustainability concept is the question of finding an appropriate analytical tool to measure a system's sustainability over time. According to the comprehensive definition of sustainability a sound methodology has to consider the environmental, economic and social aspects of sustainability.

1031 92 - 1/70

Traditional land-use systems
Review, Africa, Kenya, Tanzania, Uganda, pastoral areas, dryland, indigenous knowledge, agroforestry, ICRAF

BARROW,G.C.

BUILDING ON LOCAL KNOWLEDGE - THE CHALLENGE OF AGROFORESTRY FOR PASTORAL AREAS.

Agroforestry Today, Oct.-Dec. 1991, pp. 4-7

For generations, the lives of pastoralists in dryland Africa were shaped by one thing: an unforgiving climate. With the threat of drought always as near as the next season, pastoral communities built up knowledge about the vegetation in their harsh environment and evolved complex strategies that gave them resilience to the consequences of unreliable rainfall.

An expanding population, penetration of the cash economy, loss of dry-season grazing land to cropping, and a national emphasis on crops and settlements have brought a different set of challenges. Despite the long-term sustainability of pastoral land-management systems, they are now in danger of breaking down.

Attempts to help pastoralists adapt to their new circumstances, through agriculture or agroforestry, were often unsuccessful. In many cases, this lack of success can be linked to the fact that scientists and planners failed to discuss problems and potential solutions with the recipients of research and development.

The pastoralists' knowledge of their environment was usually ignored or, at best, simply not understood.

A brief description of three pastoral communities: the Pokot and Turkana of Kenya and the Sukuma of Tanzania gives some answers on how they utilize plants and manage their land.

Concluding, the capacity of the people and the land to recover from drought is linked to a mobile population, availability of large and diverse grazing lands, access to dry-season fodder including trees, low to moderate stocking rates per unit of land, moderate to high stocking rates per person, use of wild fruits and other fonds from trees, and limited production of dryland crops such as sorghum.

A second lesson from these pastoral societies concerns the vital link between resilience and risk. For pastoralists, decreased resilience can dramatically reduce the chances of surviving a period of drought. In this context, changes in land use, such as the cultivation of areas traditionally used for dry-season grazing, may significantly reduce resilience and increase risk. By retaining trees in crop and grazing land, agroforestry could help to migitate this threat.

One other lesson is an appreciation of the importance of traditional knowledge coupled with a strong community structure. The knowledge provides a thorough understanding of the environment and the production system.

Concluding researchers and planners must first identify valuable aspects of the traditional natural-resource management system. They must then work with local people to help them adapt their practices to changing socio-economic and environmental conditions. Research and develop priorities will naturally vary from region to region, but given the vastness of many dryland areas, it makes good sense to develop a system-wide framework that emphasizes conservation and sustainable utilization of natural resources.
Within such a framework, specific strategies could incorporate:
- The conservation and management of existing trees, shrubs and grasses, including natural regeneration
- The inclusion of a water-resource management policy to coordinate tree planting, natural regeneration, crop production and other activities that require water
- The use of existing natural-resource management strategies as a basis for further development
- A deliberate policy to increase awareness of natural-resource management, including shifting responsibility to local people
- The enhancement and reinforcement of the traditional land-management system through collaboration with resource users
- At the same time, the dissemination of promising new practices that have been thoroughly researched and tested.

Some recent approaches to research and development tend to be more enlightened than those of the past. There is now an extensive literature that strongly advocates the use of indigenous technical knowledge and that argues for participatory research as a basis for the development of appropriate interventions.
This movement towards participation in research and extension is part of a shift towards involving local people more actively in setting research priorities and planning their own development. These participatory programmes are yielding valuable information about existing systems, their potentials and constraints, problems and possible solutions.
By incorporating local people in the process of project planning and technology development, indigenous skills and knowledge can be expanded and preserved rather than lost through attrition.
People can maintain some degree of control over the changes that occur and they can gain a better understanding of alternative technologies and management practices.

1032 92 - 1/71

Traditional land-use systems
Europe, Portugal, Alentejo, field trials, land-use system, mechanization, history of development, soil productivity, traditional tillage, cropping system, cost reduction, cereals, fodder, sunflower, soil parameters

BASCH, G.

ALTERNATIVE ZUM TRADITIONELLEN LANDNUTZUNGSSYSTEM IM ALENTEJO, PORTUGAL, UNTER BESONDERER BERÜCKSICHTIGUNG DER BODENBEARBEITUNG. (ALTERNATIVES TO THE TRADITIONAL LAND-USE SYSTEM IN ALENTEJO, PORTUGAL, WITH SPECIAL REFERENCE TO SOIL TILLAGE.)

Göttinger Beiträge zur Land- und Forstwirtschaft in den Tropen und Subtropen, 31, 1988, 188 pp.

The present paper deals with the problems of the land-use system currently applied in Alentejo which have arisen since agriculture has been mechanized. A review of the history of development of land use in southern Portugal gives the background for understanding the severe problems that faces agriculture in this region.
In field trials on two sites with different levels of soil productivity, a comparative study of the traditional tillage and cropping system, with two alternatives each, was made. The choice of alternatives aimed at reducing the costs for cereal production and exploring the possibilities for improving fodder production in cereal crop rotations. For this purpose, conservation tillage methods, on the one hand, and clover and forage crops, on the other, were compared with the traditional tillage and cropping system. Supplementary investigations of soil-related parameters, herbicide use and cultivation methods for sunflower provided additional information about the possibilities and limitations of the reduced tillage methods.
On average over the three experimental years, the different tillage treatments (ploughing, scarifying and direct drilling) had little effect on cereal yields and forage and pasture dry matter production. However, marked differences in cereal yields between tillage treatments could be detected for single years, weed infestation being the main factor in producing these differences. In contrast to the sandy soil, the triple-disc direct drilling system revealed some problems in assuring a satisfactory cereal plant stand on the heavy clay soil. Yet it was on the light-textured soil where the reduction of tillage intensity tended to produce slightly lower yields.
The triple-disc system proved not to be an appropriate direct-drilling unit for the seeding of sunflower on heavy clay soils. An adequate plant density could only be achieved with seedbed preparation. However, in a trial in which seeding was done by hand without preceding tillage operations, it was found that the directdrilling method itself can be successful in producing sunflower on clay soils.

Early sowing of sunflower is possible and may result in a considerable yield increase. Early sowing in winter, however, is possible only on non-tilled soil. Variation in plant density proved to have little effect on sunflower yield. No differences in the yield of sunflower were observed between fertilized and non-fertilized plots.
Certain crop rotation effects could already be observed after three years of experimentation by considering the effects of the preceding crops on the following ones. To some extent, these effects varied between tillage treatments. On the more productive clay soil, it was mainly the forage crop that showed positive effects, due to the suppression of weeds, whereas on the sandy soil it was the following wheat crop, mainly after ploughing. The regrowth of the green fallow was dependent not only on the soil tillage treatment but also on the herbicide level used on the preceding cereal crop. After one or two years of cereal production, ploughing resulted in a pronounced delay of pasture regrowth and in a reduced total dry matter production. The plant group most affected by ploughing were the legumes.
The higher the herbicide level, the lower the total dry matter production measured. The reverse was true for legume yield. A considerable decrease in surface runoff and an even greater increase in eroded soil was observed in small erosion trials when tillage intensity was reduced.
The investigation of physical, chemical and microbiological parameters of the soil as affected by the tillage method revealed, in some cases, large differences between tillage treatments.
Reduction in soil tillage led to a marked decrease in the nitrate content of sandy soil. The reverse was observed with respect to the soil respiration rate in the top surface layer. Oxygen concentration in the atmosphere of the topsoil under water-logging conditions was found to be less under direct drilling. However, no correlation could be found between oxygen concentration and plant growth.
Small or no differences between tillage treatments were detected in the root development of wheat, bulk density, soil temperature and soil water content at the end of the vegetation period of wheat.
The results are discussed with regard to the comparison of the traditional tillage and cropping system with the chosen alternatives and in the context of results obtained in tillage studies reported by other authors. The study concludes with a comparison of the economics of the different tillage methods, indicating an increase of soil productivity if reduced cultivation or direct drilling are properly performed. Finally, prospects for changes needed in plant production in the Alentejo are given, and further research subjects, such as weed control and the suitability of other soil types for reduced cultivation, are proposed.

1033 92 - 1/72

Traditional land-use systems
Latin America, Brazil, tropical lowlands, Amazonia, indigenous farming systems, study, land tenure, deforestation, potential plants, agroforestry, non-farm activities, rural industry, employment, DESFIL

HIRAOKA, M.

INDIGENOUS FARMING SYSTEMS AND DEVELOPMENT OF LATIN AMERICA: AN AMAZONIAN EXAMPLE.

In: Proc. of the Humid Tropical Lowlands Conference, Panama, 1991, pp. 1-24

This paper discusses the possibilities and limitations of adopting indigenous farming systems for sustainable development of the moist tropics of South America. Specifically, the study proposes to
- ascertain whether indigenous farming models can be devised for adoption in the region;
- assess the economic role of traditional farming among market-oriented farmers;
- explain the relationship of indigenous agriculture to other forms of land uses, especially fallows and agroforests;
- define the scale of indigenous farming operations and target groups; and
- discuss the relevance of autochthonous practices as models of sustainable agriculture for the humid tropics of South America.

The study is based on preliminary surveys carried out among non-tribal, long-time residents of the Amazon estuary in Brazil. The agricultural systems practiced by various tribes are described.
An evaluation is made of the possibilities and limitations of indigenous farming as models of ecologically sustainable and viable land use.
The continued deforestation and attendant environmental degradation of newly opened humid tropical lowlands of Latin America have led to a search for ecologically sustainable, and economically viable, management systems. Recent research suggests that indigenous management systems may serve as alternatives to the current, short-sighted practices.
The skilful handling of diverse forest ecosystems among the indigenous people has shown to produce a variety of items including fruit, seeds, resins, fiber, and timber, as well as fauna that satisfies the inhabitants' basic subsistence needs. Utilization of a vast number of products requires detailed site-specific experience and familiarity with local biophysical elements and their interrelationships. The numerous products also are subjected to various degree of management and their output rates, seasonality of use, and amounts are influenced by diverse cultural controls encoded in myths, folklore, and community rules and regulations.

Concluding, the author states that the great variety of traditional crops associated with indigenous systems does not necessarily contribute to income generation. Crop specialisation and the large number of varieties that characterize caboclo farms may be important as repositories of genetic variability, and as sites for supplying subsistence production, but they are unable to contribute meaningfully to enhance the inhabitants' income.
The role of farming in the inhabitants' economy has tended to become of secondary importance. As less demanding, socially acceptable, and economically regarding alternatives have been devised, agriculture's share of the economy has declined. One conclusion that emerges is that indigenous farming will continue to produce a number of subsistence items for the caboclos, to earn supplemental income, to provide raw materials for rural industries, and to contribute to equalize household labor distribution during the year. The small scale family farms will essentially be an adjunct to non-farming activities. From an ecological viewpoint, the combination is desirable since the pressures on the environment will be lessened, and a large part of the land will continue to be covered by forest, albeit an anthropogenic one.
Agriculture and agroforestry should be viewed as integral segments of indigenous resource management systems. As is true among indigenous farmers elsewhere in the humid tropics of Latin America, the different phases of land use are not seen as different agricultural types, but components of an overall forest management system.
A further difficulty is that indigenous farming is site specific. No single agricultural system is applicable over an extensive area. In response to numerous combinations of environmental and cultural variables, indigenous agricultural systems show great spatial diversity. Site-specific solutions have been devised by taking into account the ecological differences in relief, climate, soils, drainage, and natural vegetation characteristics, as well as the distinctive cultural features, such as local dietary preferences, accessibility to markets, historical events, local market niches, and personal choice. Thus, standard sets of procedures and crop combinations are uncommon.

1034 92 - 1/73

Traditional land-use systems
Africa, review, tropics, shifting cultivation, socioeconomics, institutions

KAMAJOU, F.

SOCIO-ECONOMIC AND INSTITUTIONAL CONSIDERATIONS IN IMPROVING SHIFTING CULTIVATION IN TROPICAL AFRICA.

In: FAO Soils Bulletin No. 53; FAO, Rome, Italy, 1984, pp. 117-120

The traditional peasant in the tropics has adopted bush fallow or shifting cultivation in response to declining soil fertility and sparse population density, with its implied unlimited land supply. The multiple cropping system to accomodate subsistence production is linked to several factors: the prevailing closed economy, a limited work force, and the low level of technology available. These cropping systems ensured that all the food products the family required or wanted were grown simultaneously on the same plot of land. In addition, these systems allowed the family to reduce the size and number of plots needing clearing. This enabled them to save limited labour for other important household tasks, as well as for leisure. These mixed cropping systems also provided biological disease and pest control.
Today the practice or adoption of shifting cultivation, like other farming systems, results from a combination of factors. Some of these are socio-economic; others are physical, including land, labour, technology, and all forms of capital; still others are institutional, such as cultural values, land tenure systems, social organization, traditional and new or modern institutions, input and output price policy.
Among the inherent disadvantages of these systems a few are listed below:

- The low remuneration of shifting cultivation, relative to its labour requirements and to the shifting cultivator's labour supply. It is also low because shifting cultivators cannot get a good price for their produce, because there are no markets for it.
- The massive and systematic destruction of forests and forest products and the degradation of forest soils which accompany shifting cultivation. This destruction constitutes a tremendous loss of valuable resources.
- Low investment capabilities characteristic of shifting cultivation. This results from the low remuneration which makes all investments economically unappealing; this in turn leads to low productivity (thus completing a vicious circle).

The disadvantages imposed on shifting cultivation by various socio-economic and institutional changes relate to two phenomena: growing population and a growing need for cash income.
Traditional practices, with their low productivity, cannot produce enough to raise the peasant's consumption above the subsistence level or satisfy new needs which depend on cash.

Shifting cultivators today need more and more cash to buy new goods and services not produced by the family including transistor radios, gas lamps, sugar, schools, medical bills, security, etc. Peasants are finding it more difficult to practise classic shifting cultivation while producing the marketable surplus necessary to meet these new needs.
The major constraints to improving shifting cultivation in the African tropics are, by and large, the same constraints that limit agricultural development generally in those regions. The constraints in this paper deal with socio-economic aspects of the problem.

- Government assistance (financial and otherwise) should be made available to peasants. This will enable total output, per family and per caput, to increase.
- In order to speed up the recovery of initial, costly investments, cleared land could be used simultaneously for tree crops.
- Legislation instituting flexible family or individual land ownership with limited transfer or sales' rights could encourage shifting cultivators to invest more inland, thus increasing their productivity.
- Land settlement schemes used primarily to relax population pressure on over-populated areas could also be used as an indirect means to introduce continuous cropping needing fewer inputs.
- Governments and research institutions, at both the national and international levels, should give top priority to reearch in agronomy, agricultural mechanization, animal husbandry, agro-forestry, and socio-agroeconomics, especially when this research is oriented to the problems and the needs of more intensive exploitation of small-scale farms in tropical forest conditions.

1035 92 - 1/74

Traditional land-use systems
Africa, Nigeria, traditional methods, survey, study, land tenure, socio-economy, inheritance, organization of farming, income of farmers, credit, government aid, on-farm diagnostic research

ESHETT, E.T.

TRADITIONAL AGRICULTURE IN SOUTHEASTERN NIGERIA: DEMOGRAPHIC, LAND TENURE, AND OTHER SOCIO-ECONOMIC FACTORS.

Beitr. Trop.Landw. Vet. med.,28, 1, 1990, pp. 5-17

The food crisis currently experienced in Nigeria underscores the great need to understand the production system of the small farmers who produce the bulk of the food consumed. Therefore, considerable attention has been devoted to study different forms of farming systems practised across the country with a view to identifying the constraints involved and finding ways and means of alleviating these constraints, within the small farmers' socioeconomic setting.
A reconnaissance survey was first undertaken in June 1984 in the 3 target areas in order to obtain an overview of the type, organization, and functioning of the prevailing farming systems, to appraise the land resources and the physical environments under which the small farmers operate.
The study was carried out to investigate the influence of demography, land tenure, credit and other socio-economic factors on the traditional bush fallow agriculture. In spite of large land resources, there was a strong influence of existing tenurial practices on the farming system. Land tenure exists in various forms as co-operative (communal) property, permanent private property, and land leasing, the latter utilized in contract farming. One third of the farmers were members of cooperatives, others of peer groups, but both types of farming are not very effective. There were considerable differences in the gross income. Government support for the farmers was minimal. 93% of all farms investigated had not received any government credits and only 20% had been able to make use of plant material supplied by the government.
It is concluded from this study that:

- Although arable lands were generally plentiful and population densities low, achievement of higher productivity per farm family was hampered by lack of evolution of modern, improved farming techniques, by rigid and unprogressive organizational and land tenurial practices which discouraged long-term investments by external cultivators, and by absence of credit facilities to farmers and farmers' aversion to cooperation societies.

- Farmers' off-farm engagement helped to diversify and stabilize traditional revenue bases and bring about some measure of self-sufficiency in local manpower which in turn was of economic significance, especially in remote communities which did not benefit from government developmental activities.
- The strength of the traditional farmers lay in their ability to cope with large farm families (used essentially as traditional labour sources), to adapt their agricultural activities to the dictates of a rather weak and ineffective agricultural extension system, and above all, their ability to wrest an income/farm productivity level that guaranteed a stable domestic economy, with enough food resources to sustain an extended family system, leaving a reasonable surplus to sustain rapidly expanding urban populations.

1036 92 - 1/75

Traditional land-use systems
Asia, Malaysia, study, project, shifting cultivation, technology, institutions, community development, participatory approach

NEUNHÄUSER, P. et al.

APPROPRIATE LAND USE SYSTEMS FOR SHIFTING CULTIVATORS.

Schriftenreihe des FB 15 der TU Berlin, Nr. 138, 1991, pp. 99 + Appendices; ISBN 3-924333-78-5; Verlag J. Markgraf, Weikersheim, F.R.G.

This report is the result of a three-month mission carried out by a research team from the Centre for Advanced Training in Agricultural Development (CATAD), The Technical University of Berlin.
The research was conducted at the request of and in close cooperation with the Malaysian-German Forestry Research Project (MGFRP) especially with its Sabah complement in Sandakan.
This study was carried out under the Sabah component of the Malaysian German Forestry Research Project through the Sabah Forestry Department (SFD), supporting the latter in defining a concrete concept for the Rural Community Development Programme (RCDP). It was the SFD's intention to include agroforestry supporting measures under this programme.
The objective of the Malaysian-German Research Team was to develop a proposal for an economically and socially viable, as well as environmentally sound pilot project to be carried out in the hill area of Koromoko and Tg. Batu Darat in Kota Marudu District. Using this project as an example, designing experiences were extracted and a "model" was formulated which henceforth will serve to disseminate future RCDP projects in other areas.
Methodologically, the study was divided into the orientation, the survey and the planning phases.
The orientation and survey phases were carried out in parallel with farmers and institutions. In the planning phase both parties were brought to one table as often as possible, leading to a "Memorandum of Understanding" on how to proceed with the final planning and the further implementation of the project.
For the selection and application of methods throughout the study, the MGRT tried to follow a participatory approach, being defined as the ensured representation of the interests and influence of all parts of the different target groups.
The orientation and survey phases resulted in a comprehensive description and constraint analysis of the present land use system (LUS) in the target area and its determining factors.
The major problems regarding the present LUS are the low and inconsistent yields. They are caused by low to medium potential of the soils, insufficient regeneration periods for the soils, erosion and pests. There is a lack of wo/manpower mainly while slashing. Labour is unevenly distributed which leads to a high labour burden especially for women. One important limitation which

is a part of these problems is the lack of knowledge about agricultural cropping techniques and livestock management. The access to external inputs for the farmers is limited due to their unavailability, as well as lack of cash income, transport and information.
Based on the constraints of the present LUS and the ideas, needs and interests of the farmers, some low external input LUSs were proposed.
Although the project proposals are based on low external inputs, great efforts towards an improved extension service are required. Apart from their specialized skills, each extension worker should also have basic technical knowledge about integrated farming systems.
Most institutions at district level were open-minded about the participatory and integrated approach although their strategies to enforce rural development were quite different. They showed a great interest and strongly supported the MRGT carrying out the research.
To what extent the commitment of the departments involved, towards better interagency cooperation and communication, will last or possibly spread remains uncertain.
The enthusiasm of many villagers gives reasons to believe that at least on project level, new approaches do have a chance of future success.

1037 92 -1/76

Traditional land-use systems
Africa, Zambia, shifting cultivation, farming systems, study, cassava, based systems, sorghum based systems, adaptive research planning, cropping systems, soil fertility, horticulture, firewood production

RAUCH, T.

THE SUSTAINABILITY OF THE IMPACT OF THE INTEGRATED RURAL DEVELOPMENT PROGRAMME (IRDP) ZAMBIA/NW-PROVINCE.

A Publ. of the Centre for Advanced Training in Agricultural Development, TU, Berlin; Nr. 116; 1988, 257 + annexes

The traditional farming system practised in Kabompo and in Zambezi Districts is described as the "Luvale System" of semi-permanent hoe and ox-plough cultivation. The staple crop is cassava. Traditionally the farmers prefer to clear virgin bush for the cultivation of new cassava fields, except in areas of increasing land pressure. The clearing is mainly carried out between March and June. The trees and shrubs are stacked in piles ready for burning in October. Cassava is either grown on the flat, on ridges or on mounds. During the first year of cultivation it is intercropped with groundnuts, sweet potatoes, beans, local maize, calabashes, cucumbers, water melons, pumpkins and rosella. Cassava can be harvested after the first year, but it usually remains in the ground for at least two or three years, sometimes even longer.
Generally the cassava plant is easy to cultivate. In recent years, however, its cultivation has become more and more difficult in some areas, due to the cassava mealy bug (*Phenacoccus manihot*) which has spread into the project region. The population of mealy bugs is continuing to increase causing serious damage leading to problems in securing cuttings for the planting season.
The sorghum based farming system called "Kaonde-system" is found in Chizela District. It is a shifting cultivation system based on a sorghum-field, called "bujimi" in Kikaonde.
After clearing the bush at the beginning and the burning at the end of the dry season the "bujimi" is cultivated. The dominant crop is sorghum. Minor intercrops include maize and pumpkins, grown by a majority of the farmers, and to a lesser extent beans, water-melons and cucumbers. On some "bujimi" there are also patches where finger-millet and sweet sorghum are grown. The field is entirely cultivated for three to six years, before it is again abandoned. There is no crop rotation during the years in which it is cultivated. Some minor intercrops such as beans and cucumbers, however, are often no longer cultivated on the older fields.
In addition, there are other small separate fields of groundnuts and sweet potatoes. Usually, grass fallows are used for these fields. The grasses are hoed up into mounds on which the crops are planted. Often these fields are only used one year.
In the cassava based shifting cultivation system, maize is usually grown after several cycles of cassava or on cleared secondary

bush. The cash-crop fields tend to be close to the village. Maize is cropped continuously or sometimes rotated with sunflower or groundnuts. Little consideration appears to be given to planting maize on new land in the belief that the fertilizer will restore the fertility of the cassava lands. Six years after this survey, however, the question arises whether these findings still reflect the reality.
The high participation rate and the increase of the cash-crop production is one of the achievements of the programme. But the high percentage of maize cultivation suggests a high degree of maize monocropping.
If the farmers are monocropping pure stand maize on the same fields for several years, the sustainability of the programme is endangered. Maize monocropping leads to the deterioration of the soils in the long run and to a rapid decrease in yields. Due to the inpact of these risks they are discussed in detail in this paper.

1038 92 - 1/77

Traditional land-use systems
Pacific, Solomon Islands, case study, indigenous knowledge, soil use, plant productivity, CTA, IBSRAM

WAIRIU, M.

TRADITIONAL KNOWLEDGE ABOUT THE USE OF SOILS IN THE SOLOMON ISLANDS.

In: Proc. of a IBSRAM Workshop "Soil Management and Smallholder Development in the Pacific Islands"; IBSRAM Proc. No. 8; 1989, pp. 225-231

This case study was conducted to gather information from local people about their knowledge of the soils they use, particularly with regard to the use of different soil types which are classified in their own languages. Some of the things investigated in this study are the local classification of the soils, and the people's views on the use of the soil.
The investigation was conducted on a questionnaire/interview basis. The questionnaire was used as a guide during discussions with the local people. During the discussion session, the interviewer recorded all the necessary information the farmer put forward. Following the interview, a personal soil data sheet was used to record features of the identified soil types as additional information.
Agricultural production in the Solomon Islands has been developed independently by Solomon Islanders over thousands of years. They fish, forage, hunt, and cultivate for their own livelihood. Over the years of continuous shifting cultivation, each tribe or language group in the Solomon Islands has identified different soil types which suit a certain crop.
This case study shows five different soil types which are classified using the traditional system. The local classification system is based mainly on the soil colour and texture, as the local names imply.
The five different soil types identified have different crop suitability. Most of the crops grown are the traditional root crops, which include yam, taro and sweet potato, tree crops (such as coconut), and others like banana and sugarcane. This does not mean that only the crops listed under each soil type are suitable for that particular soil type. Other crops may be suitable, but the people themselves have not tried them out. That is why introducing a new crop cannot be easily accepted by the farmers, since they may think it will not perform well on a particular soil type.
This way of thinking among local people highlights the need for recorded information on traditional soil knowledge so that a better land-utilization programme can be organized. It is important that there should be a two-way system of soil information transfer between both the local farmers and modern

agriculturalists, which is one way in which agricultural development may be speeded up especially at the smallholder level. This will be possible if more organized land-use planning and land-suitability assessments are undertaken.
A close liaison between traditional knowledge and modern knowledge is required in order to make the best use of the land.

II FARMING SYSTEMS RESEARCH AND DEVELOPMENT

1039 92 - 2/123

Farming systems research and development
Review, book, indigenous knowledge, agricultural development, case studies, projects, decision-making systems, concepts, social systems, resource management, World Bank

WARREN, D.M.

USING INDIGENOUS KNOWLEDGE IN AGRICULTURAL DEVELOPMENT.

World Bank Discussion Papers 127, Washington, D.C., USA, ISBN 0-8213-1884-5, 1991, 34 p. + references

The success of a development project often depends on local participation. Familiarity with indigenous knowledge can help change agents understand and communicate with local people, enhancing the possibilities for participatory and sustainable approaches to development. This enables project staff and local people to work as partners in planning and implementing development activities.
This paper reviews three types of project scenarios: projects where local knowledge provided an improved approach to managing natural resources than proposed project technologies, projects that inadvertently ignored indigenous structures, and those projects whose success at meeting their objectives can be linked to the incorporation of indigenous knowledge components.
The World Bank, as well as numerous other development agencies, has been actively seeking ways of ensuring participatory decision-making, strengthening development capacity at the individual and institutional levels, and assuring long-term sustainability of the development process.
Ethnic groups in dozens of ecological zones have generated a vast body of indigenous natural-resource management and agricultural knowlege. Collectively they represent a dynamic information base that has supported an immense population by adapting to constantly changing circumstances. These indigenous knowledge systems have been largely ignored in many developing countries.
Indigenous knowledge is a knowledge that is unique to a given culture or society. It is the basis for local-level decision-making in agriculture, health care, food preparation, education, natural-resource management, and a host of other activities in rural communities. Such knowledge is passed down from generation to generation, in many societies by word of mouth.
Indigenous technologies used effectively by one society can be used to solve problems faced by another society in a similar agroecosystem located in another part of the world.
Research indicates that the farmers' decisions to reject an innovation are often rational when viewed through the indigenous system.

Indigenous knowledge should result in an improved development, such as the higher incomes resulting from increased crop production due to better soil and water conservation resulting, f.e. from the use of *Vetiveria* grass.
Several types of indigenous knowledge and decision-making that are useful for development are outlined in this paper:
- Mixed cropping and forest gardens
- Indigenous technical knowledge of tree management
- The role of indigenous organizations in decision-making for development
- The management of common property natural resources
- Incorporating farmers' knowledge in international rice research
- Ethnoveterinary medicine
- Indigenous crop pest management
- Agriculture in Iowa

There are several key areas where development agencies can take a leading role in promoting use of indigenous knowledge for development. These include support to systematically record and preserve indigenous knowledge for development efforts at national resource centers, provide training opportunities to incorporate indigenous knowledge components into educational institutions, conduct participatory research on indigenous knowledge systems, and establish systems for global networking and electronic exchange of indigenous knowledge. The following suggestions are discussed in more detail in this paper.
- Biodiversity and indigenous knowledge
- Global network of indigenous knowledge resource centers
- Research on indigenous knowledge systems
- Global networking for indigenous knowledge and development

Particulary global networking as carried out f.e. by ILEIA is an important method to incorporate indigenous knowledge systems and enhance the technology transfer.

1040 92 - 2/124

Farming systems research and development
Review, on-farm research, case studies, surveys, USA, sustainable agriculture, low-input systems, strategies, holistic approach, sustainable practices, sample selection procedures

TAYLOR, D.C.

ON-FARM SUSTAINABLE AGRICULTURE RESEARCH: LESSONS FROM THE PAST, DIRECTIONS FOR THE FUTURE.

J. of Sustainable Agriculture, 1, (2), 1991, pp. 43-87

The unique roles of on-farm research in assisting with the development of sustainable agriculture are outlined in this article.
On-farm research, as used in this article, pertains to scientifically-designed investigations undertaken on the field of commercial farmers. The research may pertain to only some or all crop and livestock enterprises on particular farms. On-farm research is intended to be distinct from on-farm demonstrations in which improved technologies developed on-station are tried out on farmers' fields. Demonstrations usually do not involve formal replications or other required features for the statistical analysis of data collected.
In detail the following aspects are dealt with in this paper:
- Systems nature of sustainable farming
- Strategies to effectively address issues in sustainable agriculture
- Unique roles of on-farm research in assisting the development of sustainable agriculture
- Documenting existing sustainable practices and experiences
- Experimenting with new sustainable practices/enterprises
- Issues for consideration in the next generation of on-farm research
- Comparative tests of sustainable and conventional farms
- Partnership among university specialists, private organizations, and farmers in the design and conduct of on-farm research.

Applied to sustainable agriculture, on-farm research can be used for
- documenting the sustainable practices and experiences of commercial sustainable farmers and
- experimenting with new sustainable practices/enterprises on the fields of commercial farmers.

The systems nature of sustainable agriculture requires the strategic use of:
- multidisciplinary research teams;
- whole-farm, holistic analasis;
- long-term research programs
- and "synthetic" as well as analytic approaches.

1041 92 - 2/125

Farming systems research and development
Review, manual, developing countries, market research, sustainable development, culturally-adapted research, sociology, economics

EPSTEIN, T.S.

A MANUAL FOR CULTURALLY-ADAPTED MARKET RESEARCH (CMR) IN THE DEVELOPMENT PROCESS.

Publ. of Grant, 40 Babbage Road, Roseville Chase, N.S.W.2064, Australia; 1991, AD 12.00 + AD 2.00 for postage

This manual outlines how CMR promotes participatory development by eliciting the views from the ultimate users of developmental activities. It concentrates on adapting established market research methods to the setting of different Third World cultures. In doing so it should help to fill the gap which presently exists in the available development literature relating not only to user research but also how to make it culture-specific.
Apart from international, national and non-governmental developmental agencies, the manual will be of interest to administrators and implementors of development programmes, development planners, politicians, educationalists and Third World market researchers.
The manual is organized as follows:
Part I discusses not only the reasons why CMR has to become an integral part of the development process, but also why existing evaluation procedures have largely failed to increase the rate of project successes and how CMR can help to improve project efficiency.
Part II outlines relevant established market research methods and provides guidelines for their use in the development process.
Part III sets out by means of key cultural variables how market research can be culturally adapted.
Part IV suggests a model structure to integrate CMR into developmental activities.

1042 92 - 2/126

Farming systems research and development
Review, book, environment, natural resources, holistic approach, soil fertility, development policy, resource degradation, stabilization, strategies, price policy, subsidies, fiscal policies, land tenure systems, agricultural trade, GDI

OTZEN, U.

ENVIRONMENTALLY COMPATIBLE AGRICULTURAL DEVELOPMENT. RESOURCE, FOOD AND INCOME SECURITY AS A TASK FOR DEVELOPMENT AND STRUCTURAL POLICY.

Publ. of German Development Institute (GDI); Berlin; 1992, 56 p. + notes

The disastrous combination of rapid population growth, under-development and dwindling resources on the one hand and advancing industrialization and climatic change due to pollutants on the other calls for a change of attitude towards nature.
The value attached to nature and the organization of economic activities that use its dwindling resources need to be reconsidered. Given the multicausal linkages, this needs to be done at all levels of the economy and in almost all spheres of life in both industrialized and developing countries.
The application of purely economistic and, therefore, reductionist models to land development in the tropics and subtropics with their particularly fragile ecosystems, has had devastating effects on the natural balance, causing erosion, soil salination, soil and landscape degradation, disastrous droughts or flooding. The economic, social and demographic consequences of such anthropogenic processes of land destruction and of the climatogenic processes closely associated with them are declining yield capacities, increasing poverty and the uprooting of sections of the population, as more and more people flee the effects of environmental destruction to seek food and a living elsewhere.
Production and consumption should therefore increasingly form part of substance and energy cycles which preserve resources and that agriculture should again develop more as a form of site-specific production based on regional comparative economic-ecological cost advantages.
Agricultural development, whether in the South, where its destructive impact on the land tends to be determined by the system, or in the agricultural economies of the North, whose adverse effects on the environment tend to be compulsive, is causing rising environmental costs. In the former case, these largely consist of on-farm costs in the shape of losses of yield and output due to sheet erosion, soil salination, soil degradation or nutrient leaching; in the latter case, they consist largely of "external costs" in the shape of surface and ground water pollution, land clearance, the loss of species or the contamination of food products with chemical residues. In the debate on global warming the agricultural economies of both North

and South are, moreover, accused of increasing emissions of carbon dioxide and methane due to mechanization, large-scale livestock farming and the growing of lowland rice.
If there is to be an economic-ecological and innovative-organizational move towards the progressive application of ecological standards in agriculture and forestry, a number of basic conditions will need to be met at national and international level. These conditions are outlined in this paper.
Resource stabilization and food and income security are unlikely to be achieved with individual promotional instruments, but rather as a complementary task of measures taken under price, innovation, structural and trade policies. Agricultural development policies that are socially, economically and ecologically balanced may therefore emerge from the interplay among:
- national reforms of agricultural structures and prices based on economic-ecological principles,
- international commitments to internalize environmental costs in agriculture and
- a local commitment by each producer to use resources in a way that is compatible with the environment.

Agricultural development policies compatible with nature will therefore be able to prove themselves in practice only in the long term, in keeping with the general demand for globally responsible thinking and conception and locally responsible action to the benefit of the environment and international society.
Author's summary, shortened.

1043 92 - 2/127

Farming systems research and development
Review, USA, sustainable agriculture, downstream perspective, soil erosion control, property rights

HITZHUSEN, F.J.

THE ECONOMICS OF SUSTAINABLE AGRICULTURE: ADDING A DOWNSTREAM PERSPECTIVE.

J. of Sustainable Agriculture, 2, 1992, pp. 75-87

The objectives of this downstream perspective and assessment of the economics of sustainable agriculture in this paper are:
- to explain to a general audience (broader than economists) that sustainability from an economic perspective as a minimum requires accounting for both on and off-site effects of economic activity;
- to focus on soil erosion and related water quality impacts (including changing property rights) as the major sub-set of downstream economics of alternative farming systems, and
- to present some empirical results and policy implications of Ohio downstream impacts which would seem to be generalizable to many other settings.

More empirical evidence is needed regarding on-site and downstream costs (particularly groundwater contamination) and returns of alternative tillage and rotation systems if socially optimal systems are to be identified. The evidence to date suggests that on average downstream costs of soil erosion are not trivial and that they exceed the average on-site costs of soil erosion. This implies that some form of tax, subsidy, technical assistance or regulatory intervention may be appropriate and necessary. The evidence also suggests that downstream costs per unit of soil loss can vary dramatically from site to site. This points to the extreme importance of targeting control measures.
The empirical evidence on the economics of soil erosion to date suggests the following for consideration:
- Further research and extension of information to farmers on sustainable reduced tillage and expanded rotation systems which reduce downstream costs without reducing profitability to the farmer.
- More comprehensive research on downstream costs of soil erosion and related chemical contamination of water and identification of any strong correlated or proxies, e.g., population, existence of harbors, density of private wells, etc. for these impacts.
- Taxes on the inputs, such as nitrogen (e.g., N without inhibitors) and selected pesticides (e.g., Atrazine) which have been most problematic in surface and groundwater contamination to at least provide revenues for further research.

In sum, more comprehensive economic assessment, particularly of the downstream costs and benefits of alternative farming systems, is likely to favour those systems that are less erosive and

chemically intensive. This in turn leads to the need to reassess the entitlements and property rights related to alternative farming systems and their downstream impacts. Evidence to date suggests shifts in favour of the impacted downstream users and these trends will probably continue. Thus, sustainable agriculture is an idea that is currently ecologically, and in many cases, economically attractive. In addition, its future economic attractiveness is likely to increase.

1044 92 - 2/128

Farming systems research and development
Review, agricultural research, monitoring and evaluation, impact assessment, guidelines, evaluation concepts, terms, ISNAR

MCLEAN, D.

MONITORING AND EVALUATION IN THE MANAGEMENT OF AGRICULTURAL RESEARCH.

ISNAR Working Paper No. 14; Int. Service for Nat. Agric. Research (ISNAR), The Hague, Netherlands, 1988, 29 pp.

This paper introduces the general topic of monitoring and evaluation, including a brief definition of terms, and the functional roles of different types of evaluation in research systems.
It provides the framework for the development of a series of materials on the comprehensive topic of monitoring and evaluation.
Research managers have become increasingly aware of the importance of installing M/E procedures into their organizations, but the successfulness of these efforts has been mixed.
Monitoring and evaluation are not new concepts. Yet research institutes have had little success in integrating effective M/E into their organizations.
Many different terms are used in the literature to describe the methods and techniques used in program evaluation. The central features of all these approaches are that they are analyses of program processes, not just program content. They have implications for improving efficiency and effectiveness. They include quantitative and qualitative techniques.
Most research programs in developing countries are responsive to larger development objectives. A comprehensive program evaluation should include, therefore, representatives from development and extension organizations, and a mechanism for bringing user feedback into the process. Program evaluations may also include representatives from planning and finance ministries, depending on the size and importance of the program.
The best key indicators of project performance are objective, quantifiable, and unambiguous. They can be verified if necessary.
A good monitoring system is not more time consuming than the benefits justify, collects no superfluous data, is timely in data analysis, interpretation, and feedback, and is useful to researchers.
This paper does not attempt to cover the monitoring and evaluation procedures associated with personnel appraisal and financial and administrative management. These topics are considered in other ISNAR papers on human resource management and in general management literature.
This paper underlines the importance of integrating monitoring and evaluation into routine management practices, so that they are viewed by both those conducting evaluations and those being evaluated as tools for improving research.

In addition to the main text there is an annex which more thoroughly discusses the evaluation of ongoing research, largely through annual reviews and comprehensive program reviews.
The annex has tried to illustrate the importance of integrating monitoring and evaluation activities into day-to-day management practices in national research organizations. It concentrated on the internal monitoring and evaluation which should take place for ongoing research, and focuses primarily on the necessary reporting requirements of the researchers themselves.
The ISNAR working papers series is a flexible instrument for sharing analysis and information about relevant organization and management problems of the agricultural research systems in developing countries.

1045 92 - 2/129

Farming systems research and development
Review, Africa, agricultural development, institutions, colonial period, post independence period, national agricultural research, sustainability, ISNAR

EICHER, C.K.

SUSTAINABLE INSTITUTIONS FOR AFRICAN AGRICULTURAL DEVELOPMENT.

ISNAR Working Paper No. 19; Int. Service for Nat. Agric. Research (ISNAR), The Hague, Netherlands, 1989, 26 pp. + annex

The thesis of this paper is that after a third of a century of independence, many African states are several generations behind Asia and Latin America in terms of their stage of scientific, political, and institutional maturity.
It is hypothesized that the stage of institutional maturity of individual African states will play a critical role in determining the type, amount, and sequence of foreign aid that can be absorbed with integrity. But most donors normally ignore the stage of institutional maturity of individual African states and prepare a continent-wide strategy to strengthen institutions such as a national agricultural research system or a national extension service.
What flows from Africa's agricultural research history over the past 60 years is the simple but powerful proposition that current institution-building strategies and lending approaches that are effective in Asia and Latin America will have to be sharply modified to fit the earlier stage of development of many countries in Africa. In addition, because of the differential stages of development between African countries, institution-building approaches in middle-income countries in Africa, such as Zimbabwe and Cameron, are likely to fail in Guinea, Chad, Burundi, Somalia, Uganda, and Ethiopia.
A subregional strategy should be prepared to strengthen the three core national agricultural services--research, training, and extension--for each of the five major agroecologies: Sahel, coastal West Africa, Central Africa, Eastern Africa and the Horn, and Southern Africa. Each strategy should include basic concepts research networks to link researchers in NARS with regional and international institutes.
The subregional approach to research planning has the potential of capturing research spillovers. But to implement such an approach, African states and donors must deal with some complex political issues limiting the development of sustainable institutions.
The paper is organized as follows:
Chapter I: Introduction
Chapter II: The African development context
Chapter III: Institutions and African development
Chapter IV: Institutional development during the colonial period: 1930-1959

Chapter V: Institutional development during the post-independence period: 1960-1988
Chapter VI: Longer-term issues to ponder: 1990-2020
Chapter VII: Reflections on the World Bank's strategy to strengthen NARS in Africa
Chapter VIII: Implications for African States, donors and ISNAR

Summarizing this paper presents some thoughts on the development of sustainable institutions for African agricultural development. The focus is on strengthening the three core institutions research, training, and extension that form the institutional base of agriculture. Primary attention is devoted to strengthening national agricultural research systems (NARS), and secondary attention, to training and extension.
The ISNAR working paper series is a flexible instrument for sharing analysis and information about relevant organizational and management problems of the agricultural research systems in developing countries.

1046 92 - 2/130

Farming systems research and development
Review, human resource management, agricultural research, planning, training, ISNAR

SACHDEVA, P.S.

HUMAN RESOURCE MANAGEMENT FOR NATIONAL AGRICULTURAL RESEARCH: LESSONS FROM ISNAR'S EXPERIENCE.

ISNAR Working Paper No. 18; Int. Service for Nat. Agric. Research, The Hague, Netherlands; 1988, 18 pp. + annex

This paper reviews ISNAR's experience in helping national agricultural research systems (NARS).
Thebetter manage their human resources and identifies key lessons from that experience.
The paper is intended for the generalist agricultural research manager and discusses some key concerns and lessons. The underlying premise is that all managers and supervisors need to become adapt in effectively and efficiently managing their human resources.
This paper is divided into three parts:
- Overview and highlights of ISNAR's experience by major area,
- lessons from this experience, and
- conclusion.

The diversity of approaches used by ISNAR is illustrated by a few examples.
In many of these countries, the conditions of service of researchers have been reviewed in detail, with attention given to such items as grade structures, personnel costs as a proportion of the recurrent budget, salary differentials etc..
ISNAR has recently documented fresh evidence that the number of researchers in developing countries has more than doubled in the past 20 years, well ahead of the growth in recurrent expenditures for agricultural research during the same period. In many countries the need for additional scientists remains substantial, but the potential supply from academic institutions is variable in quality and quantity as well.
In the future, it will be essential that the NARS first undertake strategic planning and then set priorities, formulate programs, and estimate manpower requirements.
Recent ISNAR experience indicates also a few concerns, which are outlined in this paper.
In terms of the broader areas, problems of efficiently managing growth of manpower, research programs, and training institutions are likely to remain high on the agenda of most NARS.
Under conditions of scarce financial resources coupled with the pressing need for producing and delivering useful research some hard choices involving shifts in strategy, reduction of marginal programs, redeployment of personnel, restructuring of organizations, and rationalization of research station networks will be inevitable.

1047 92 - 2/131

Farming systems research and development
Review, agricultural research, technology transfer, developing countries, linkage mechanisms, evaluation criteria, political factors, technical factors, oganizational factors, ISNAR

KAIMOWITZ, D.

A CONCEPTUAL FRAMEWORK FOR STUDYING THE LINKS BETWEEN AGRICULTURAL RESEARCH AND TECHNOLOGY TRANSFER IN DEVELOPING COUNTRIES.

ISNAR LINKAGES Theme Paper No. 1; Int. Service for Nat. Agric. Research, The Hague, Netherlands; 1989, 28 pp. + references

This paper synthesizes the contributions of seven papers commissioned by ISNAR as part of an international project to study the links between agricultural research and technology transfer.
In particular, the paper addresses four basic questions:
- What linkage mechanisms exist and what are their characteristics?
- What contextual factors influence which linkage mechanisms are appropriate to use and how?
- Which of these contextual factors can be controlled or influenced by policy makers and leaders of research and technology transfer institutions?
- What limitations do contextual factors impose upon the use of linkage mechanisms?

ISNAR initiated a major international comparative study on the links between agricultural research and technology transfer in developing countries. This study was developed in response to requests from agricultural research managers for advice in this area.
Many institutions have noted the problem of poor links between research and technology transfer in developing countries.
This framework is the subject of this paper, and represents the first phase of the ISNAR study. It is the result of 18 months spent synthesizing the experts' contributions and reviewing the available literature.
This framework should help leaders of research systems find out what paths exist and where they lead. The specific routes to guaranteed improved performance are not yet known, but this paper gives some indications of their general direction. It opens with an elaboration of the key concepts of the framework, and then discusses the criteria for evaluating performance. This is followed by analyses of the political, technical and organizational factors which affect linkage mechanisms in the development and transfer of agricultural technology.
Experience has shown, however, that it is impossible to come up with a set of general recommendations which would be appropriate in all circumstances. Solutions which work well in one context perform poorly in others.

1048 92 - 2/132

Farming systems research and development
Case studies, Africa, Asia, Latin America, on-farm research, extension, linkage problem, sustainability, ISNAR

EWELL. P.T.

LINKAGES BETWEEN ON-FARM RESEARCH AND EXTENSION IN NINE COUNTRIES.

OFCOR Comparative Study No.4; Int. Service for Nat. Agric. Research, The Hague, Netherlands, 28 pp. + references

ISNAR initiated a major study on the organization and management of on-farm, client-oriented research (OFCOR) in national agricultural research systems (NARS).
In this study, OFCOR programs are analyzed in terms of the functions OFCOR can perform within the larger research and extension process.
The intention is to provide a body of practical experience upon which research managers can draw as they strive to strengthen OFCOR as an integral part of their research systems.
The study focuses directly on the issues of implementation and institutionalization.
By region, the countries studied are:
- Latin America: Ecuador, Guatemala, Panama
- Africa: Senegal, Zambia, Zimbabwe
- Asia: Bangladesh, Indonesia, Nepal

The case studies provide important insights and lessons on the general issues, as well as specific guidance for research policy and the organization and management of OFCOR in their countries.
The cases reflect a variety of institutional settings and strategies for introducing and developing OFCOR. They also reflect the broad range of models used in the organization and management of OFCOR. The profiles outlined highlight the features of each case.
The study is organized as follows:
- In Chapter 1, the relationship between on-farm research and extension is contrasted in three countries - Guatemala, Nepal and Zambia.
- Chapter 2 draws on evidence from all nine countries to analyze the experience with six mechanisms for linking on-farm research and extension.
- Chapter 3 points out the lessons that emerge from the case studies for research managers using on-farm research as a means of strengthening the links between research and extension.

The case studies report several examples of links between research and extension that have not lasted.
The most successful cases of institutionalization are those where links have been forged simultaneously at several levels of the administrative hierarchies of the organizations involved. Good cooperation at the field level is impossible to sustain unless regular opportunities to meet and work together are actively supported by management.

1049 92 - 2/133

Farming systems research and development
Review, agricultural research, resource-poor farmer, farmer participation, research management, ISNAR

BIGGS, S.D.

RESOURCE-POOR FARMER PARTICIPATION IN RESEARCH: A SYNTHESIS OF EXPERIENCES FROM NINE NATIONAL AGRICULTURAL RESEARCH SYSTEMS.

OFCOR Comparative Study Paper No. 3; Int. Service for Nat. Agric. Research, The Hague, Netherlands; 1989, 34 pp. + references

This paper is a result of a collaborative group effort. It is based on the case studies prepared for the ISNAR study on organization and management of on-farm client-oriented research in national agricultural research systems.
This paper reviews the experiences of resource-poor farmer participation in the agricultural research process and draws out lessons for agricultural research managers. Participation in this context is seen as the involvement of farmers in research activities as clients, colleagues, partners, planners, and evaluators in the research process.
The paper reviews the experiences of nine national agricultural research systems: Ecuador, Guatemala, Panama, Senegal, Zambia, Zimbabwe, Bangladesh, Indonesia, and Nepal. In these countries, resource-poor farmers have been designated as major clients of research and all have had major on-farm client-oriented research (OFCOR) efforts in operation for several years. One of the principal objectives of these programs has been to promote participation of resource-poor farmers in research. This has been stressed because it increases the cost-effectiveness of research and helps keep research priorities focused on the clients.
The analysis is divided into four chapters. The first chapter looks at the types of farmer participation in research in the country case studies. A typology of four modes of participation (contract, consultative, collaborative, and collegial) is used to differentiate the ways in which resource-poor farmers participate in research programs. The typology has implications for management and some of these are briefly described. The OFCOR programs in the country case studies are then described, with particular reference to the nature of participation. Modes of participation are subject to development policy, national agricultural research policy, institutional context, and changes in research methodology. Some of the ways in which these factors have contributed to changes in programs are considered.
Chapter 2 discusses the levels at which resource-poor farmers and scientists interact, looking in particular at the village, national, and regional levels. The complex and often difficult circumstances at the village level have implications for managers; and several aspects of these are discussed, including bias, the status and role of scientific staff, local politicians, community representatives, and the staff of extension and development

agencies. These factors contribute to the way in which a research program is implemented; they are crucial to the nature and extent of resource-poor farmer participation.
A major part of chapter 3 discusses meetings between researchers and resource-poor farmers as an important complement to trials and surveys. Such meetings require careful design and clear objectives if the resources allocated to working with farmers are to be used efficiently and effectively. Farmers can be involved in meetings in a number of ways. These are set out, bearing in mind the location-specificity and nature of the research program. The case studies show considerable experimenting with different types of meetings to improve farmers participation; some of those at the village and national level are described.
The fourth chapter draws out lessons and implications for research managers. It concludes by placing emphasis on the need to support local research practitioners in finding ways to develop new methods and techniques for increasing the participation of resource-poor farmers.
One of the most important findings from this study is that research practitioners have been innovative and have developed a wide variety of mechanisms to involve farmers in the research process.
Support must be given to local researchers, and funds must be allocated for communicating experiences with farmer participation among researchers in different regions and in different countries.

1050 92 - 2/134

Farming systems research and development
Review, Africa, Asia, Latin America, Senegal, Zambia, Zimbabwe, Bangladesh, Indonesia, Nepal, Ecuador, Guatemala, Panama, case studies, on-farm research, organisation, management, ISNAR

EWELL, P.T.

ORGANIZATION AND MANAGEMENT OF FIELD ACTIVITIES IN ON-FARM RESEARCH: A REVIEW OF EXPERIENCE IN NINE COUNTRIES.

OFCOR Comparative Study No. 2, Int. Service for Nat. Agric. Research, The Hague, Netherlands, 1988, 42 pp. + annex

ISNAR initiated a major study on the organization and management of on-farm, client-oriented research (OFCOR) in national agricultural research systems (NARS).
The objective is to analyze the critical organizational and managerial factors which influence how national research institutes can develop and sustain OFCOR programs to realize their specific policies and goals.
This paper is one of a series comparing and analyzing the concrete experiences with OFCOR of national institutes in the nine countries studied. It is focused on how the field staffs have been organized, both in relation to other parts of the system and internally. It analyzes how the research process has been managed, and the procedures used for planning, programming and review. The organizational implications and management requirements of different methodologies are discussed, although it has not been a goal of the study to evaluate the effectiveness or efficiency of different research methods, or to assess their impact.
Closely related topics are analyzed in separate papers: the linkages between on-farm and on-station research, the experience of the participation of farmers, and the linkages between OFCOR and extension institutions.
This paper has concentrated on a limited set of issues directly related to the organization and management of the field research personnel and their activities. General lessons drawn from the experience of the case studies are summarized in this paper:
- Improving focus on the targeted clients
- Selecting collaborators
- Maintaining an interdisciplinary perspective
- Sustaining feedback
- Administering field operations
- Providing leadership

On the basis of the experience it is accepted that no package of technology, no matter how high its yields or economic returns on an experiment station, will necessarily out-perform current varieties and practices under farmers' conditions. A technology which is heavily dependent on inputs from outside of the immediate region, and which is very sensitive to hazards and variations in the environment will not be sustainable on small farms.

92 - 2/135

1051

Farming systems research and development
Africa, agricultural development, analysis, socio-political model, land holding systems, demographic aspects, housing, food, land exploitation, education, extension, research, administration, social integration, CTA

KAVADIAS, G.V.

DIMENSIONS SOCIALES ET HUMAINES DU DÉVELOPPEMENT AGRICOLE DE L'AFRIQUE DANS LA PERSPECTIVE DE L'AN 2000. (SOCIAL AND HUMAN DIMENSIONS OF AGRICULTURAL DEVELOPMENT IN AFRICA IN THE PERSPECTIVE OF THE YEAR 2000).

In: Agriculture in the Year 2000 - The Case of ACP-Countries; Proc. of an Int. Forum: Green Government and CTA, Netherlands, ISBN 92-9081-0440, 1990, pp. 99-104

A theoretical analysis of this phenomenon has already shown that the economic - technological approach to development is insufficient if there is no concurrent reference to the socio-political framework, because development efforts are essentially social actions geared to a certain type of society which they are trying to change.
Experience has shown how important the above mentioned dimensions are since they are decisive for development, particularly in agricultural regions of a traditional nature, as is the case in Africa.
With other words, in every development effort in sub-Saharan countries, the social and, more generally, the human dimensions of the undertaking constitute a fundamental problem. In agricultural areas, and taking into account the specific local context, these aspects constitute a key problem.
And yet, the social and human factors are always more or less neglected, at the same time, nearly all the attention is focused on the financial, technological and technocratic factors.
The author explains that it is thus impossible to speak specifically about social and human dimensions of agricultural developement as evidenced by the historical reality of each African country.
The only thing that is attempted, is to try to approach the problem within the context of an abstract socio-political model of a qualitative nature elaborated in stages and based on common or related features of the countries in question. The practical utility of such a model lies in the fact that it represents a reference value. By comparing the model with the situation prevailing in a given country differences and similarities to the model enables observations on the fabric and internal dynamics of the social structures of the country. Furthermore by comparing the existing social structures of the society in question with the social infrastructure dictated by the chosen type of development, it is possible to ascertain discrepancies and identify the necessary measures to be taken in order to reconcile the two.

Such an attempt calls for a multi-dimensioned analysis.
The levels of observation and analysis necessary to the construction of an integrated rural development model in Africa are described.
This model emphasizes the distance between North and South which is increasing. If this gap is not closed, not only will the misery of poor nations persist, but there will be greater danger for world peace through new wars.
The theoretical sociological model of their current development conditions which has been described allows:
- a description of their deficiencies and needs which have to be faced, from the sociological angle,
- the formulation of a series of measures which are required by social and human considerations and which can contribute to the general effort in connection with economic, organizational and technological measures,
- the confirmation that action for development must follow efficient planning.

The planning must prescribe measures for the development of every sector of life, as well as measures for the appropriate combination of their dynamics.
This paper is rather theoretical and the whole effort described above is difficult to accomplish.

92 - 2/136

1052

Farming systems research and development
Review, book, Africa, Ghana, study, ethnic group, social system, traditional society, ecology, religion, spiritual interaction, cooperation

RIEHL, V.

NATURE AND SOCIETY.

Diss. Univ. Münster, FRG; Verlag P. Lang GmbH, Abt. WB, Postf. 940225, DW 6000 Frankfurt/M. 90; ISBN 3-631-45235-7, 1993, 264 pp.; price DM 74,--

The Tallensi, an ethnic group of 60.000 people who are mainly farmers on a subsistence level, are considered as a paradigma for a stateless society, which organizes its social life on a highly decentralized basis - a "tribe without rulers".
This was the research result of the widely known British social anthropologist Meyer Fortes who did his field research among the Tallensi in the mid 30s of this century. Since then British colonial rule and since 1957 the state of Ghana were established. The Tallensi were confronted with the effects of development aid and christian mission became significant not only for the Tallensi but for all the other ethnic groups in the semiarid parts of Northern Ghana.
What impact did all these changes have on the political system of the Tallensi?
This was the main question the author had when he started a 32-months research stay among the Tallensi in 1986. During that time he was living in a local extended family, doing participant observation.
With this work the question has been answered how the Tallensi were able to keep up their political system and egalitarian social structure and to fit it into changing social situations. By a detailed description of the Tallensi-Festivals he works out the significance of "nature" (hunting, fishing, food) as a counterpart to "culture" (agriculture, village life, clan relations).
This work gives an interesting view "from inside" how an ethnic group has developed certain social techniques of keeping the social and economical equilibrium. The book offers an important contribution to the discussion wheather stateless societies are per se ecological societies which live "in harmony with nature and environment". One of the social effects is that egalitarian societies can only keep up their social system by religious and spiritual interactions which are based on a solidarical and equal cooperation of all the segments of the ethnic group.
This book is clearly written and well worth the attention of those interested in traditional societies which live in harmony with nature and environment. The book is highly recommended for scientific audiences and practicioners looking to extend their general awareness of this exciting area.

1053 92 - 2/137

Farming systems research and development
Review, Latin America, Peru, Caribbean, Haiti, sustainable development, theory and practice, key terms, fragile lands, poverty, policy, technology, institutions, interventions, watershed development, integrated approach, environment education, extension, conservation, USAID, DESFIL

GOW, D.

DEVELOPMENT OF FRAGILE LANDS: THEORY AND PRACTICE.

Publ. of Developm. Strategies for Fragile Lands (DESFIL), Washington, USA; prepared for U.S.Agency for Int. Development, USA; 1988, 21 pp.

In this paper the author attempts to synthesize an integrated approach to the sustainable development of fragile lands.
The paper is divided into four sections:
- In the first the author deals with the problem of terminology and suggest definitions that will capture the breadth and complexity of the issues under discussion.
- In the second section, the causal factors in the creation of fragile lands will be briefly described.
- In the third, the DESFIL approach is presented, in both theory and practice, recent experience in Latin America and the Caribbean is discussed.
- In the final section, a set of guidelines for an integrated approach to the resolution of fragile lands issues, specifically, the sustainable development of such lands, is provided.

Concluding, the integrated approach is briefly outlined. Such an approach includes:
- Political commitment, policy, and planning:
  If such an approach is to have any chance of success, there must be a commitment on the part of national governments. Such a commitment must be demonstrated through the enactment of appropriate policies and development strategies and provision of the necessary resources to implement them.
- Technological interventions, adaptive research, and monitoring:
  Enough is known about technological interventions, using both western and indigenous models, to improve the sustainability of present land-use systems. Many of the possible technical interventions are site-specific and must be adapted to the prevailing environmental conditions. There is no standard technical package that can be extended, just as there is no standard way of disseminating these interventions, since they must be adapted to prevailing social and political conditions. Of equal importance, however, is the need to monitor the effectiveness of these technological interventions and, whenever it is necessary, to modify them.

- Institutional strengthening and coordination:
  Public sector institutions dealing with fragile lands issues are often weak and fragmented - whether they are in the Ministry of Planning, the Ministry of Agriculture, or the Ministry of Natural Resources. The necessary conditions for their strengthening include political commitment, the availability of resources, as well as the required technical competence.
- Enhancing local organizational capacity:
  Local organizations of farmers and their families fulfill important functions in the sustainable development of fragile lands by acting as vehicles. Equally important in this connection are the NGOs working in natural resources management, which often serve an intermediary function as indigenous grassroots support organizations.
- Environmental education and extension:
  This is the most realistic and practical way of disseminating what is known about fragile lands issues to those most affected by them. It is also the first step in translating this knowledge into action.
- Conservation and development:
  There is no essential contradiction between sustainable economic development and conservation of the natural resource base. Potential activities include nature tourism, natural-forest management, game cropping, and sustainable extraction of minor forest products.

1054 92 - 2/138

Farming systems research and development
Review, book, agricultural research, network effects, sustainable development, national agricultural research systems, ICRISAT, IDRC

FARIS, D.G.

AGRICULTURAL RESEARCH NETWORKS AS DEVELOPMENT TOOLS: VIEWS OF A NETWORK COORDINATOR.

Copublication of the Int. Development Research Ottawa, (IDRC), Canada and the Int. Crops Res. Institute for the Semi-Arid Tropics; India; ISBN 92-9066-205-0, 1991, 108 pp., LDC: USD 7.50, HDL: USD 18.30

An Agricultural Research Network (ARNET) is a cluster of scientists or institutions linked together by a common interest in working dependently or interdependently on an identified shared problem or problems. ARNETs are popular with agricultural research scientists, administrators, and donors as tools to strengthen the research capability of national agricultural research systems (NARSs) and to identify, address, and solve farmers' problems.
An effective network will overcome isolation, facilitate sharing of research information and ideas, help reduce unnecessary duplication, provide the critical mass of effort needed to give quick answers to pressing problems, and hasten scientific breakthroughs.
ARNETs have five important components: membership, research, coordination, communication, and assets.
Networks are dynamic and responsive to changing needs in agricultural systems.
There are many types of ARNETs depending on the problems that need to be addressed, the membership and its requirements, the extent of coordination available or needed, the research strategy developed, and the assets available.
The author shares in this book the results of his search to understand the workings, benefits, costs, and pitfalls of networks and he provides information from his own experience and that of others to help those wishing to organize and operate ARNETs.
This book is highly recommended for all those working in international development.

1055 92 - 2/139

Farming systems research and development
Review, book, economics, price distorsions, market intervention, protection measures, income gap measures, aggregation, sensitivity, domestic resource costs, policy relevance, FAO

SCANDIZZO, P.L.

MEASURES OF PROTECTION: METHODOLOGY, ECONOMIC INTERPRETATION AND POLICY RELEVANCE.

FAO Economic and Social Development Paper No. 84; FAO, Rome, Italy; ISBN 92-5-102859-1; 1989, 58 pp. + appendices

This paper analyzes the properties and the policy significance of the measures of protection currently used by economists in a variety of national and international situations.
The main objective of the paper is to define a set of operational rules to measure the extent and the consequences of government market interventions, with a view to provide guidance for the evaluation of structural adjustment policies involving movements to freer trade. This objective is pursued through a survey of the different measures and of the underlying theoretical constructions and a review of their implications for economic policy.
The paper is oganized as follows: the first section describes the problem area and the possible theoretical approaches and classifies the measures into the three categories of the "price gap", income gap" and "real income gap", according to whether they measure price, incomes or welfare differences due to protection. These three gap measures are reviewed in the second, the third and the fourth section.
Summarizing and concluding the following has been stated:
- Measures of protection have been devised with the two-fold objective of quantifying trade distortions through the measurement of its effects on several economic variables: prices, value added, exchange rates, producers and consumers welfare, government income. More recently general equilibrium models have attempted to measure effects on wages, employment and growth.
- All the measures were born conceptually within the single country context. That is, they measure the effects of single or multiple government interventions by comparing the level of a single variable (e.g. domestic price of a particular commodity) after the intervention with the level that the same variable would have taken without the specific intervention.
- Measures of protection can also be classified in the two categories of "ex ante" and "ex post" measures, according to whether they refer to presumptive or first round effects, or to real comparisons with and without protection. The "ex ante" measures can be easily performed only for tariffs, taxes and subsidies, while the "ex post" ones, based on real price comparisons, can be used for all government interventions, including quantitative restrictions.

Measures of protection can be a valuable tool for policy making, provided that they are used with caution. Both ex ante and ex post measures should be used in the policy process of structural adjustment for different tasks: the ex ante measures to agree on the removal of tariff levels and other specifications, the ex post measures to evaluate priorities and set monitorable targets.

1056 92 - 2/140

Farming systems research and development
Review, bibliographies, Africa, Botswana, Lesotho, Malawi, Zambia, women, development

CTA

WOMEN IN DEVELOPMENT IN SOUTHERN AFRICA; AN ANNOTATED BIBLIOGRAPHY.

Publ. of the Centre Technique de Cooperation Agricole et Rurale (CTA), Postbus 380, 6700 A.J. Wageningen, Netherlands.
VOL.I BOTSWANA COMPILED BY L. RAMORE 82 pp., ISBN 92 908-1082-3; VOL. II LESOTHO COMPILED BY M.M. CHADZINGWA, 46 pp., ISBN 92 908-1083-1; VOL. III MALAWI COMPILED BY G.W.P. KISHINDO, 114 pp., ISBN 92-908-1084-X; VOL. IV ZAMBIA COMPILED BY M. MISENGO AND K.L. CHANDA, 78 pp., ISBN 92 909-81085-8

Women in development in Southern Africa is the series title of a four-volume bibliography which covers Botswana (Volume I), Lesotho (Volume II), Malawi (Volume III) and Zambia (Volume IV). The proposal to compile a bibliography of women in development was made in 1987 at the workshop on Agricultural Information Sources held in Malawi and sponsored by CTA. Participants, conscious of the growing awareness of the indispensable role of women in development, expressed interest in undertaking this project, a project which CTA agreed to sponsor.
Each volume contains an annotated list of authors. There are over 300 entries in the Botswana volume which include both published and unpublished material. The entries have been divided into eleven broad subjects including agriculture, health and welfare, legal rights, economic development and education. Within each subject area the entries are arranged alphabetically according to the author. Each entry is numbered and contains detailed bibliographic information and, in most cases, this is followed by a description of the publication. The other three volumes follow the same basic format.
The bibliographies are aimed at researchers, extension workers, development personnel, teachers and trainers. They bring together all the available material on issues concerning women and development in the four countries.

1057 92 - 2/141

Farming systems research and development
Review, book, developing countries, industrialized countries, resource guide, women, organization, rural development, health, migration, tourism, education, communication

ISIS

WOMEN IN DEVELOPMENT: A RESOURCE GUIDE FOR ORGANIZATION AND ACTION.

ISIS Internat. Inf. and Comm. Service; Intermediate Technology Publications Ltd., 103-105 Southampton Row, London WC1B 4 HH, UK; ISBN 1-85339-105-0, 1991, 226 pp., UKL 12.95, paperback

For too long now policy-makers and decision-makers attempting to consider women's needs where development plans and policies are concerned, have ignored a basic principle. They have failed to consult the organizations and groups that have been set up for and by the women themselves. In the past this has led to development which has at best neglected or, at worst, been detrimental to women.
Women's experiences of development, their struggles for rights, for the adequate supply of basic needs such as food, water, shelter, health and education, and their continued ability to mobilize and organize themselves successfully in order to execute change, must be recognized if any serious debate on the issues surrounding women and development is to take place.
'Women in development' is a guide which offers some answers written by women, for women, in both developing and industrialized countries. It examines the insights that women themselves have brought to the debate, with specific attention to the following areas: multinationals; rural development; health; migration and tourism; education and communication.
Abstract from SPORE

1058 92 - 2/142

Farming systems research and development
Africa, women, economics, rural areas, income generation, employment, poverty, FAO, UNESCO

NTIRI, D.W.

INCOME GENERATION AND AFRICAN RURAL WOMEN: CHOICE OR MERE NEGLECT.

In: FAO Economic and Social Development Series No. 44, FAO, Rome, Italy, 1988, pp. 143-154

This article aims to examine the economic outlook and conditions of rural areas in Africa, with particular attention to the income/employment and attitudes of women. It explores those critical issues that deal with the continuing and long-term impact of unemployment and underemployment and poverty, as well as examining those forces that play a part in the development of the rural woman's image and status.
Women in Africa actively pursue economic endeavours in related farm-and non-farm activities to supplement the little they receive from farming. Women's rural non-farm activities are generally aimed at income or employment generation and are visible all over the continent. Trading and marketing constitute two key areas of these economic pursuits.
Modern economic parameters have assigned women to inferior placements in the rural framework, primarily as a result of the process of modernization.
In addition to the obstacles of modernization, limited access to land and related resources; lack of control over their own labour; and lack of mobility because of family responsibilities and social and cultural restrictions have to be mentioned.
A set of recommendations for income-generating projects are mentioned:
- It is essential for women to change their attitudes and venture into more lucrative areas that are at present taboo.
- For example, the West African "market mammies" are famous for their economic control in the fishing industry.
- Capital or credit facilities must be created to help women with economic initiatives.
- Expanding income opportunities for skills/trade for women means expanding indigenous productive skill areas or popular skill attractions (tailoring, poultry-keeping, dairy production) through more systematic and organized marketing schemes. This is because markets do not expand fast enough and new markets must be sought. Traditional skill areas will have to be therefore more vigorously enriched and organized (quality control, production schedule, product-symmetry-shape, size, colour) to serve as real income-generating projects.
- Women require and should obtain more training in terms of mental change, and also to meet the required managerial and technical expectations of the programme (bookkeeping, clerical skills). Grass-roots training should be given priority.

1059 92 - 2/143

Farming systems research and development
Case study, Asia, Israel, traditional agriculture, technology transfer, development approach, social structure, infrastructure, agricultural technology, agronomy, economy, crop budget, tomato, cucumber, melon

RYMON, D. and U. OR

ACCELERATING TECHNOLOGY TRANSFER BY MEANS OF ATTA (ADVANCED TECHNOLOGIES IN TRADITIONAL AGRICULTURE).

J. of Sustainable Agriculture, 2, (1), 1991, pp. 103-118

This paper adopts the approach to increase agricultural production in order to supply growing food requirements.
Over the past 20 years a rapid adoption process of agricultural technology has taken place in the Jiftlik Valley, west of the Jordan River in Israel.
This case study covers close to two decades of development from the end of the 1960s until the mid-1980s. During that relatively short period the traditional agriculture of the region underwent a dramatic change as a direct result of the introduction of a new agricultural technology based on drip irrigation. Increased yields, and the corresponding increase in farmers' incomes have resulted in capital accumulation and further development; in this sense the technology has played a key role in upgrading the lifestyle of the local population.
Vegetable production has increased more than tenfold and net income of most of the farmers has increased by an even greater factor, thanks to the improved quality of the produce. This dramatic change can be attributed to the innovativeness and full participation of the farmers. At the start of the technology transfer process the study population was characterized by two socio-economic features: a traditional but stable social structure, and the existence of a continuous market demand for the high-value crops it produced.
Against this background the main elements contributing to the development were:
- suitable agricultural technology;
- the physical support system, e.g., credit and infrastructure;
- a balance of privately and publicly supplied extension services; and
- backing in the form of appropriate intervention by the government.

The overall objective was to replace the traditional technology by an appropriate modern one, as a package of techniques. Accordingly, the following components were introduced:
- Earth-built water ponds to enable provision of the water supply according to crop needs, independently of the traditional allocation based on water rights.
- Drip irrigation system including all of its peripheral components.

- Seeds (usually hybrid varieties) and seedlings.
- Plastic sheeting (used for mulching, low tunnels, etc.).
- Chemicals (fertilizers, insecticides, fungicides, etc.).

The Valley population has enjoyed a stable social structure for decades. The traditional collaboration between landlord and farmers has not been altered during the period of adoption of the new technology.
The main lesson to be learned is that accelerating technology transfer to a farming community - as opposed to a step-by-step approach - is a viable option; this without the prior development of a complete infrastructure comprising all of the required "software" and "hardware". The ATTA approach (Advanced Technologies in Traditional Agriculture) may therefore offer an economically and socially acceptable way to overcome shortages of relatively high-value food crops in the growing metropolitan centers of developing countries.
A stable social structure is an important factor. In assessing the sociocultural elements that may affect the introduction of an advanced technology.
Farmers' participation and organization are extremely important for successful, and rapid technology transfer. At the outset, participation requires initiative on the part of the farmers, and their involvement will increase as their confidence builds up.