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AUSTRALIAN CO-OPERATION
WITH THE
NATIONAL AGRICULTURAL RESEARCH PROJECT
THAILAND

FARMING SYSTEMS RESEARCH:

- FUTURE DIRECTIONS

B.J. GORDDARD (ED.)

**AUSTRALIAN CO-OPERATION WITH THE
NATIONAL AGRICULTURAL RESEARCH PROJECT THAILAND**

FARMING SYSTEMS RESEARCH:

- FUTURE DIRECTIONS

**Proceedings of a Workshop held at Rama Gardens Hotel, Bangkok,
Thailand, July 8-9, 1987**

Editor: B.J. GORDDARD (Project Manager ACNARP)

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WORKSHOP
ACNARP - CIMMYT
DEPARTMENT OF AGRICULTURE

FARMING SYSTEMS RESEARCH - FUTURE DIRECTIONS
WEDNESDAY JULY 8TH; THURSDAY JULY 9TH, 1987
RAMA GARDENS HOTEL

PROGRAMME

Wednesday July 8th :

0830 : Registration

0930 : Welcome: Dr Yookti Sarikaphuti,
Director General, DOA

0915 : Introduction by Chairman:
Mr Bryan Gorddard,
ACNARP Manager, Bangkok

0930 : The Present Situation in Farming Systems Research
Institute:
Mr Chanuan Ratanawaraha Director, FSRI.

1015 : The CIMMYT approach to farming systems research.
Dr Larry Harrington,
CIMMYT Economics Program
- Types of research
- FSR concepts
- Overview of the CIMMYT approach to FSR

NOON : LUNCH

1300 : The CIMMYT approach to FSR (continued)
- Adaptive Research
- Case studies in adaptive research

1430 : Coffee Break

1500 : The CIMMYT approach to FSR (continued)
Dr L. Harrington, CIMMYT

1630 : Close.

Thursday July 9th : Chairman : Dr Ampol Senanarong
 Deputy Director-General
 Department of Agriculture.

0830 : The relationship of FSR to discipline and component technology research.

 Dr David Ivory,
 ACNARP Research Programs Adviser

0915 : The relationship of FSR to extension at the field level:

 Mr Ian Craig, NERAD

1000 : The Extension - Research Linkage

 Mr Bryan Gorddard,
 ACNARP Manager

1030 : Discussion and questions : panel of speakers.

NOON : LUNCH

1300 : Group Discussion and Resolutions on future directions for FSR.

1430 : Concluding Remarks and Follow-up.

 Dr Ampol Senanarong
 Deputy Director-General
 Department of Agriculture

LIST OF PARTICIPANTS

Mr Ampol Senanarong	Department of Agriculture
Mr Prasoot Sittisroung	Rice Research Institute
Mr Sophon Sinthuprama	Field Crops Research Institute
Mr Sansern Piriyathamrong	Horticulture Research Institute
Mrs Valee Manomathaya	Sericulture Research Institute
Mr Rerngchai Vimuktanan	Rubber Research Institute
Mr Chanuan Ratanawaraha	Farming Systems Research Institute
Mr Damkheong Chandrapanya	Planning and Technical Division
Mrs Permpoon Sarnthoy	Planning and Technical Division
Mr Precha Surin	Plant Pathology and Microbiology Division
Mr Panya Poonyathawon	Entomology and Zoology Division
Mr Damri Thavornmart	Soil Science Division
Mr Suraweth Krishnasrani	Agricultural Engineering Division
Mr Prasert Anupunt	Si Sa Ket Horticulture Research Centre
Dr Montien Somabhi	Khon Kaen Field Crops Research Centre
Mr Nathavudh Bhasayavan	Farming Systems Research Institute
Mr Vichien Sasiprapa	Farming Systems Research Institute
Mr Suphachai Banglieng	Farming Systems Research Institute
Mr Vicharn Votong	Farming Systems Research Institute
Mr Rasamee Kirithavip	Farming Systems Research Institute
Mr Somporn Isaranurug	Farming Systems Research Institute
Mr Nichai Thaipanich	Farming Systems Research Institute
Mr Karsedis Distabanjong	Surat Thani Rubber Research Centre
Mr Waivit Buranatham	Chacherngsao Rubber Research Centre
Mr Poonsup Piya-Anant	Bureau of Budget
Ms Chidchom Saridratyothin	Bureau of Budget
Miss Puckinee Premyodhin	Civil Service Commission
Mr Kowit Nualvatana	Department of Agricultural Extension
Ms Boonluck Seetanun	NARP
Mr Bryan Gorddard	ACNARP
Dr David Ivory	ACANRP
Dr Larry W. Harrington	CIMMYT
Mr Iain Craig	NERAD

ABBREVIATIONS

ACNARP	Australian Cooperation with the National Agricultural Research Project, Department of Agriculture, Thailand.
BOB	Bureau of the Budget, Thailand.
CIMMYT	The International Maize and Wheat Improvement Centre.
CSC	Civil Service Commission, Thailand.
DOA	Department of Agriculture, Thailand.
DOAE	Department of Agricultural Extension, Thailand.
FSR	Farming Systems Research.
FSRI	Farming Systems Research Institute of the Thai Department of Agriculture.
MOAC	Ministry of Agriculture and Cooperatives, Thailand.
NARP	National Agricultural Research Project, Department of Agriculture, Thailand.
NERAD	North-East Rainfed Agricultural Development Project, MOAC, Tha Pra, Khon Kaen.

NARP and ACNARP

The National Agricultural Research Project (NARP) was proposed by the World Bank in 1975 to strengthen the Department of Agriculture's (DOA) research operations. The aim was to increase the development of new technology, which was necessary for the agricultural extension project also being implemented with World Bank assistance. The main areas identified for attention were the organization and management structure of the research system, particularly coordination of resources, and staff capacity and capability at field stations. The project aimed to decentralise research away from Bangkok and to reorganise research programs along multidisciplinary lines. Project cost was estimated at US\$91.5 million for staff training, provision of additional physical facilities and equipment and technical assistance for improving research programs. The loan agreement between the Bank and the Thai Government was signed on 19 December 1980.

Australia agreed to contribute to the technical assistance and training requirements of the NARP. This assistance was to be provided in five functional areas:

- research program planning;
- finance and administrative systems;
- research centre development;
- research training for DOA staff and support for research at Thai universities;
- scientific information systems.

The Australian Development Assistance Bureau (ADAB) entered into an agreement with the Western Australian Department of Agriculture (WADA) and the University of Western Australia (UWA) to manage Australia's contribution to the NARP (ACNARP). During 1981 advisers were provided on a short-term basis and the project was commenced by the managing agents in April 1982. Australian assistance was for a period of eight years to 30 June 1990, and is expected to total over AU\$18 million.

In addition to assisting the DOA to improve the quality and relevance of its research programs, ACNARP is most anxious to promote the linkage between DOA and DOAE, so that the strengthened research programs can generate benefits at the farm level.

FARMING SYSTEMS RESEARCH - FUTURE DIRECTIONS

BRYAN GORDDARD
ACNARP

There are several major schools of thought in "FSR" around the world, and there has not yet been any general agreement between them on methodology. It is hardly surprising, therefore, that there has been some confusion in Thailand as to the scope, purpose and techniques of FSR.

There have been many inputs to Farming Research Institute (FSRI) by consultants, dealing with the way in which FSR **SHOULD** be organised in Thailand.

ACNARP has made several of these inputs through its short-term and long-term advisers. However, ACNARP does **not** have a preferred or recommended FSR methodology. ACNARP has attempted to establish principles and guidelines for the work of FSR within the overall research function of the Department of Agriculture. As a result, ACNARP has become primarily concerned with the **LINKAGE** of FSR to the other components of the research process. ACNARP also believes that the research process must be linked to farmers via extension, and that FSR is the most appropriate way to build this linkage. For this reason, ACNARP has strongly opposed the separation of FSRI from the mainstream of DOA research. The principles of this linkage are set-out in my paper "Extension - Research : A Natural Linkage".

Farming Systems Research has recently come under increasing criticism overseas, and in Thailand, for having failed to fulfill its promise -- for failing to "deliver the goods." It is my opinion that a major cause of this disillusion with FSR has been the attempt to set up FSR as a quite independent "discipline" and to ignore the vital linkages with mainstream research and extension. There has also been confusion as to the exact nature of FSR itself.

Farming Research Institute in Thailand is now attempting to resolve these problems, and a number of in-house meetings have been held, most recently at Khon Kaen on May 31st 1987. There now seems to be support from FSRI for improved linkages with the other Institutes and Divisions of DOA and with DOAE. However there is still a lot of uncertainty in three main areas :

- (i) how to solve the administration problems of this linkage?
- (ii) which of the many FSR methodologies to adopt?
- (iii) how to involve extension in the process?

ACNARP wishes to assist FSRI and DOA to resolve these problems, by developing practical solutions which will be acceptable in the Thai administrative system. Therefore ACNARP has sponsored this high-level workshop on Farming Systems Research for executive-level staff of DOA, DOAE, CSC and BOB. This workshop will explore the scope and purpose of FSR in Thailand, and addresses the questions -

- what IS FSR ?
- how does it relate to traditional research and extension functions?
- what are the administrative problems with FSR?

The workshop aims to promote a common understanding amongst key senior administrators about the work of FSRI. It will also highlight the problems of linkage under current official staffing structures, and develop suggestions for overcoming these problems.

THE CIMMYT APPROACH TO FARMING SYSTEMS RESEARCH

DR L. HARRINGTON
CIMMYT ECONOMICS PROGRAM
BANGKOK

Overview

- 1) FSR concepts and terms
- 2) FSR as research
- 3) Some basics on research efficiency
 - priority setting, time frames
 - farmer adoption behavior
 - system interactions
 - defined areas, defined groups of farmers
 - social science input
- 4) CIMMYT procedures in adaptive research
 - defined areas, and domains
 - diagnosis
 - planning/priority setting
 - experimentation/kinds of trials
 - assessment/hypothesis testing
 - research/extension linkages

About CIMMYT

CIMMYT stands for the "International Maize and Wheat Improvement Center". It is an International Agricultural Research Center (like IRRI or ICRISAT) with a mandate for research on maize and wheat.

CIMMYT's Regional Office for Asia is in Bangkok. CIMMYT has other Regional Offices for:

- Central America/Caribbean
- Andean countries of S. America
- West Africa
- Eastern and Southern Africa
- Northern Africa and the Middle East

The major objective of CIMMYT is to strengthen national agricultural research programs by means of "intermediate products" such as:

- Improved germplasm
- Training opportunities
- Improved research procedures
- Networking opportunities
- Data and analysis

Many of CIMMYT's activities focus on FSR. CIMMYT has been active in systems-related research since the mid-1970's. One major example of CIMMYT activity in FSR is CIMMYT's technical supervision (on behalf of USAID) of 13

national FSR projects in Eastern and Southern Africa. In Asia, CIMMYT has collaborated in FSR activities with national programs in Bangladesh, Indonesia, Pakistan and the Philippines.

FSR Concepts and Terms

The term "FSR" has too many meanings. Almost any kind of agricultural research can claim some relationship to FSR. "FSR" has come to mean any kind of research that views the farm in a holistic manner, and considers interactions.

The essential characteristic of FSR is a farmer orientation. This means that researchers see farmers as their major client. A farmer orientation implies a sensitivity to farming systems interactions, and a willingness to keep these interactions in mind when designing or evaluating new technology. It also implies a desire to get useful new technology into farmers' hands as quickly as possible.

Here are some different possible kinds of FSR (all can have a "farmer orientation"):

- 1) Farming systems description
- 2) Research to overcome major environmental constraints through new land management systems
- 3) Research to invent whole new farming systems
- 4) Cropping pattern testing
- 5) Component technology research (when problems are defined and solutions selected using a systems perspective)
- 6) Plant breeding (when desirable characteristics are determined from a systems perspective, and testing is done under representative conditions)

Exercise 1 -- Identifying FSR

Which of the following are examples of FSR? (Which are characterized by a "farmer orientation"?)

- a) A group of graduate students from the University of Michigan come to Thailand to visit one village. They draw up flow diagrams of farm inputs and outputs. The major result of the study is a series of journal articles in Agricultural Systems.
- b) A research team in one site conducts cropping pattern testing. Although some farm practices are described (for the site), little is known about areas outside the site. Farmers and extension workers have little influence on the "improved pattern" (which is largely imposed by political considerations). No comparisons are made between the "improved pattern" and the farmers' practice.
- c) A rice breeder and a wheat breeder join a team of agronomists, social scientists and extension workers to study an area where most farmers grow a rice-wheat pattern. They join in diagnostic activities and learn how system interactions affect desirable characteristics for rice and

wheat varieties. Consequently, the rice breeder gives more attention to early maturity and non-photosensitivity (characteristics which allow wheat to be planted earlier and thus yield more). The wheat breeder gives more emphasis to tolerance to waterlogging (a special problem for wheat after rice). Rice and wheat varieties are tested in the context of the rice-wheat pattern.

FSR is not a set of procedures. It is, rather, something closer to:

- an attitude
- a perspective
- a way of looking at problems and solutions
- a sensitivity to interactions

If FSR is really a "frame of mind" and not a set of procedures, then there are a number of important implications:

- FSR practitioners need not treat the whole farming system as variable. (Some enterprises can usually be left unchanged.)
- FSR need not always stress the testing of alternative cropping patterns. (Sometimes, major opportunities to improve farmers' incomes are via improvements in crop management.)
- Component technology research (when conducted under representative conditions, with farmers' cooperation, and with a systems perspective) is valid FSR.
- Social science input in FSR is essential in understanding farming systems and using this understanding in taking research decisions.

"Holistic FSR" vs "Carefully-focused FSR"

Many researchers equate (quite incorrectly) the "farming systems perspective" and the notion of "research on the whole farming system". These two concepts can -- and should -- be kept separate.

The "farming systems perspective" is a way of seeing things from the farmers' viewpoint, of being sensitive to farming systems interactions, of understanding how the farming system operates.

"Research on the whole farming system" or "holistic FSR" is something quite different. It typically aims to design whole new farming systems, including new crop and livestock enterprises.

When taken to extremes, this becomes a search for "the final solution".

Sometimes, researchers conducting FSR feel uneasy or uncomfortable if they are not working on large numbers of crop and livestock enterprises. They feel like they're not really "doing FSR".

This unease is not warranted. "Holistic FSR" is not the only kind of FSR.

Characteristic	Holistic FSR	Carefully-focused FSR
Uses a farming systems perspective?	Yes	Yes
Necessarily restricted to pre-determined crops?	No	No
Can integrate research on crops and livestock?	Yes	Yes
Try to simultaneously change or improve most farm enterprises?	Yes	No
Restrict research to a few priority enterprises?	No	Yes
Focus on problems, causes and likely solutions?	Usually not	Yes
Design new FS?	Yes	No

The purpose of the above comparison is to explain why:

- 1) Practitioners of FSR need not be restricted to cropping pattern testing. There are usually major opportunities to conduct other kinds of research with a farmer orientation, using a systems perspective.
- 2) Cropping pattern testing itself is not FSR if improperly conducted (i.e., without an adequate farmer orientation).

Basic, applied and adaptive research

The term "FSR" can refer to virtually any research activity with a farmer orientation. Perhaps we need a different way to categorize research activities: Perhaps the "Traditional Research" vs "FSR" is not enough.

Some researchers are beginning to refer to "basic", "applied" and "adaptive" research.

Basic research aims to expand the frontiers of science. It focuses on new breakthroughs in theory and research tools. It rarely has (or needs) a farmer orientation.

Applied research is aimed at developing new technological components (e.g. new crop varieties, or new kinds of equipment).

Note that applied research can be conducted on-farm as well as on-station (e.g., multi-location testing of a new variety). Applied researchers can best obtain the "farmer orientation" that they need by participating in diagnostic activities, with other researchers and extension workers.

Adaptive research aims at tailoring available technology to specific defined areas and defined populations of farmers. It aims to solve problems.

Adaptive research can only be properly conducted when researchers have a strong farmer orientation.

Both applied and adaptive research need a farmer orientation. Diagnostic activities to stratify farmers into homogeneous populations, and to analyse important productivity problems, are as important to plant breeding programs as they are to cropping pattern testing.

Typically, too little emphasis is placed on diagnostic activities for applied research programs.

Exercise 2 -- Categories of Research

For each of the following, categorize the research activity into basic, applied or adaptive research. Then categorize it in terms of FSR vs non-FSR (farmer orientation vs no farmer orientation).

- a) A scientific team studied the possibility of developing gene splicing tools, in order to produce drought-tolerant rice and deep-water wheat.
- b) A team of agronomists, social scientists and extension workers determined that previous maize breeding activities were inappropriate. Earlier efforts produced maize varieties with weak stalks (that were pulled down when planted with the farmers' climbing bean varieties). Maize breeding was changed and a stronger emphasis was placed on stalk strength and on testing in farmers' fields.
- c) An interdisciplinary team conducted diagnostic activities in one area, and decided that the single most important problem affecting maize productivity was weed competition. The area was characterized by extreme labor scarcity and farmers were already using chemical weed control. The 2,4D treatment (farmers' practice), however, did not control the grassy weeds that caused the problems. Researchers found that a mixture of atrazine and paraquat controlled weeds well, and was extremely profitable. After screening this practice for farming systems compatibility (herbicide residual effects, input availability, risk, etc.), they began multiple-location testing.
- d) An interdisciplinary team in another area decided that nothing could be done to improve the productivity of the farmers' major crop, rice. Land and moisture were available for a second crop, so cropping pattern testing was begun. Since farmers typically worked off-farm after the rice harvest, researchers focused on crops and management practices that required little labor input.
- e) A cropping pattern testing team moved into a new site. They designed an alternative cropping pattern based on researchers' judgment and conventional wisdom, then planted it at 15 locations within the site. They conducted no diagnosis, did not compare the introduced cropping pattern with the farmers' practice, and did not analyze their results. The potential farmer clients (who might be able to use the new pattern) were never very well defined.

FSR as Research

FSR should be seen as a kind of research. As such, it should use the scientific method.

The hallmark of the scientific method is the developing and testing of hypotheses.

Researchers use a conceptual model to develop specific, testable hypotheses, which are then rigorously tested. Inappropriate hypotheses are discarded and new hypotheses may be included at any time. The model itself may be modified or entirely replaced.

In FSR, researchers should have a conceptual model of major dimensions of the farming system, and major internal and external interactions and linkages.

Specific hypotheses may be generated with respect to:

- major problems (that limit productivity)
- major causes of priority problems
- systems interactions that affect problems, causes, or appropriate kinds of solutions
- solutions to problems

These specific hypotheses should then be rigorously tested (in the most appropriate way) under representative conditions.

Here are some examples of specific, testable hypotheses:

- Shootfly damage causes major yield loss in the second maize crop.
- The efficiency of Nitrogen applied to upland rice is quite low (low yield increase per kg of N applied).
- Labor is scarce in July (maize weeding time) because farmers are also engaged in transplanting lowland rice.
- A need to compensate for expected low seed germination rates is one cause of the farmers' overplanting practice.
- One cause of farmers' not applying fertilizer to their maize is that there is much weed competition in maize fields.
- One possible solution to the problem of low N efficiency would be to apply some P (and part of the N) at planting, instead of applying N only at 30 days farmers' practice).

Note that:

- 1) Hypotheses should be drawn from a conceptual model that makes sense.
- 2) If "researchers" are not developing and testing hypotheses, they are not really conducting research -- they are not using the scientific method.

Different hypotheses are best tested in different ways. For example:

- If the hypothesis is, "Shootfly damage is very heavy on maize in the second crop, especially on late-planted fields", then the best way to test it is through a survey of farmers' fields, to measure shootfly damage. A cropping pattern trial will not answer this question very efficiently.

Data collection tools (to test hypotheses) in adaptive research may include:

- Exploratory surveys
- Formal surveys
- Cropping pattern trials
- Researcher-managed on-farm trials
- Farmer managed trials
- Field observation/surveys
- Secondary data

Exercise 3 -- Selecting Data Collection tools

Name one or more sources of data for testing the following hypotheses:

- 1) The application of compound fertilizer to first-season maize is not profitable given current prices. _____

- 2) Most soils in the study area are not deficient in phosphate. _____

- 3) Maize thinnings are not an important source of fodder for livestock in the study area. _____

- 4) Farmers could profitably plant a peanut crop after their second-season maize crop. _____

Research Efficiency

Researchers should always be concerned with research efficiency. Research efficiency is measured by benefits accruing to producers and consumers (due to farmer adoption of new technology) per unit of money invested in research.

Efficient research activities (leading to large benefits) are good for everyone -- farmers, consumers, traders, the government, etc.

Research resources are limited. Research resources include:

- Skilled manpower
- Transport and petrol allowance
- Operational budget for inputs and per diem.

These resources are scarce and should be used in the most effective manner. Otherwise, researchers will lose credibility.

For research to be efficient, priorities have to be carefully set. Here are some common criteria for setting priorities:

- 1) Research on important problem is preferred to research on less important problems.
- 2) Research leading to rapid farmer adoption of new technology is preferred to research leading to slow farmer adoption of new technology.
- 3) Research on problems affecting many farmers is preferred to research on problems that only affect a few farmers.
- 4) Inexpensive, rapid research procedures are preferred to expensive, complex research procedures.

One dimension of research efficiency that is usually overlooked is farmer adoption behavior.

Farmers (as a group, and over a reasonable period of time) tend to be rational decision-makers -- they tend to allocate their scarce resources fairly efficiently.

Furthermore, it is a documented fact that farmers normally adopt new technology piece by piece, that is, in a stepwise manner. This means that they will normally pick up one or two inputs or practices at a time, and fit them into their farming system.

Another dimension of research efficiency that is commonly over-looked is the numbers of farmers affected by research. Many researchers conduct their field activities with little idea of the population of farmers who can be expected to make use of research results.

Researchers need a fairly good idea of who they are working for -- which farmers, in which districts, under which conditions, form the "clientele" for a particular research activity.

Farming Systems Interactions

Finally, researchers need to have a good feeling for major farming system interactions. This is true for both applied research and adaptive research.

However, many researchers (including FSR practitioners) only look at one or two kinds of interactions.

Here is a suggested classification of farming system interactions:

- 1) Direct interactions between crops
 - Interactions in space (e.g. intercropping)
 - Interactions over time (e.g. carry-over of soil structure, crop residues, fertilizer, weed seeds, etc. from one crop to another in a pattern).
- 2) Interactions between crops and livestock
 - Use of crops and residues as fodder
 - Use of manure as fertilizer
 - Use of animal traction for tillage

- 3) Resource competition and complementarity
 - Conflicts in labor use between enterprises
 - Competition for irrigation water between enterprises.
- 4) Meeting multiple objectives of farm households
 - Choice of crops and practices to manage risk
 - Planting and storage of food crops balance seasonal food needs.

Many of these interactions can only be measured through survey techniques. Thus social science input of some kind is essential in FSR. (This can mean, of course, training of agronomists in field survey techniques.)

CIMMYT Procedures for Adaptive Research

The objective of this section is to describe the kinds of procedures used by CIMMYT staff in adaptive research. If FSRI is interested in some of these procedures, they may well have to be adapted to fit the special circumstances of FSRI.

Here is an overview of steps in the adaptive research process:

- 1) Diagnosis
- 2) Research planning
- 3) Experimentation
- 4) Assessing research results
- 5) Technology transfer

Note that all of the steps are conducted in each cycle of research.

Also note that these steps are conducted in the context of national policy and objectives, using available technology "off the shelf".

Diagnosis

Diagnosis is the process of collecting data to assess farmers' circumstances. It involves obtaining primary data to be used in the next step (research planning).

Diagnosis is a continuous process -- it is not a "site description", performed once and then forgotten. It follows a "sequential" approach -- that is, further diagnostic work is planned in light of what has already been learned.

Diagnosis is used to develop hypotheses on problems, causes, solutions and system interactions.

Since the emphasis is on developing (not testing) hypotheses, researchers can be flexible in the choice of data gathering tools.

As a general rule, researchers should use the cheapest data collection tool that gives the required degree of precision.

Some tools commonly used in diagnosis are:

- Rapid rural appraisal (exploratory survey)
- Formal, single-visit surveys
- Direct observation of farmers' fields
- Analysis of secondary data

Exercise 4 -- Sources of Information

For each of the following statements, choose the type of data collection technique most appropriate for verifying the statement.

Types of Data Collection

- A. Secondary data
 - B. Exploratory survey
 - C. Formal survey
 - D. Experiments
 - E. Special studies
-
1. The majority of farmers grow their maize in association with beans.
 2. The rainy season usually begins the middle of June.
 3. Those farmers that rotate their wheat with pasture have less nematode problems.
 4. There is a strong yield response in wheat to additional potassium.
 5. Those farmers with less than 2 ha of land are less likely to plant cotton.
 6. Local moneylenders are charging 5% per month interest.
 7. It is economic for farmers to use Furadan on their maize.
 8. The average application rate of N on wheat is less than 50 kg/ha.
 9. Farmers do not know about chemical weed control.
 10. The population of the research area has doubled in the past twenty years.

Research Planning

The purpose of the following sections is to describe CIMMYT procedures in research planning. These procedures emphasize: understanding problems and their causes, and setting priorities.

Here are some of the basic criteria that researchers are often encouraged to use in selecting priority research themes:

- 1) Importance of the enterprise (to which the problem corresponds)
- 2) Number of farmers who can benefit from a solution of the problem
- 3) Severity of productivity loss caused by the problem
- 4) Frequency of productivity loss
- 5) Likely cost of research to solve the problem (and the relevant time frame)
- 6) The existence of apparently feasible solutions to the problem

These criteria are helpful, but they are not helpful enough. An explicit set of steps is needed, that researchers can follow in the field.

A Suggested Set of Steps for Setting Priorities in On-farm Trials

- 1) List problems
- 2) Prioritize problems
- 3) For each priority problem, identify causes
- 4) Diagram problems and causes to show interactions
- 5) List possible solutions to well-defined problems
- 6) Screen possible solutions for farming systems compatibility, research cost, likely profitability and risk
- 7) Select priority solutions (experimental variables) to be tested under farmers' conditions

Note

- Priorities are set at two levels:
 - problems
 - solutions
- Selection of enterprise to be studied is part of the process, not pre-determined
- Emphasis on understanding causes of problems
- Role of judgment
- Role of farming systems perspective

Step 1 : List Problems that limit yields or productivity, or lead to resource inefficiency

Example A: List Problems Limiting the Productivity of the System (Malang, East Java)

Problem	Evidence available	Further evidence needed
Farmers' maize varieties have low yield potential	On-station experiments, maize yield surveys with crop cuts, visual observation	On-farm variety trials
Overplanting & thinning causes interplant competition & reduces maize yield	Visual observation	On-farm trial featuring lower planted density
N efficiency on maize is very low	Visual observation, 2 kg of maize produced per kg of N applied	None
Upland rice shows signs of P deficiency	Visual observation	Exploratory trial
Cassava varieties have low yield potential	On-station experiments	On-farm variety trials
Papaya orchards have disease problems	Visual observation	None

Example B: Maize-Related Problems in S Bukidnon

- 1) N deficiency
- 2) Low fertilizer efficiency (all nutrients)
- 3) Weed competition (aguingay)
- 4) Borer
- 5) Varieties with low yield potential
- 6) Low land use efficiency (cropping pattern could be intensified)

Exercise 5 -- Identifying Problems

Which of the following are problems as we have defined them?

- 1) Sesame yields are low because of poor plant stand.
- 2) Marketing is a major problem.
- 3) Cash is scarce and interest rates are too high.
- 4) Maize appears to suffer from nitrogen deficiency and weed competition.
- 5) Farmers don't apply fertilizer.
- 6) Hybrids can outyield open-pollinated varieties.

Step 2 : Assign Rough Levels of Priority to Problems

- automatically gives priority to some enterprises
- use criteria:
 - importance of enterprise
 - importance of problem
 - domain size

Ranking System:

- 0 = little importance
- X = some importance
- XX = high importance

Example A: Malang, Indonesia

Problem	Importance of the enterprise	Severity of problem	Domain size	Rank ^{1/}
Farmers' <u>maize</u> varieties have low yield potential	XX	X	XX	2
Overplanting & thinning causes interplant competition & reduces <u>maize</u> yields	XX	XX	XX	1
N efficiency on <u>maize</u> is low	XX	XX	XX	1
<u>Upland rice</u> shows N & P deficiency	X	XX	X	2
<u>Cassava</u> varieties have low yield potential	0	X	XX	3
<u>Papaya</u> orchards have disease problems	X	XX	0	3

^{1/} Rank 1 has the highest priority

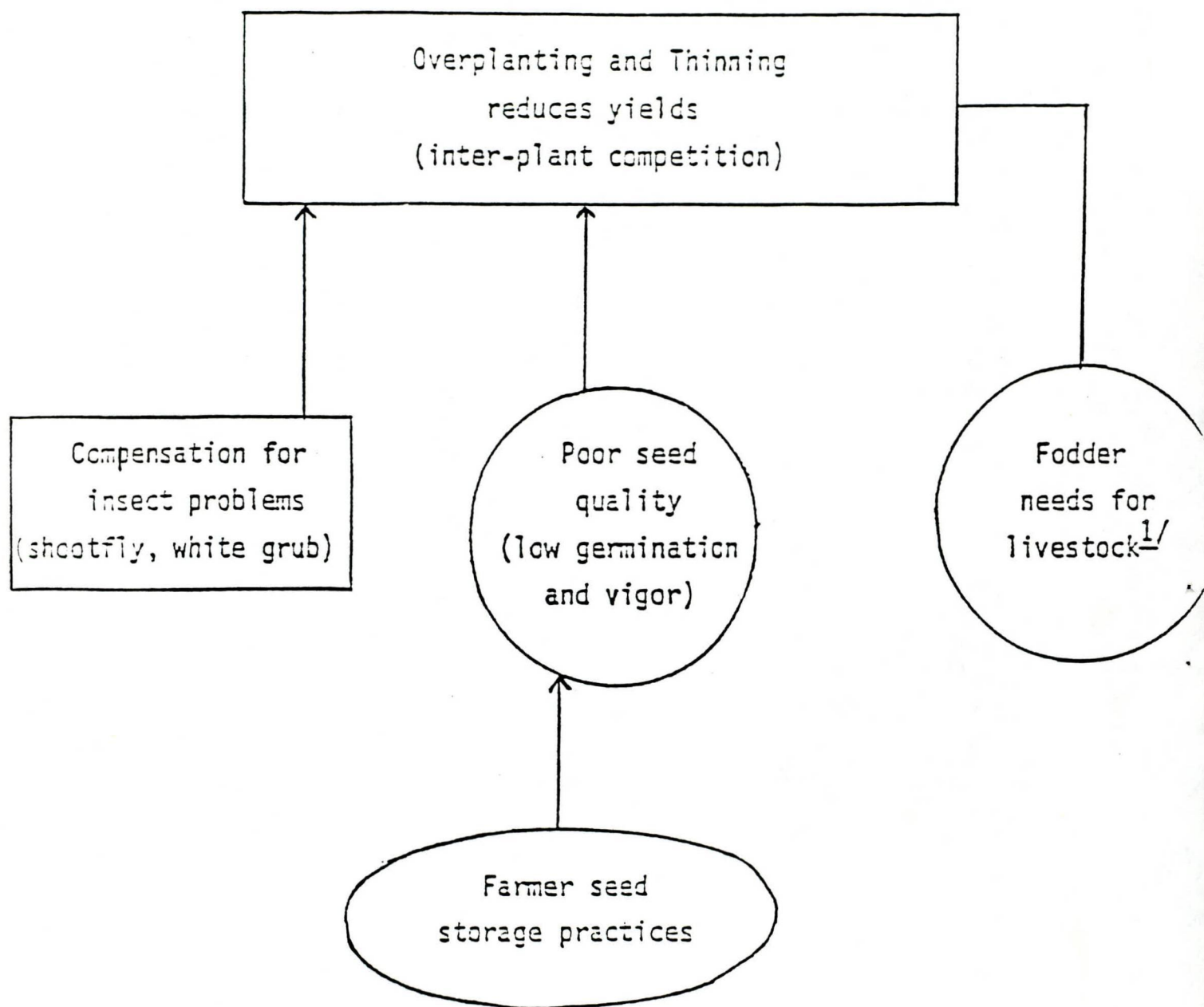
Example B: Ranking Maize-Related Problems for S Bukidnon, Philippines

Problem	Problem severity	Problem frequency	Rank
1) N deficiency	XX	XX	2
2) Low fertilizer efficiency	XX	XX	2
3) Weed competition	XXX	XX	1
4) Borer	X	X	4
5) Varieties with low yield potential	X	XX	3
6) Land use efficiency	X	XX	3

Step 3 : Identify the Cause of Selected Problems.

If the causes of a problem are not understood, you may waste time and resources on naive and inappropriate solutions.

Figure 2: Causes of Overplanting/Thinning, Malang, East Java



^{1/} Not an important cause.

Figure 3: Some problems have a chain of causes

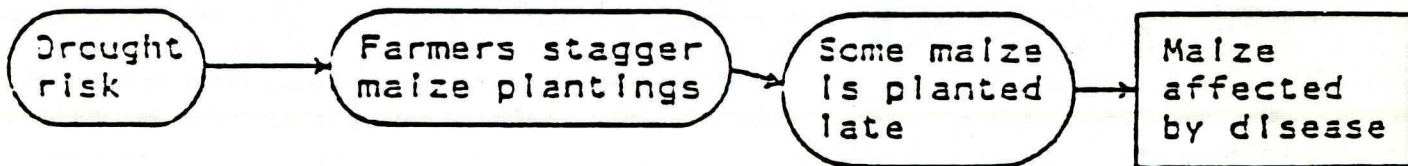


Figure 4: Some problems have multiple causes:

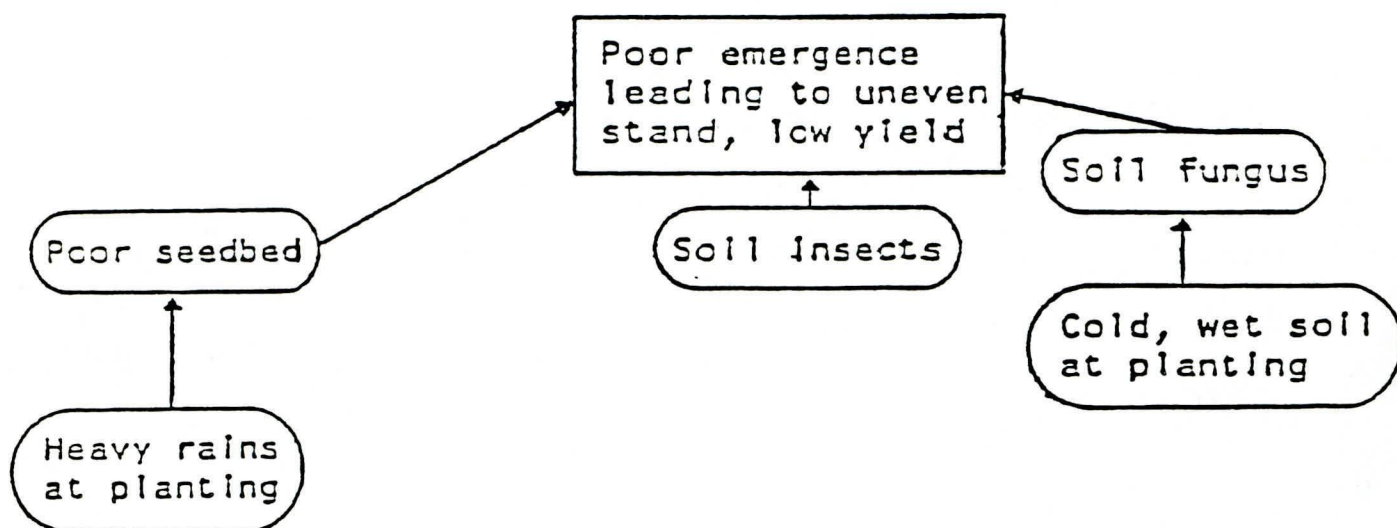


Figure 5: One problem can be the cause of another problem

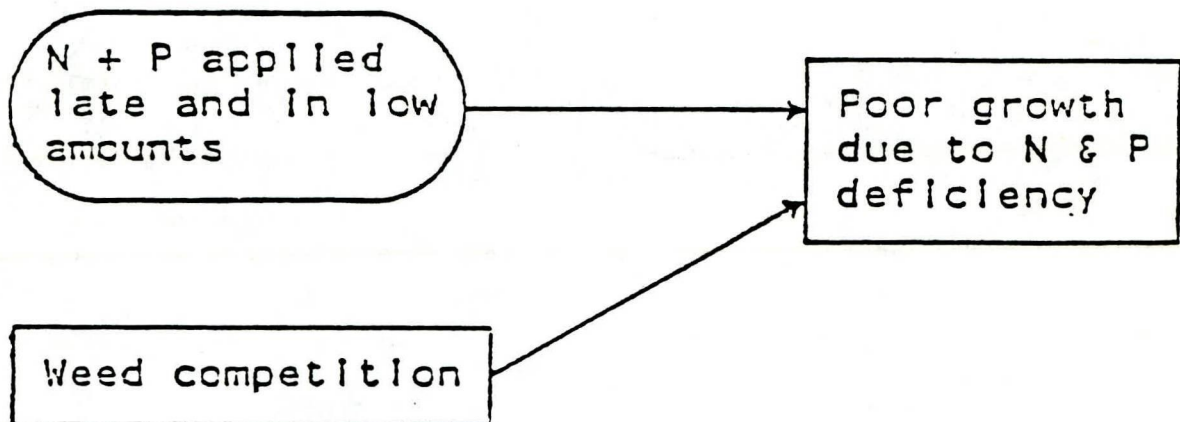
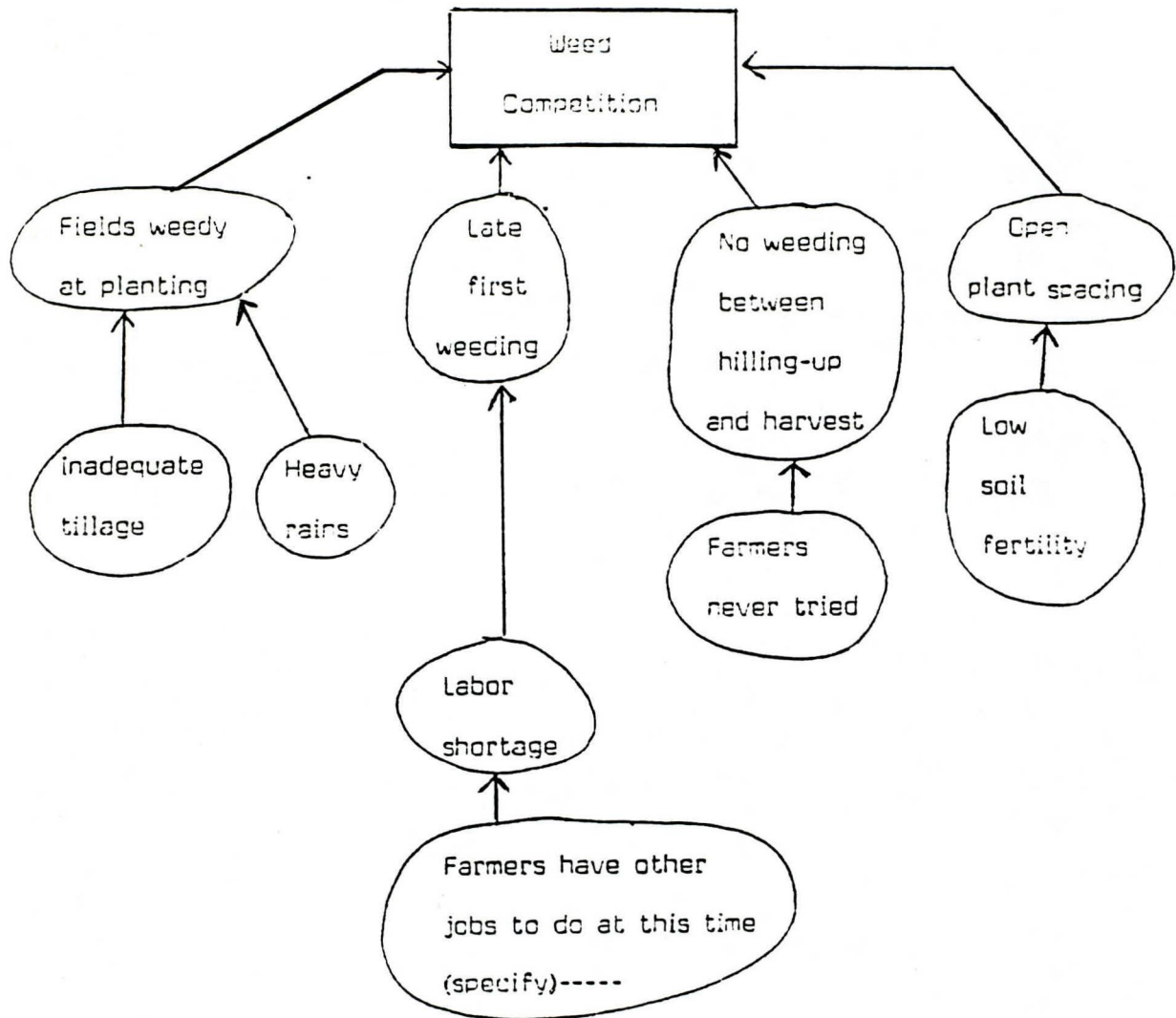


Diagram (Weed Competition)



Exercise 6 -- Problems and Causes

Given the following information, draw a diagram of problems and their causes.

In parts of NE Thailand, mungbean (planted before lowland rice, under irrigated conditions) seems to suffer from uneven plant stand, and also from late season moisture stress. Plant stand problems are attributed to waterlogging in low spots, in turn due to uneven field topography and slow drainage. Farmers only irrigate their mungbean once (before planting), although water continues to be available throughout the season. Late irrigation, it seems, tends to damage the remaining plants in low spots, again because of uneven field topography and poor field drainage.

(Exercise for completion by Workshop participants)

Step 4 : Diagram Relationships Among Problems and Causes

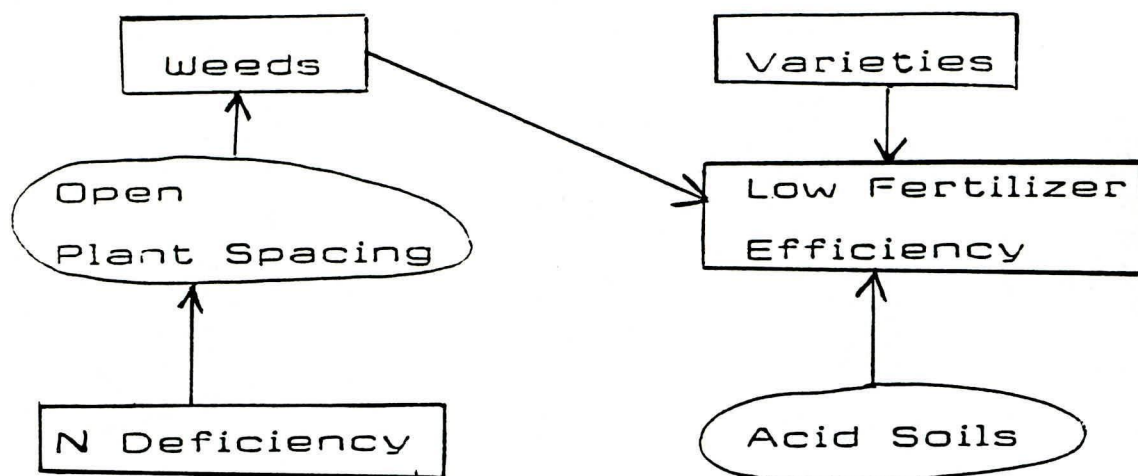
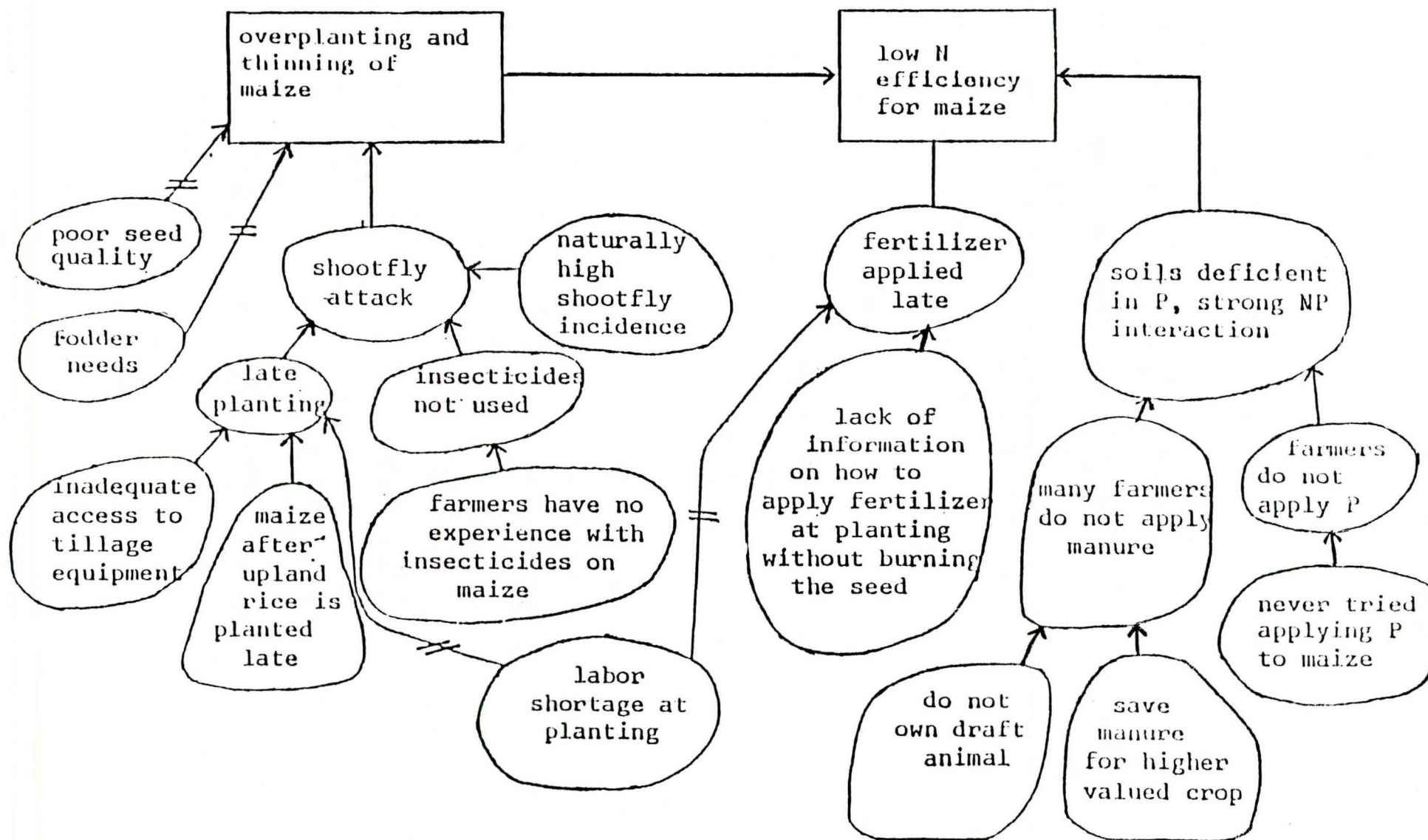


Figure 6. Priority Problems and Their Causes, Malang, East Java



≠ Not an important cause

Step 5 : List Possible Solutions (in light of causes of the problem)

Example A: Possible Solutions to Selected Problems, Malang, East Java, Indonesia

Problem	Possible Solution ^{1/}
1) overplanting & thinning reduces maize yields	1a) use of insecticide to control shootfly attack, thus allowing farmers to reduce seed rates (research to enable farmers to plant maize earlier after upland rice:) 1b) - tillage systems for upland rice 1c) - tillage systems for maize after upland rice
2) low N efficiency for maize	2a) apply P (TSP) 2b) apply N & P at planting (sidedress N also) 2c) apply more manure 2d) reduce seed rates (see problem 1) 2e) look into solving possible micro-nutrient deficiencies

^{1/} Not all possible solutions are listed here, just some of the major ones.

Example B : Possible Solutions to Weed Problems S Bukidnon (Philippines)

- 1) Treatments to improve tillage (fewer weeds at planting)
- 2) Treatments to allow an earlier first weeding (different implements, chemical weed control, etc.)
- 3) Treatments for weeding between hilling-up and harvest ("continuous weeding")
- 4) Closer plant spacing (in conjunction with N application?)

Exercise 7 -- Identifying Possible Solutions:

Given the following information list several possible solutions to the specified major problems. First, diagram problems and causes.

Farmers in Zambia (E. Africa) have a number of problems that affect their maize crop. These include heavy disease attack (for late planted maize fields), and late season drought. Many farmers plant their maize fields late because of inadequate draft power for land preparation. It seems that draft animals are too weak to work very hard at the beginning of the rainy season, because of shortage of fodder during the dry season.

Step 6 : Screen Solutions for System Compatibility, Research Cost, Expected Profitability, Risk

Example A : Checking Farming System Compatibility (General Format)

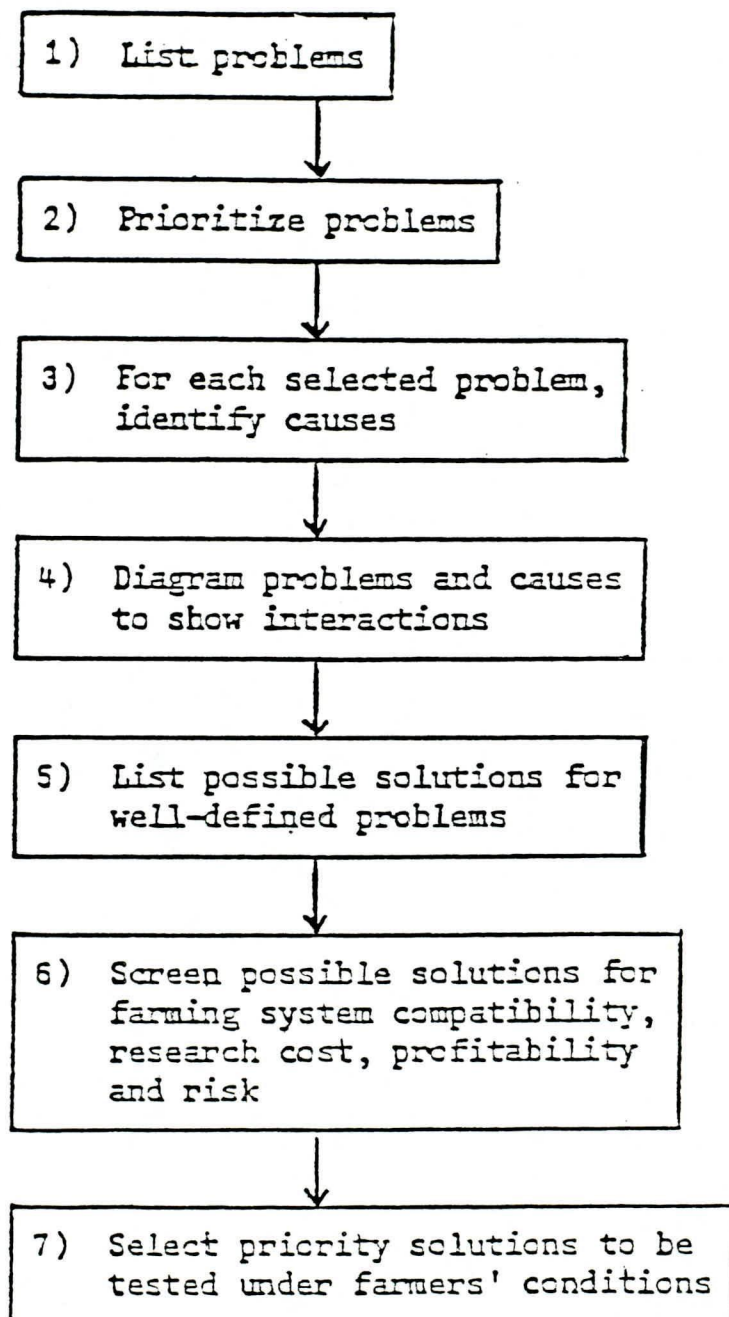
Aspect of farming system	<u>Possible solutions</u>		
	Solution 1	Solution 2	Solution 3
Landuse & cropping calendar			
Cash & credit resources			
Labor resources			
Draft Power resources			
Input availability			
Family food requirement & preferences			
Livestock feed requirements			
Other			

Example B: Example of Screening Possible Solutions (Malang, Indonesia)

Criteria	Possible Solution: Insecticide Use
System compatibility:	No problem
Research cost:	Low (could use a superimposed trial with & without insect control, or a 2 x 2 factorial of insect control by density)
Technical feasibility:	High (Furadan is used for shoot-fly control in many regions)
Expected profitability:	High (cost increase is negligible and is partly repaid by lower seed cost. Less than 100 kg/ha yield response is sufficient to pay for increased costs)
Divisibility:	High (Farmers can try Furadan on small areas)
Risk:	Reduces risk of yield loss due to insect attack. Yield variability should decrease

Step 7 : Select Priority Solutions for Testing

Figure 1: Steps for Setting Priorities in On-Farm Trials



Experimentation

Researchers need to use different kinds of trials for different purposes.

Some trials are needed to properly define problems (e.g., is there a response to phosphate or not -- is P deficient or not?)

Other trials are needed to identify profitable rates of inputs, or select the more profitable practice from several alternatives.

Yet other kinds of trials are needed to confirm that previous research results are stable and valid for large, defined areas and populations of farmers.

In CIMMYT terminology, trials to properly define problems are called exploratory trials. These tend to be small-plot, with full-factorial designs.

Note that rapid rural appraisal, farm surveys, field observation and secondary data can also help define problems. Experiments are not the only method.

In CIMMYT terminology, trials to identify profitable input levels, or profitable practices are called levels trials.

Levels trials can be conducted as small-plot researcher-managed trials, or superimposed trials.

Note that the selection of experimental variables for levels trials is made through the research planning process outlined earlier.

In CIMMYT terminology, verification trials are trials to confirm that profitable practices identified in levels trials) are consistently and reliably profitable for most farmers in a large, defined "study area".

Verification trials are usually farmer-managed (except, at times, the experimental variable), use large plots, are replicated over locations (not within locations), and are jointly implemented by researchers and extension workers.

Cropping pattern trials are useful to assess new alternative crops for farmers in a defined area, but are quite inefficient for testing new component technology.

In any particular cycle of research, (for a particular defined area), researchers may simultaneously plant exploratory trials, levels trials, and verification trials.

All three kinds of trials should be planted under representative conditions, with farmer cooperation, at several locations spread around the defined study area.

Sites, Zones and Domains:

Now that we have begun to talk about spreading trials around a "study area" or a "defined zone", it is appropriate to discuss this concept in more detail.

Organizing Research by Zones

At present, much agricultural research in Thailand seems divided into two organizational extremes:

- 1) Some research pretends to be valid at the national level, e.g., research leading to national maize variety and cultural management recommendations. These recommendations are unsuitable for many farmers, given the variability of environments in which production takes place.
- 2) At the other extreme, many other research activities are conducted at the research "site" level. (A site is usually no larger than one or two villages.)

Many researchers have little knowledge in farming activities that take place outside of the site. Sometimes, researchers don't begin to become acquainted with the "extrapolation area" for which they are working until several years into the research process.

Research at a site can be quite misleading -- when the site is not representative of any larger extrapolation area of interest.

This can easily happen when researchers are not sufficiently familiar with the "clients" for their research -- the population of farmers outside of the site who can be expected to use researchers' results.

An alternative to "national-level research" or "site-specific research" might be "zone-level research". Research at the zone level would avoid much of the irrelevance of national recommendations, while avoiding the intense introspection of site-based research.

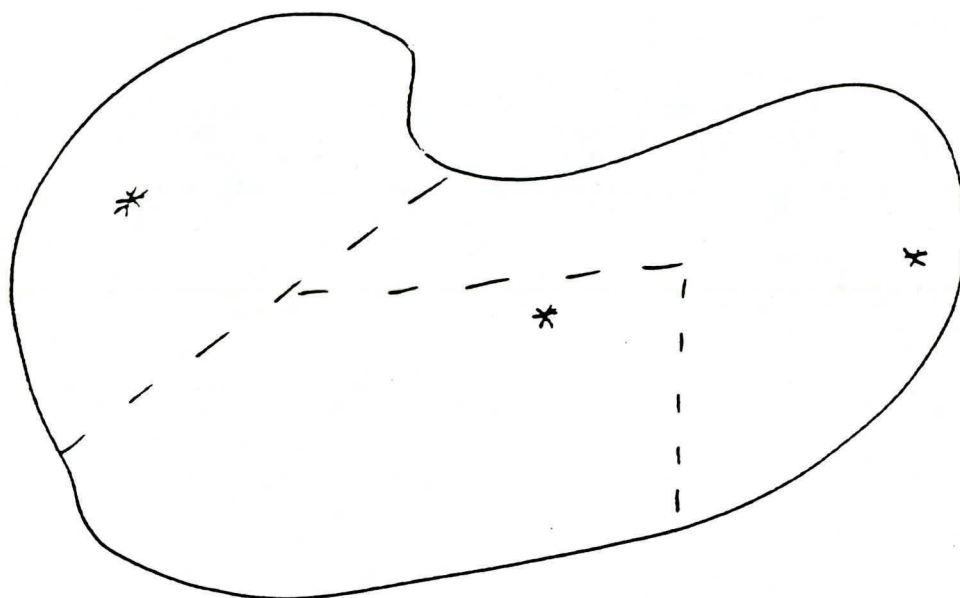
A "zone" or "study area" is merely a reasonably large geographical area (5,000 - 50,000 ha or more) in which farmers follow fairly similar cropping patterns under fairly similar conditions.

In many cases, zones can be defined by "conventional wisdom". Farmers, traders and extension workers will often refer to particular zones, and can usually point out some of the differences between zones.

Examples of maize-based zones in Thailand might include:

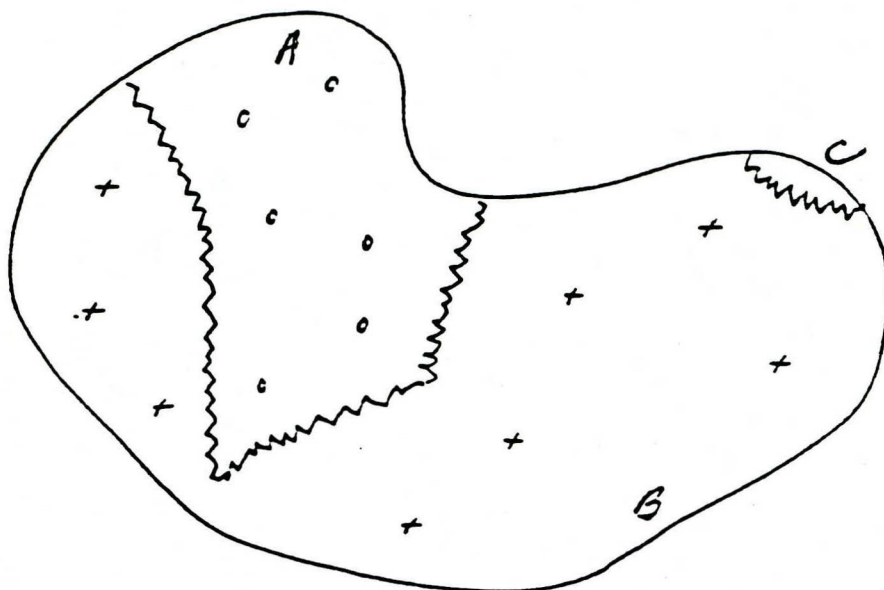
- Areas around Phaisalee with hilly land-types and relatively severe weed problems.
- Areas in Tak Fa and Ta Khli on black soils, with a fairly flat topography and few weed problems.

Example -- Site Locations in "Region 13"



----- provincial boundary
* research site

Example -- Maize Zones in "Region 13"



----- zone boundaries

° research locations zone A

+ research locations zone B

A zone level approach to research organization can help increase research efficiency in a number of ways:

- It sharply defines the "client" group of farmers (farmers for whom research is being conducted).
- It facilitates early multiple-location testing (on selected components). It allows researchers to more thoroughly understand the variability found within the zone.
- It facilitates diagnosis and research planning relevant to the whole population of "client" farmers.
- It encourages more effective research-extension links.

Note --- a zone approach to research organization need not be restricted to maize. Any enterprise (or potential enterprise) for a zone may be a candidate for research activity.

For example, in one zone, the major pattern is maize-maize, with a few farmers growing peanut, and some interest in soybean. Research could focus on one, some, or all of these enterprises.

Assessing Research Results

The weak point of many research organizations is in assessing and using research results.

This is unfortunate, because a lot of time, effort and expense goes into planting sets of trials -- the results of which are then not fully used.

Assessing research results for a defined study area implies at least four kinds of analysis.

- 1) Making agronomic sense of trial results for each experimental location.
- 2) Assessing statistical significance of trial results, location-by-location as well as over all locations in the defined area (zone).
- 3) Examining the profitability of new technology through economic analysis of data pooled over locations.
- 4) Using the analyzed data to test hypotheses developed during diagnosis and research planning.

This implies relating the results of one cycle of research with results from previous cycles.

These comparisons are conducted with respect to specific hypotheses relevant to a specific defined study area.

Example A: Summary of finding on plant protection, 1984-1986.

Activity	Cycle	Results
Exploratory trial	1	Trials were heavily damaged by shootfly. No control measured were used. Plantings were 2-4 weeks later than the main planting time.
Verification trial	3	Use of the carbofuran treatment, superimposed on the unmodified farmer practice, resulted in a 850 kg/ha yield response (8 locations)
Verification trial	4	The carbofuran treatment, superimposed on the improved practice, increased yields by 700 kg/ha. (1 location)
Shootfly survey	4,5	Observations were made on three-week-old plants. Maize planted early in each season showed shootfly incidence ranging from 1 to 30% in the rainy season and from 8 to 51% in the post rainy season. Maize planted 3-4 weeks later in each season showed shootfly incidences of up to 80%. These records, however, do not include those plants that died and disappeared in the 3-week period between seeding and record taking. Thus the incidence of damage may have actually been higher than recorded.
Shootfly trial	4	Carbofuran treatment gave a 900 kg/ha yield response (1 location on-station)
Verification	5	Yield response of 746 kg/ha to carbofuran application (3 locations)

Source: MARIF, 1984-1986.

N.B. Trials were planted early in cycles 4 and 5, leading to levels of shootfly infestation lower than observed for neighboring farmers.

Research Linkages

The kinds of research activities described usually help bring about improved research linkages.

These include internal linkages (between researchers of different disciplines) and external linkages (between research and extension).

Cooperation between researchers and extension workers is especially enhanced by joint management of verification trials.

Cooperation among researchers can be enhanced through joint diagnosis for a particular defined area.

If researchers from different disciplines (and institutes) can agree on what are major problems, the causes of these problems, and relevant system interactions, it is usually quite easy to see how each discipline and institute can contribute to the solution of priority problems.

The Relationship of FSR to Discipline and Component Technology Research

D.A. IVORY
ACNARP

The effectiveness of farming systems research (FSR) in the DOA will be greatly influenced by the degree of interaction and cooperation obtained between the FSRI, commodity institutes and technical divisions. Throughout the world there has been and increasing awareness that there is a need within agricultural research organizations for a group of scientists who can integrate individual pieces of research into technological packages which are relevant and acceptable to farmers and which improve their socio-economic situation. The need for multidisciplinary research and development has occurred because of the great advances in scientific knowledge and consequent scientific specialization which has created an emphasis on compenent research.

The need for groups which can promote and undertake multidisciplinary research and development can be met by FSR groups within research organizations. Such groups as the FSRI in the DOA can provide a vital role in :

- (i) Conducting multidisciplinary research on farms to overcome problems or constraints to agricultural production that have been identified by farmers, extension specialists, industry and researchers.
- (ii) Conducting innovative multidisciplinary research on farms and research stations to develop new technologies or opportunities to intensify or diversify farm production.
- (iii) Developing close links and involvement of discipline and extension specialists and farmers in problem identification, research and technological development.
- (iv) Identifying and encouraging research by discipline specialists on specific problems which occur in production systems on farm.

I believe the purpose of this seminar is to provide a forum in which all concerned can discuss and formulate practical guidelines as to how the FSRI can fulfill this very important role within DOA. Throughout this talk I would like to make some definite suggestions on several aspects of FSR in the DOA to provide points for further discussion.

Firstly however I would like briefly to discuss the structure and function of the FSRI and its relationship to the regional centres and technical divisions. This has a bearing on how FSR can function effectively within the DOA.

1. Structure and function of the FSRI

In my report of November 1986 I considered the existing structure and staffing of the FSRI and made some suggestions as to how I thought the effectiveness of the FSRI could be increased by changes in function and by structural and staff changes.

I suggested that the FSRI would become a more effective research unit of the DOA if the following recommendations were adopted :

- (i) A regional concept of operations should be adopted where FSR is co-ordinated and controlled at the regional level.
- (ii) More FSRI staff should be based at regional centres so that FSRI staff can be actively associated with promoting and aiding interdisciplinary research with staff of commodity Institutes and Technical Divisions and cooperation with DOAE staff and farmers.
- (iii) To achieve the above there needs to be a major transfer of staff, particularly senior staff, to the regional centres to enable good regional leadership and research experience at these centres.
- (iv) Consideration needs to be given to the location of FSRI staff in the east and southern regions to support the research activities of the DOA in these regions.
- (v) Staff should be transferred to selected Field Crop and Horticulture Research Centres where presently there are no FSRI staff.

Some of these changes have been implemented but I feel it is still necessary to take these changes further to improve the effectiveness of FSR in the DOA.

The other aspect I would like to give emphasis to is the structure of FSRI because I believe that this also has an important bearing on the effectiveness of FSR

Within the FSRI there are two official research groups, the Cropping Systems Group and Crops Environment Group. These two groups are internally organized into three further sections as shown in figure 1.

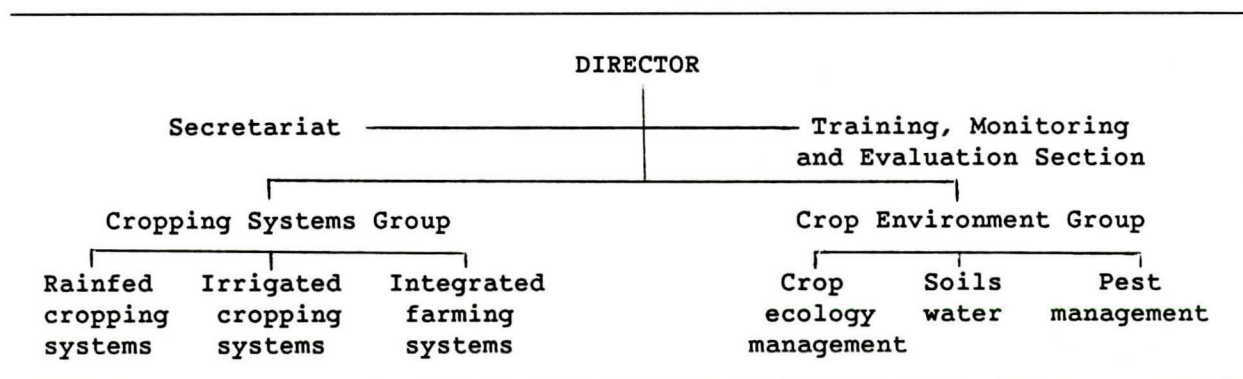


Figure 1: The present organization of the FSRI.

I believe however this structure is not the most appropriate structure for the following reasons:

- (i) The structure is not oriented towards a regional concept of FSR activities and operation.
- (ii) The structure contains an integrated farming system group which is intended to provide integrated research of cropping with livestock, fisheries, etc. I believe that there are insufficient staff with a livestock or fisheries background in FSRI and that integrated research should be on the basis of cooperative projects with the Livestock Development or Fisheries Departments.

- (iii) There is a pest management group which is intended to provide research on weeds, insects and disease. I believe these functions should be covered by cooperative interdisciplinary research with staff of the respective technical divisions.
- (iv) There is no grouping which covers aspects of socio-economic analysis, farm management and systems analysis. I believe these are very important aspects of FSR.

On the basis of these points I therefore suggest that consideration should be given to changing the structure of the FSRI as shown in figure 2.

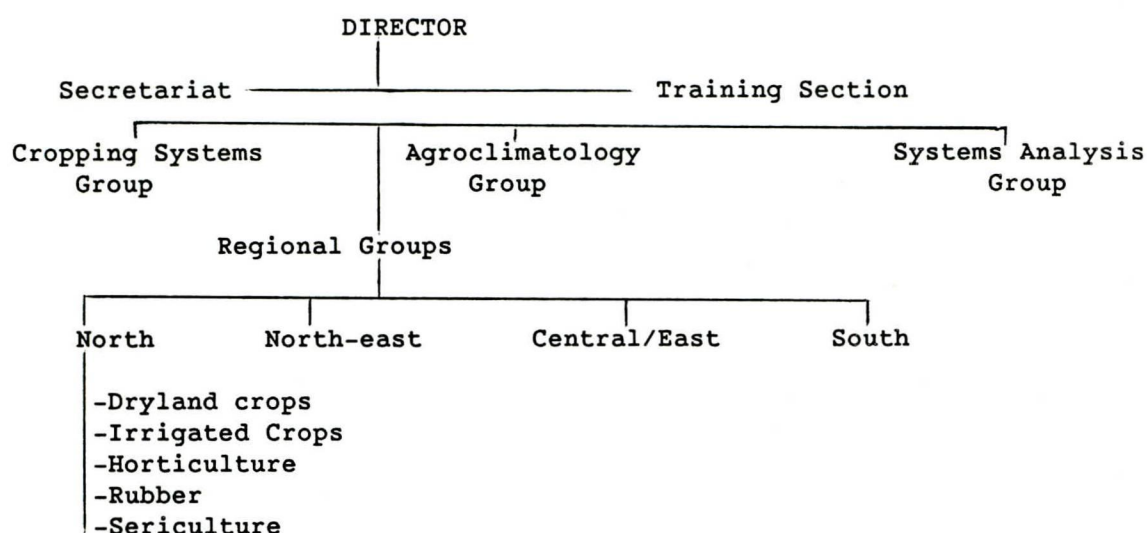


Figure 2 : Suggested restructuring of FSRI.

In the new structure I suggested that the present Crop Ecology group could be renamed an Agroclimatology group with its main functions to provide special emphasis to promoting a stronger biological and physical basis for assessing the suitability of cropping systems to the given climatic environments and soils of particular regions. Another group should be formed to cover aspects of Farm Resources, Systems Management and Economics, which are presently not covered. Specialists are required in farm resource survey, farm management, systems analysis, sociology and agricultural economics. It is noted that the FSRI has moved to remedy part of this deficiency by appointing one agriculture economics graduate who is presently undertaking post-graduate study.

It is further suggested that the staff belonging to the Cropping Systems Group would be mostly deployed at the regional centres and could be loosely subdivided into areas of FSR activities such as dryland crops, irrigated crops, etc., if deemed necessary. The other two major groups would have most of their staff in Bangkok with responsibility for providing technical inputs into the regional programs.

I believe that these changes to the structure and operations of the FSRI will improve the effectiveness of FSR and also provide a specific role and need for FSR in the DOA.

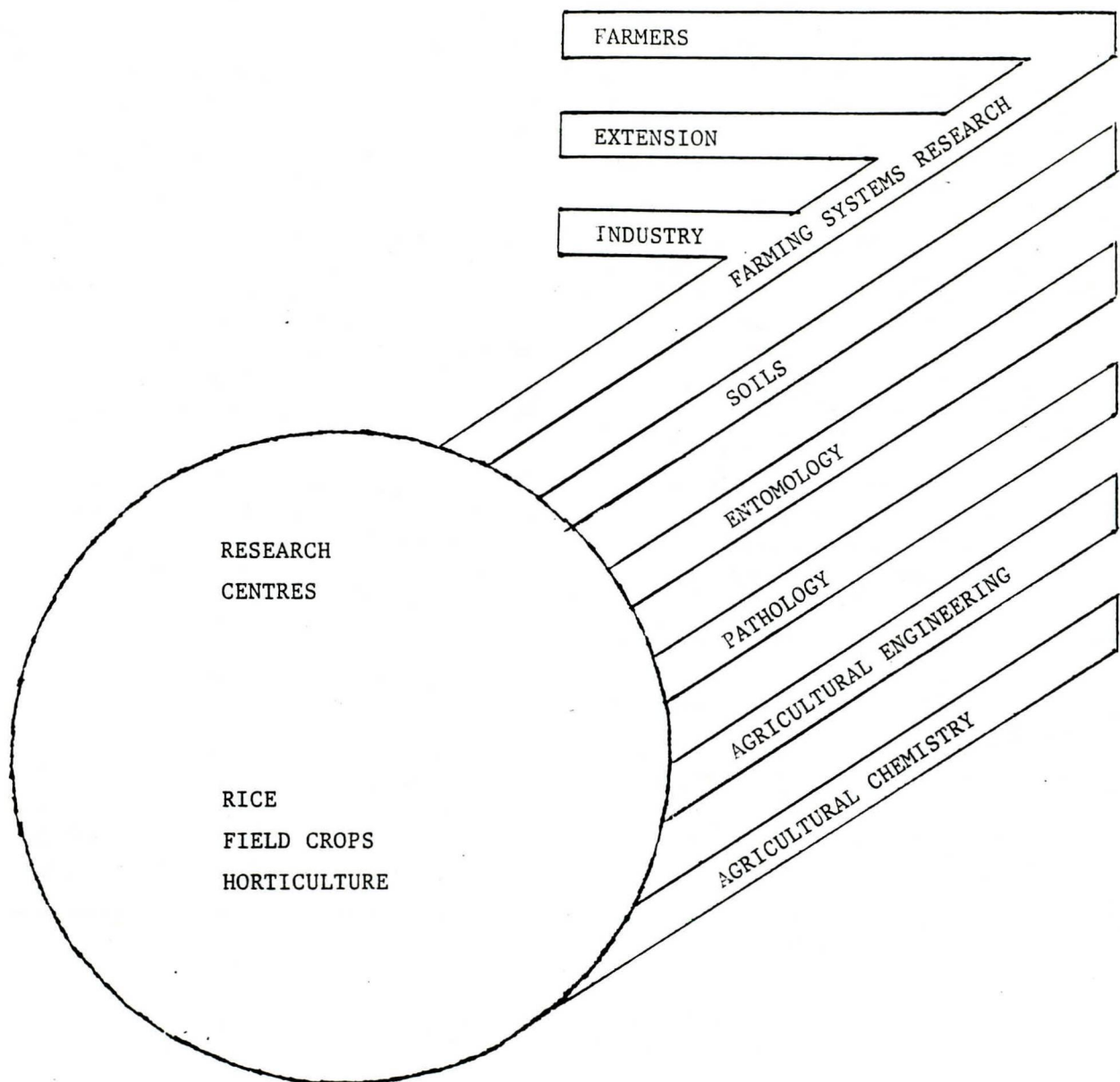
I would like to emphasize the fact that the FSRI has an important role in satisfying the specific needs of agricultural research and development that cannot be supplied by other divisions or institutes within the DOA. These are:

- (i) the need to integrate discipline-based research into systems or technologies for testing and development for use by farmers.
- (ii) the need for research information on the environment, physical resources, farming systems and socio-economic factors which affect the requirement and type of technology which is appropriate.
- (iii) the need to analyse new technologies and predict where they will be successful and what will be the expected economic or sociological returns.
- (iv) the need to provide a close link between research, extension and the farmer.

There is no need for the FSRI to duplicate the activities of existing research disciplines, such as soil science, pathology and entomology, that are already well catered for in existing discipline divisions in the DOA. The FSRI will necessarily require inputs from these disciplines to their on-farm research program but it should be achieved by encouraging multidisciplinary research at the regional centres where a number of discipline specialists of the DOA and extension officers from DOAE join together in solving a common problem or developing a farming technology.

Thus the FSRI, commodity institutes and technical divisions should come together at the regional centres and form an interdisciplinary workforce aimed at solving the regional problems of farmers and thus improving their socio-economic situation, as shown schematically in figure 3.

Figure 3: Relationship between Institutes, Divisions and the Agriculture community at regional research centres.



2. The integration of FSR with discipline and component technology research

Within the DOA there is a need for a research capability at various levels. In attempting to solve a particular problem of agricultural production there may be a range of needs from basic to very applied research or from single component research to an integrated multidisciplinary approach. The thrust of the National Agriculture Research Project (NARP) is to provide this capacity at a regional level so that the regional needs of farmers can be solved through research associated with the regional research centres. It is envisaged that the regional research centres will not only provide research expertise in particular crops but that they will provide a coordinating role to encourage complimentary disciplinary research inputs from the technical divisions and FSR from the FSRI (figure 3). I am not going to say very much about the participation of the technical divisions in regional research but many of the points I wish to make about the participation of FSR at regional centres also applies to disciplinary research by the technical divisions.

Rather than talk theoretically about the integration of FSR with discipline or component technology research I would like to focus on particular issues which I believe are important in improving the effectiveness of FSR in the DOA.

2.1 Research goals

The focus of FSR should obviously be on on-farm research. In addition to this I believe that FSR should be organized on a regional basis and FSR staff based at regional centres. Thus FSR should be closely associated with the regional problems of farmers. This means that although FSR staff are based at regional centres the focus of their research should be determined by regional needs rather than the particular research of the regional centre.

This can however create a problem or dilemma in that the Centres and FSR can have different research goals. Research at the Centres is oriented towards crop or commodity research where there is usually a national mandate for research in particular crops. These crops may not however be very important in the region or there may be many other crops grown in the region which are not being researched at the centre.

I believe however that this problem can be overcome to some extent by:

- (i) Reorienting research at the regional centres so that there is a better balance between research on crops for which the centre has a national mandate and important crops of the region.
- (ii) Encouraging FSRI staff to interact more closely with other centres where they are not based, which have a national mandate for crops that are important in their region.

2.2 Research prioritization

It is important that a common set of problems be identified for regional research. This means that the FSRI should join with the commodity institutes, with inputs from DOAE, farmers, industry and regional projects, to decide on a common set of problems and priorities for research on individual crops for which the centre has a national mandate and for crops of regional importance. A decision should then be taken on which problems require more basic or applied research by the commodity institutes or technical divisions and which require applied or adaptive research by the FSRI.

The FSRI should then have a regional meeting where they consider all the regional problems and priorities for FSR, based on the problems and priorities of the individual centres in the region and then decide on priorities for FSR across the region. Some problems and priorities may be found to be common problems across the region and therefore have high priority while some may be specific to certain areas.

2.3 FSR implementation

Because FSR is decided on a regional basis rather than on a crop commodity basis, this does not mean that FSR should be conducted in isolation from research at the regional centres. To the contrary, FSR should provide an essential interface and link between discipline research and technological development.

The implementation of FSR at regional centres may fulfill several different functions, such as :

- (i) The development of resource information on agriculture production in the region. This can include inputs from agroclimatology (natural resources) and farming systems analysis (economic and human resources). The information obtained is valuable in defining the farming systems of the region, the identification of problems in agricultural production and a more systematic approach to on-farm research.
- (ii) On-farm research on component technology development or cropping systems. This research should be multidisciplinary in nature and encourage the participation of discipline research scientists where appropriate. This research should be aimed at solving problems or developing new technologies or opportunities to intensify or diversify farm production.
- (iii) The analysis and evaluation of research on cropping systems, in both biological and economic terms, to provide a prediction of crop production in the region and economic returns to farmers.
- (iv) The development of closer links of regional research with extension specialists, industry and farmers. This has benefits both in terms of problem identification for research and the development and adoption of new technologies.
- (v) Provide an important feedback link between problems which arise in technological development and which need further research input by discipline specialists.

A CROPPING SYSTEMS TECHNOLOGY DEVELOPMENT PROCESS:

THE BASIS FOR IMPROVING LINKS BETWEEN
RESEARCH AND EXTENSION THROUGH FSR.

Briefing document prepared for the Directors General and Division Directors of the Departments of Agriculture and Agricultural Extension. 8th to 9th July, 1987, Rama Gardens Hotel, Bangkok.

Prepared by:

Iain A. Craig, Cropping/Farming Systems Specialist,
Northeast Rainfed Agricultural Development (NERAD) Project,
Northeast Regional Office of Agriculture,
Tha Phra, Khon Kaen 40260, Thailand.

A Cropping Systems Technology Development Process:
the NERAD Model

BACKGROUND AND OBJECTIVES

In the early years of NERAD many problems were encountered in designing, implementing and evaluating the cropping systems research and extension trials. The major problems included:

- Very little use was made of existing data and information during the planning stage for the cropping system trials.
- Technologies tested usually emphasized yield maximization and were often inappropriate for meeting the real needs of the farmers.
- There were no practical, clearly documented methodologies for conducting on-farm trials compatible with the resources of the responsible agencies.
- The collection and analysis of data from the trials was generally considered unimportant.
- There was completely inadequate documentation and use of data generated by the trials.
- There was little or no integration of the research and extension phases of the trials towards a common goal in a mutually supportive manner.

This document describes the overall process being developed within NERAD in an attempt to overcome these problems and to improve integration between the departments responsible for agricultural research (DOA) and agricultural extension (DOAE). It summarizes the status of the progress made within the project in developing such a process and presents it to interested parties in order to receive suggestions on how to improve it. Most important in this respect is feed-back from DOA and DOAE officials on its compatibility with their regular programs in order to refine the process or components of it into a form appropriate for every day use.

Although the process documented here was designed for cropping systems technology development, it is considered appropriate for the development of any agricultural technology. With minor modifications it could be used for the development of: fruit-tree, forestry, sericulture, fish and livestock production and water resource development technologies.

Some cropping systems technologies within NERAD have now reached the multi-location phase of the development process but an entire cycle has not yet been completed for any technology. Consequently, the characteristics of the later phases presented here are still unproven by NERAD and are described in only general terms.

DESCRIPTION AND METHOD OF USE

A diagrammatic representation and definitions of each phase of the process are contained in Figure 1 and Table 1, respectively and more detailed characteristics of the phases are described in Table 2.

There are 3 key characteristics of the process which are considered essential for its success. First, it is a two way flow: technologies are tested,

screened and improved at each stage of the process but information gained at each phase also 'feeds back' to previous phases. Secondly, the process is iterative and does not end with farmer adoption of the improved technology; as new technologies are adopted by farmers on a large scale, then new constraints will emerge as the farming system is adjusted to incorporate the improved technology. This will require identification of new problems and the process will begin over again. Finally, it must be flexible, as NERAD gains experience in utilizing the process, it will be continually improved and adjusted according to the lessons learned in each phase.

Figure 1. Cropping systems development

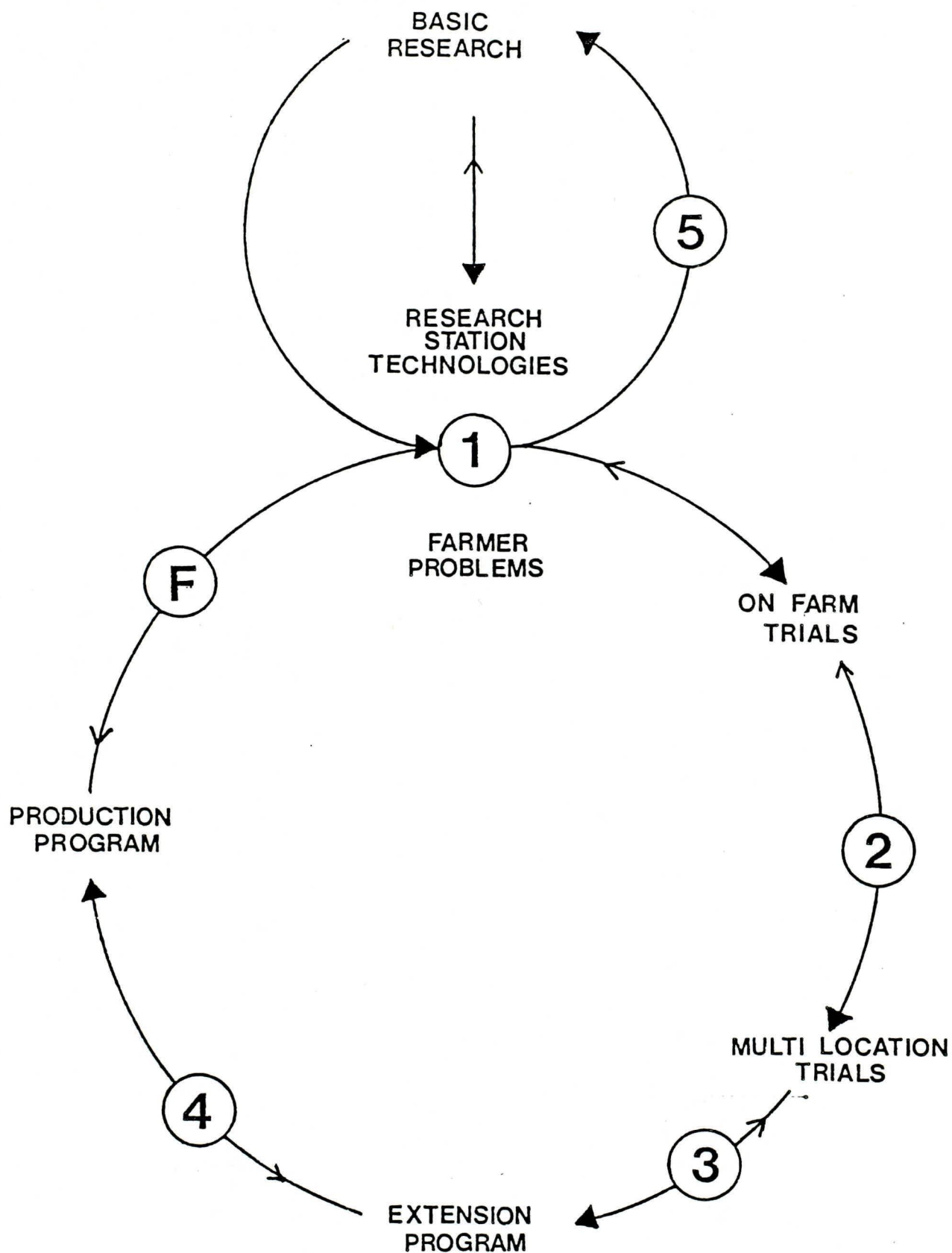


Table 1. Definitions of the various phases of NERAD's cropping systems development process

FARMER PROBLEMS	Problems that are significantly reducing the productivity or profitability of crop production systems OR constraints that are critically limiting development opportunities which are experienced by a significant proportion of farmers in the target area.
RESEARCH STATION TECHNOLOGIES	Currently available technologies that have been successfully tested on the local research station.
BASIC RESEARCH	Fundamental research within any discipline with the objective of discovering new techniques or solving problems associated with current technologies.
ON FARM TRIALS	A test of a research-improved technology in a farmer's field conducted jointly by a researcher and the farmer. The farmer supplies labor and makes some day to day decisions but management is essentially under the control of the researcher who also supplies all inputs.
MULTI-LOCATION TRIALS	Extension and farmer testing of promising on-farm trial technologies in farmers fields conducted jointly by extension, research and farmers under the leadership of extension. Technical advice and some essential inputs are supplied but the farmer is expected to make most management decisions himself and supply some of the input costs.
EXTENSION PROGRAM	A full extension campaign through demonstrations, field days, radio broadcasts, etc. to inform farmers about promising technologies from the multi location phase and to monitor farmer adoption patterns of the technology.
PRODUCTION PROGRAM	A program to match production potential in that area with market capacity through credit and market support programs, etc. in a way that best integrates local production patterns with national policy objectives.

Table 2. Key Characteristics of Each Phase of NERAD's Cropping Systems Development Process

Development Phase Key Characteristic	BASIC RESEARCH	RES. STN. TRIALS	ON-FARM TRIALS	MULTI-LOCATION TRIALS	EXTENSION PROGRAMS	PRODUCTION PROGRAM
EXAMPLES:	Breeding/lab work/physiological studies	Varietal screening/Planting-date studies	Cropping pattern testing with super-imposed treatments	Farmer testing of promising technologies	Extension of promising technologies	Accelerated adoption from proven technologies
IMPLEMENTATION	DOA Technical Divisions/Institutes	DOA Institutes	DOA (FSRI)/DOAE	DOAE/DOA (FSRI)	DOAE	CPD/DOAE
SUPPORT	Feedback: DOA Institutes FSRI	Technical support: Technical Divisions other DOA Institutes Feedback: DOA (FSRI)/DOAE	Technical support: DOA Market Analysis: DCP/OAE ECON Data Analysis: OAE Feedback: DOAE/Farmers	Technical support: Technical Divisions DOA Institutes Feedback: Farmers ECON Analysis: OAE/CPD	Technical support: FSRI/NEROA Farmer Training: DOAE Demonstrations: DOAE/FSRI Field Days: DOAE/DOA Radio Broadcasts: DOAE/NEROA	Technical support: DOA Logistic support: NEROA Analysis: CPD/OAE
NO. OF TECHNOLOGIES TESTED	Many	Many	4-6	2-3	1	1
RESEARCH:EXTENSION (ratio)	100:0	95:5	75:25	30:70	10:90	5:95
MANAGEMENT: RESEARCHER:FARMER (ratio)	100:0	100:0	70:30	20:80	5:95	0:100
SUPPORT SERVICES: GOVERNMENT: PRIVATE SECTOR	100:0	100:0	75:25	60:40	40:60	10:90
TYPE OF DATA GENERATED	Highly detailed in one discipline	Detailed agronomic data	Basic agronomic and economic data	Simplified agronomic and economic data + detailed farmer-practice data	Information on: - Input supply problems - Marketing problems - Farmer adoption patterns	Information on: - Local production potential - Market potential
TRIAL DESIGN CHARACTERISTICS	- V. high degree of control - Sophisticated treatments	- High control - Complex treatments - Standard replicated designs	- Adequate control - Simple superimposed treatments - Replication across farms	- Minimal control - Zero or 1 simple treatment + check - Low level of control gives important information on farmer management	- 2 treatments according to farmer adoption: 1. Adopters 2. Non adopters(check)	- Production program area is experimental group
TYPE OF ANALYSIS	Sophisticated statistical analysis	Standard statistical analysis	Simplified/modified standard procedures (c.f. FSSP modules)	Simple hypothesis-generating type analysis for feedback to on-farm trials	Analysis of farmer adoption patterns Analysis of infrastructure requirements	Analysis of inter-actions between production potential and national policy objectives
NUMBER OF PARTICIPATING FARMERS PER TAMBON	-	-	5-10	10-20	Early adopters	All farmers
FREE INPUTS SUPPLIED TO FARMERS	-	-	All excluding labor	Minimal but may be some guarantee against risk	None	On credit basis only

SCREENING/ANALYSIS STAGES IN THE TECHNOLOGY DEVELOPMENT PROCESS

Decisions have to be made at a number of critical stages in the technology development process in order to evaluate the results of previous phases and to effectively plan future trials. These screening or analysis stages are numbered 1-5 in Figure 1. Effective analyses are the key to successful technology development and act as the 'driving-force' within the technology development process. Screening requires clearly defined evaluation criteria and a systematic step-by-step procedure that integrates the perspectives of the multi-disciplinary team involved in the technology development process. The 'Agricultural Triage' technique has proved appropriate for this and the reader is referred to NERAD Methodology Series Paper M2 for more information on conducting triage.

The productivity, stability, sustainability and equitability measures of agroecosystem performance are also important criteria for screening cropping systems technologies and should be considered during triage. Although important for all stages, special attention is individually given to these properties at different phases of the technology development process (See Table 3).

Table 3. Properties of agro-ecosystem performance as criteria in screening cropping systems technologies at different phases in the development process

PROPERTY	IMPORTANT SCREENING STAGE	DEFINITION
PRODUCTIVITY	3	Average returns to land labor or capital, commonly measured as yield, profit, etc.
STABILITY	4	Variability about the mean productivity over both space and time. Can be measured as the inverse of the coefficient of variation.
SUSTAINABILITY	5	The long term potential productivity of the technology or its durability in the face of stress or disturbance.
EQUITABILITY	5	The distribution of the benefits of the technology among target farmers.

Source: Craig, 1980; Gypmantasiri et al., 1980; Conway, 1985.

SCREENING STAGE 1.

RESEARCH STATION TECHNOLOGIES/FARMER PROBLEMS --- ON FARM TRIALS

Objective:

To match available agricultural technologies with real and significant farmer problems in the most appropriate manner.

Properties to be emphasised during screening

Productivity / Stability / Sustainability / Equitability

Questions to be answered:

- (1) What are the most important, real problems of the farmers?
- (2) What technologies are available?
- (3) Which technologies are likely to help to solve these problems?
- (4) How should these technologies be adapted/modified to be appropriate for local conditions?
- (5) What are the major unanswered questions regarding these technologies and how should super-imposed component technology trials be designed to answer these questions?

Data/information required:

1. Climatic
2. Socio-economic
3. Local production pattern information
4. Soils
5. Marketing data
6. Research Station trial results summaries

Steps in the analysis:

- (1) Conduct a site description which defines the local agro-ecosystem in terms of the important physical, biological, economic and social factors.
- (2) List the farmer problems or development opportunities identified.
- (3) Prioritize the problems in order of importance.
- (4) List the technologies available for solving these problems.
- (5) Match the most important problems with the technologies that have the highest potential for solving them.
- (6) Select technologies for testing and plan on-farm-trials documenting their objectives and expected benefits.

Available tools to assist in the analysis:

1. Agro-ecosystems analysis (AEA)
2. Rapid rural appraisal (RRA/RAT)
3. Formal farmer surveys
4. Interdisciplinary assessment work shops
5. Agricultural triage

Departmental roles:

DOA - Research station trial results/climatic data
DOAE - Local production patterns/production resources
DLD - Soil maps/data on existing water resources

OAE - Socio-economic characteristics/price analyses
CPD - Market analysis
DOLD/RFD/DOF - Support data
NEROA - Coordination and logistic support

SCREENING STAGE 2.

ON FARM TRIALS --- MULTI-LOCATION TRIALS

Objective:

To concentrate further testing on, and begin extension of those technologies which have the greatest potential for significantly benefitting the majority of target farmers.

Properties to be emphasised during screening

Productivity

Questions to be answered:

- (1) Which technologies are unlikely to benefit farmers and why?
- (2) Which technologies have potential but still have significant problems requiring further on farm research and what form should this research take?
- (3) Which technologies have proved to be biologically feasible, economically viable and socially acceptable and what are the bio-physical, economic and social conditions necessary for their successful adoption?
- (4) Are there any new technologies considered to merit on-farm testing as a result of the on-farm trials experience?

Data/information required:

- Agronomic performance data of the on-farm-trials
- Economic performance data of the on-farm-trials
- Farmer responses/modifications to the technologies tested in the on-farm-trials
- Climatic and soils data for the trial sites
- Price and marketing data and problems
- Information on interactions of the technology with other elements of the farm system.

Steps in the analysis:

- (1) Evaluate the on-farm trials in terms of their agronomic feasibility, economic viability and social acceptability.
- (2) Triage or categorize the technologies tested in the on-farm trials into:
 - Those technologies unlikely to significantly benefit farmers.
 - Those technologies with potential but still requiring further on-farm component research.
 - Those technologies with high potential considered ready for expanded testing and early extension.
- (3) Document the technology status for each of the above categories as follows:
 - (a) Technologies that under present or expected future conditions are unlikely to be successful:

- Document:
 - Objectives of the technology
 - Results summary
 - Major constraints to the technology achieving its stated objectives
 - Suggestions for further basic research needed at experiment stations.
- (b) Technologies that have potential but need further on-farm component research:
- Document:
 - Objectives of the technology
 - Results summary
 - Major problems remaining
 - Recommendations for experimental treatments for the on-farm trials to overcome the remaining problems.
- (c) Successful technologies considered appropriate for expansion in a multi-location phase:
- Document:
 - Objectives of the technology
 - Results summary
 - Conditions necessary for successful implementation of the technology
 - Recommended implementation practices

Tools available to assist in the analysis:

1. Triage*
2. Interdisciplinary analysis workshops
3. Participating farmer interviews (RRA or formal survey)
4. Cropping systems research analysis techniques

Departmental roles:

- DOA - Agronomic analysis of the technology
- OAE - Economic/price analysis of the technology
- DOAE - Assessment of farmer acceptability of the technology
- CPD - Market analyses preparation
- DLD/RFD/DOF/DOLD - Analysis of the interactions of the technology with the entire farm system
- NEROA - Coordination and support.

* For an explanation of the triage process see NERAD Methodology Series Working Paper No. M2.

SCREENING STAGE 3.

MULTI-LOCATION TRIALS --- EXTENSION PROGRAM

Objective:

To decide which technologies have potential for large scale farmer adoption and to plan an appropriate extension program to achieve this.

Questions to be answered:

1. How did farmers modify the technology in the multi-location trials and with what results?
2. Is farmer interest sufficient to warrant an extension program?
3. What type of demonstrations, training and dissemination is appropriate for the extension program?
4. What modifications should be made to the technology in the light of the multi-location trial phase?
5. How stable is the performance of the technology across different farms?

Data/information required:

1. Farmer modifications to technology and the effect of these on its performance
2. Farmer problems encountered with the technology
3. Performance data (agronomic, economic and social) for the technology and an analysis of the variability of results over farms.

Steps in the analysis:

- (1) Evaluate the multi-location trials in terms of their social acceptability, economic viability and agronomic performance.
- (2) Triage or categorise the technologies tested in the multi-location trials into:-
 - Those technologies which need to be returned to on-farm trials for further component technology research
 - Those technologies which require further multi-location testing
 - Those technologies with good 'all-round' performance considered ready for extension through the extension program phase
- (3) Document the status of every technology for each category as follows:
 - (a) Technologies which need to be returned to the on-farm trials phase for further component technology research:
 - Document:
 - Objectives of the technology
 - Results summary
 - Problems necessitating further on-farm component research trials
 - Suggested treatments for on-farm trials to solve the above problems
 - (b) Technologies which require further multi-location testing:

- Document:
 - Objectives of the technology
 - Results summary
 - Reasons for further multi-location testing
 - Suggested improvements to the technology
- (c) Technologies with good all-round performance that are considered ready for extension through the extension program phase:
- Document:
 - Objectives of the technology
 - Results summary
 - Recommended practices for the technology in the extension program.

Tools available to assist in the analysis:

1. Interdisciplinary analysis workshops
2. Modified triage
3. Farm record keeping analysis
4. Farmer surveys (RRA or formal)
5. Modified stability analysis.

Departmental roles:

- | | |
|--------------------|---|
| - DOAE | - Analyse farmer response to the technology |
| - DOA | - Analyse agronomic problems encountered by farmers during multi-location trials |
| - OAE | - Prepare economic and labor analyses of the multi-location trials |
| - CPD | - Assess marketing problems and potentials |
| - DLD/RFD/DOF/DOLD | - Analyse interactions of the technologies with other components of the farm system |
| - NEROA | - Coordination and support. |

SCREENING STAGE 4.

EXTENSION PROGRAM --- PRODUCTION PROGRAM

Objective

To match local production potential with market demand in a manner consistent with government policy.

Properties to be emphasised during screening:

1. How many and what type of farmers adopted the new technology?
2. What are the main constraints to farmer adoption?
3. What effect will full adoption of the technology have on production and will markets be able to absorb this?
4. Are the results of the technology consistent with government policy?
5. Are there likely to be any negative environmental or social effects of large scale adoption of the technology and how can these be avoided?

Data/information required:

1. Farmer adoption patterns.
2. Farmer problems encountered with the technology after adoption.
3. Local production potential.
4. Market potential and infrastructure requirements.

Step in the analysis:

- (1) Evaluate farmer adoption in terms of:
 - Numbers and types of adopting farmers
 - Farmer modifications to the technology after adoption
 - Performance of the technology in the fields of the farmer adoptors.
- (2) Evaluate:
 - Local production potential
 - Market demand and capacity
 - Credit facilities available
 - Policy - is the technology consistent with policy objectives?
- (3) Adjust the local production patterns and credit facilities to be in line with market demand.
- (4) Ensure that '(3)' above is in line with national policy objectives.

Tools available to assist in the analysis:

1. Interdisciplinary analysis work shops
2. Mini-evaluations
3. Agro-ecosystems analysis
4. Farmer seminars

Departmental roles

- Changwat Sub-committee - MOAC policy interpretations
- Ministry of Commerce - Marketing and promotional support

- Private enterprise - Input/output market development
- BAAC - Arrangement of necessary credit facilities
- NEROA - Coordination and support.

SCREENING STAGE 5.

FARMER PROBLEMS --- BASIC RESEARCH

Objective:

To communicate important farmer problems to the appropriate research agencies to assist in setting basic agricultural research priorities.

Properties emphasised during screening:

Productivity / Stability / Sustainability / Equitability

Questions to be answered:

- (1) Which major, common farmer-problems have no technologies available for their solution?
- (2) What basic research (or experiment station research) needs to be conducted to produce these problem-solving technologies?
- (3) Which is the most appropriate agency to conduct the necessary research and what is the most effective means of communicating the problem to them?

Data/information required:

1. Local production pattern data
2. Climatic/soils/marketing/social data
3. Information on local problems/constraints
4. List of available technologies and information on the conditions necessary for their success

Steps in the analysis:

- (1) Divide the problems identified into:
 - Those that have technologies available for their solution
 - Those that have no technologies available for their solution
- (2) Prioritize the unsolved problems using the criteria:
 - size of the problem
 - severity of the problem
 - number of farmers experiencing the problem
- (3) Document these problems stating the nature, severity and the reasons for the problem and suggestions on the type of research needed for their solution
- (4) Communicate these findings to the relevant research agency

Tools available tools to assist in the analysis:

1. Rapid rural appraisal (RRA/RAT)
2. Agro-ecosystems analysis (AEA)

3. Agricultural triage of on-farm trial results
4. Interdisciplinary seminars on the problems identified involving subject matter specialists.

Departmental roles:

DOA - Research station trial results, climatic data
DOAE - Local production patterns, farmer production resources
DLD - Soil maps, information on existing water resources
OAE - Socio-economic characteristics, price analysis
CPD - Market analysis
DOLD - Support data
RFD - Support data
DOF - Support data
NEROA - Arranging problem oriented, subject matter seminars coordination and logistic support.

SCREENING STAGE F.

APPROPRIATE TECHNOLOGIES --- FARMER ADOPTION

Analysis and screening at this stage is conducted by the farmer who has to decide if the technologies being demonstrated really do meet his needs or help solve his problems. By understanding the criteria used by farmers in adopting or rejecting new technologies the technology development process itself can be improved. There are two important implications of this:

- (i) Much can be learned from the technologies which are re-jected if it is understood why they were unacceptable. With this knowledge the technologies can be modified or their appropriateness for other areas can be assessed. In addition, the information generated can be used to modify the technology development process itself.
- (ii) The technology development process does not end with successful farmer adoption of a technology. As the adopter modifies his farm system to include the new technology new problems or constraints will emerge and the process should begin again.

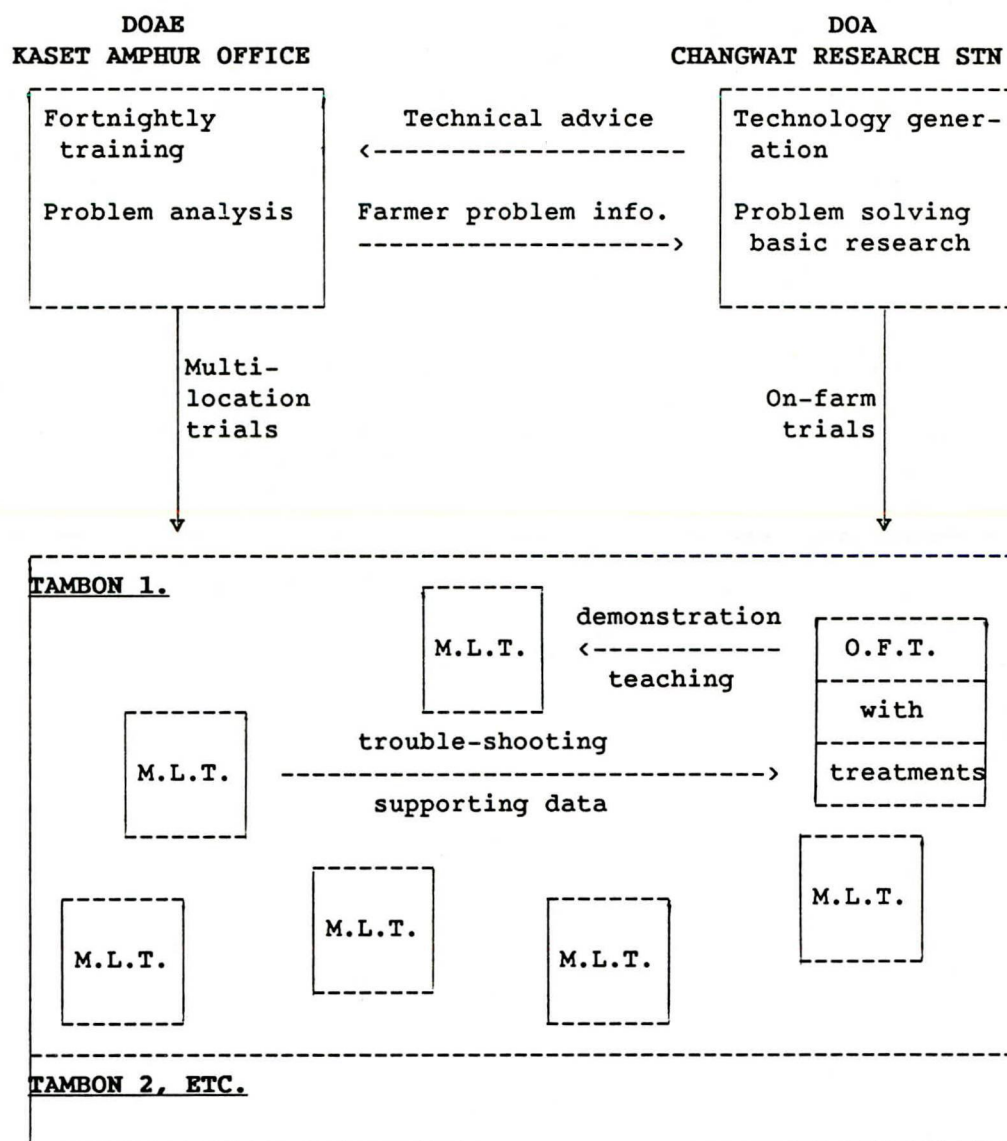
FUTURE DEVELOPMENT NEEDED

If true integration between DOA and DOAE is to be achieved and institutionalized, every effort must be made to integrate the regular programs of these two departments, namely the on-farm trials and the Training and Visit (T & V) systems, respectively. The multi location phase of the development process offers the opportunity of achieving this due to its strategic position as the key transition phase between research and extension (See Table 2, page 5).

There are a number of possible ways of integrating DOA's on-farm trials and DOAE's T & V system and the most appropriate will need to be determined according to the needs of the two departments in close collaboration with their respective officials. As way of an example, one possible means of integration is presented here and summarized in diagrammatic form in Figure 2.

- Technologies appropriate for multi-location testing are agreed to by DOA and DOAE officials using triage or a similar analysis procedure
- DOA officials conduct training on the chosen technology for K.T.'s as part of the T & V fortnightly training program.
- Kaset Tambon select appropriate farmers to participate in the multi-location trials during their fortnightly visit schedule according to the technical criteria defined by DOA and implement the trials of the technology on these farms.

Figure 2. Diagrammatic representation of one implementation model for improving integration between on-farm-trials and the T & V system.



- DOA conduct on-farm trial(s) of the technology in the same tambon (these trials will be more researcher managed and will have a number of superimposed component technology treatments).
- Plot visits by DOA and DOAE for trial monitoring and data collection are coordinated so that both on-farm and multi-location trials are regularly jointly inspected by both researchers and extensionists to facilitate exchange of information.
- Different cultural practices can be demonstrated to the participating multi-location farmers by using the superimposed treatments of the on-farm trials. These plots can also be used as a follow-up teaching tool for Kaset Tambons to supplement the lecture sessions of the fortnightly training with real field experience of the technology.

- Problems encountered in the multi-location trials are likely to be the same as on the on-farm trials and can therefore be discussed by Kaset Tambon with DOA officials thus giving him a valuable source of technical expertise when and where he needs it. In addition, the multi-location trials will give DOA useful information on the performance of the technology under farmer-managed conditions and the type of problems likely to occur with it in the future.
- At the end of (and during if desired) of the crop cycle when complete data for both sets of trials are available the fortnightly training session can be used for a joint DOA and DOAE technical review of the results in order to set research and extension priorities and to plan future trials.

Effort in the remaining 2 years of NERAD will concentrate on improving and adjusting the cropping system technology development process as the technologies currently under development pass on to the later phases and the cycle is completed. If requested by the MOU committee and under their guidance, every effort will be made to refine the development process into a form that is replicable within the MOAC. This will ensure that the lessons learned by NERAD are institutionalized after the project is over and that the participating departments are left with a useable product.

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- Panothai, A. 1984. Issues on the development of an FSR approach. Proceedings, 1st National Farming Systems Conference. Surat Thani, April 2-5, 1984. (In Thai).
- Pantastico, B. 1986. Farming systems research and development and extension linkages: FAO experience. Paper presented at an FSR consultation meeting of experts. Los Banos, Philippines.

APPENDIX

The following NERAD Working Papers are available on request from the Project Director:

NERAD Methodology Documentation Series

- M1 A cropping systems technology development process: the NERAD model.
Craig, I.A. et al., 1986.
(Thai and English)
- M2 Triage: a methodology for screening agricultural technologies and
prioritizing research and extension activities. Craig, I.A. and
Sukapong, C., 1987.
(Thai and English)
- M3 North East Rainfed Agricultural Development Information and
Coordination System (NERADICS). Hopkins, J., 1987.
(English)
- M4 The Rapid Assessment Technique (RAT): a procedure for identifying farmer
problems and development opportunities. Alton, C. and Craig, I.A., 1987.
(Thai and English)

NERAD Technology Documentation Series

- T0 Executive Summary: NERAD Promising Technologies. Thamabood, S.
(Editor), 1986.
(Thai)
- T1 Direct sown rice technology documentation. Craig, I.A. et al., 1986.
(Thai and English)
- T2 Cooperative buying groups in Thailand: results of a social experiment.
Meyer, A.L. and Infanger, C.L., 1987.
(English)
- T3 Modified shallow well technology documentation. Ragland, J.L. and
Thamabood, S., 1986.
(English)
- T4 Pre-rice green manuring: a technology for soil improvement under rainfed
conditions in Northeast Thailand. Craig, I.A., 1987.
(English)

EXTENSION - RESEARCH : A NATURAL LINKAGE

A discussion paper prepared for the Department of Agriculture, Thailand, by ACNARP -- the Australian Cooperation with the National Agricultural Research Project. The project is concerned with the decentralisation of the Department of Agriculture through the development of nineteen new research centres, and the upgrading of the quality of agricultural research within the Department in order to generate more relevant information for farmers. Responsibility for extension in Thailand rests with a separate Department of Agricultural Extension. Improved linkage between the Departments is therefore a high priority objective of ACNARP.

This paper is also available in Thai.

BRYAN GORDDARD
PROJECT MANAGER
ACNARP *
JUNE, 1986

* POSTAL ADDRESS : P.O. BOX 9-43
BANGKHEN
BANGKOK 10900
THAILAND

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SUMMARY

This paper is written to assist the present debate within MOAC on the improvement of linkages between the separate Departments of Agriculture (DOA) and Agricultural Extension (DOAE). It presents a bottom-up view of the issue, beginning with a simple analysis of farmers as managers and decision makers, and describes the farmer's reaction to new ideas and recommendations. This analysis suggests that the essential first step in developing a relevant research program is to define the farmers' problems as accurately as possible.

The paper suggests that there is a natural linkage between "research" and "extension" based upon the joint, agreed definition of high priority farm problems, and on a shared interest and commitment by both sides towards improving the farmer's situation. The sources of conflict between research and extension are examined, and some necessary conditions for effective linkage are suggested. Finally, a number of specific recommendations are presented for consideration and endorsement. These focus on the possible role of the recently formed Liaison Committees in promoting a strong and effective linkage between DOA and DOAE.

1. THE FARMER¹ AS A DECISION-MAKER

Farmers, like all of us, make numerous decisions every day, including deciding to put off deciding until tomorrow! Farmers everywhere are **decision-makers**. They make decisions about the management of their resources - even the poorest peasant is a manager of his limited resources. The farmer is a manager because he makes decisions about the factors of agricultural production- land, labour and finance. The farmer's decisions are much more complicated than those of most government officials, and they differ in another important respect - the farmer has to take full responsibility for the outcome of his decisions whether they be good or bad. He has to bear the physical and financial consequences of his decisions. This is vitally important when considering the issue of **RECOMMENDATIONS to FARMERS from RESEARCH**. This is because farmers have different individual resources, and because they may have different **GOALS**, different **PRIORITIES** and different attitudes to **RISK**. The tendency to classify farmers into amorphous, mindless groups is now well and truly discredited.

¹ In this paper, the term "farmer" applies to the farm family as a decision-making unit.

Research has shown the farmer to be a rational decision maker, within the limits of his knowledge, resources and risk preferences. Rejection of innovations has been shown to be based upon technical flaws in the innovations themselves, rather than on farmer ignorance or lack of information.

There is a considerable body of knowledge on what a farmer wants and does not want from research and extension services.

He does NOT want a standard "package" of technology which he is supposed to adopt. We know that farmers adopt different pieces of a new system at different stages. They do so at different times, but mostly in the same sequence. What a farmer really does is to fit what he sees as the appropriate pieces of technology into his own unique set of circumstances - into his own system. He makes decisions about each option in the light of his own circumstances. He decides about the financial, social and technical "fit" of the change.

This should be so obvious that it ought to be boring. However, the point that is usually overlooked is the fact that the farmer is making a conscious decision - he is making choices between alternatives. He is managing his resources. He is not acting like a robot.

The decision making process in adoption requires, at some point, the input of information about the new practice. With some changes, it seems to be an "all-or-nothing" response - either the farmer buys the new weeder or he doesn't. In others, he may or may not use the "recommended rate" of, for example, fertilizer. What our farmer-decision maker really wants is information from a source which he regards as credible, about the input-output relationships involved. He may want to know, for example,

"what happens if I do not use any fertilizer -- by how much will my yield be reduced? What if I only use a little - what will happen to yield? What happens if I use the recommended rate and it is a very dry season? How much less yield will I get if I spread the fertilizer rather than band it? etc, etc."

He is also weighing up the cost of financing the fertilizer against his present debt load, the extra work, the reliability of delivery when he needs it and, always, the likely price for any extra yield. As we said earlier - quite a complex decision! What does he usually get from extension and research? --- usually a blanket, official "recommendation" to use, (for example) 20 kg/rai of 20:20:0. This answers none of his questions!

Is the recommendation wrong? How can it be improved? Can the farmer be blamed for not adopting such a recommendation? The answers are crucial for the effective linkage of research and extension. Because -- the purpose of both research and extension should be to help the farmer to make better decisions in order to solve his problems. The farmer must solve his own problems -- research and extension can only give him better tools to help in this task.

This is very different to handing out recommendations of isolated pieces of technology, as is the common view of "extension" in Thailand. It is very different to the generation of new technology by research, and its downward passage to passive farmers via extension.

It is very different to having the extension (or research) system **MAKE THE DECISIONS FOR** the farmer. The extension and research services **CAN ONLY HELP** the farmer to make his decisions - he needs and welcomes this assistance if it is really useful. If it is not seen by the farmer as relevant, reliable and practical - he will ignore the advice - and rightly so.

2. TOWARDS BETTER DECISIONS

We have looked at some problems of farmers making decisions about changes in their farming practice. There are three avenues through which advice to farmers **MIGHT** be improved. -

- 2.1 By ensuring that the real problems and constraints of the present farming system are **really** understood by researchers and extension workers.
- 2.2 By obtaining **agreement** between research and extension workers as to the nature and importance of these problems and constraints.
- 2.3 By designing research programs which will produce results which can be used for decision making at the farm level - by farmers and their advisers. This also involves the presentation of research data to extension workers in a **form that is useful** for decision making.

2.1 Defining the real problems

This is superficially easy. Every researcher can recite a list of what he believes to be the farmers' problems in an area. So can every extension officer. They usually sound convincing, and each list is obviously the product of a sincere attempt by that person to understand the farming system. Any challenge to the accuracy of such a problem - list will invariably be taken as a personal criticism and rejected --- "my experience is better than your experience".

This is a very delicate and complex problem, and egos are easily bruised. It is also the basis on which the relationship between farmers, extension workers and researchers is built or broken, and it cannot be brushed aside lightly or ignored.

There are many causes for these differing views of farmers' problems - level of research training, level of education, amount of practical on-farm experience and social class, to name a few. These sources of different opinions are a two-edged sword - they make consensus more difficult to obtain but they also bring a wide diversity of experience to bear on farmers' problems. However, if the output from research is going to be useful to farmers, **the research process must start with the existing on-farm situation**, and with a careful consideration of the problems as perceived by the farmer.

Techniques for the definition and analysis of on-farm problems are well known. They have been developed by rural sociologists as various small-group activities, involving farmers, extension workers and resource specialists. Techniques for problem definition and prioritisation are also well developed as part of farming systems research (FSR) methodology, of which a number of versions have already been applied in Thailand. These include the techniques of Rapid Rural Appraisal/Assessment, agro-ecosystems analysis, and the more recent "triaging" system.¹ Unfortunately these techniques have become so closely identified with FSR that they have been largely ignored by both

research and extension. As we shall see later, these techniques can be used as the key to solving the extension-research linkage dilemma.

2.2 Conflicts between extension and research

With a few notable exceptions, researchers and extension workers in Thailand are as far apart as ever. The extent of the gap may be judged by the public and private claims of DOAE staff that the results and recommendations of the DOA are not relevant to the real needs of the small farmers. The argument then follows that DOAE "must do its own research in order to solve the farmers' problems." Research and extension appear to see themselves as competitive rather than as complementary functions.

Clearly, there is a huge gap in the perceptions of the two organisations as to what research is required. This will lead to on-going conflict and a waste of scarce research resources unless it can be resolved.

At this point it is worth examining some of the traditional differences between people involved in research and extension.

Extension Officers' Complaints about Researchers

- (1) Much research bears little relation to the real problems of farmers. Researchers are interested mainly in research for its own sake.
- (2) Researchers are reluctant to undertake work in complex, multi-disciplinary areas. They prefer to remain within the boundaries of their own discipline (or commodity) area. Worse, they are not interested in problems outside their own area --- these are "someone else's responsibility". Interactions with other disciplines or systems are ignored or dismissed in the same way.
- (3) Researchers are not interested in the social or economic aspects of a problem.
- (4) Research results are either not published at all, published very late, or published in rigorous scientific jargon. This is difficult to access in the field, and takes much time to read.

Researchers' Complaints about Extension

- (1) Farmers and extension workers do not understand the principles of research or the scientific method, and have an inadequate knowledge of biometrics.
- (2) They present ever-changing demands for answers to new and urgent problems, leading to disruption of long-range research programs.
- (3) Extension officers are prone to think like farmers --- they are uncritical and subjective with their observations, and are given to premature judgements.

¹ As developed by the NERAD (USAID) project at Khon Kaen

- (4) Extension workers only want simple, "recipe" - type advice on complex problems.
- (5) Extension workers are unable or unwilling to seek out and read research reports and publications.
- (6) Research by extension workers leads to poorly designed trials which cannot be interpreted and can be quite misleading to farmers.
- (7) Extension workers do not accurately describe or define the problems they see in the field.
- (8) Extension activities and training activities are time-consuming and interfere unduly with research activities. (Some researchers, however, enjoy direct contact with selected farmers --- the training of extension workers is much less popular).

Even a casual glance at these lists indicates that the problems will not be solved easily, and certainly not be legislation or coercion. The solution must lie in the development of a system of mutual collaboration between farmers, extension officers and researchers which acknowledges the role of each group and recognizes that each party requires the assistance of the other if the goals of improving farm productivity and raising the standard of living of the rural community are to be achieved.

2.3 Resolving the conflicts

It is one thing to propose that these deep-seated conflicts can be resolved simply by "cooperating" or "working together", but it is quite another to make this "cooperation" work in practice. The problem can only be resolved by tackling its basic cause, that is -- the differing opinions on research priorities held by researchers, extension workers and farmers.

A linkage can only begin from a personal understanding of farmers' needs by both extension and research workers. It is vital that both groups share the same view of the problems, constraints and opportunities within the farming system. The views will not always be identical, of course, but there must be agreement on the major issues and their importance. This can be done by arranging for both research and extension people to engage in a systematic, objective, joint, program of problem definition and analysis at the farm level. It is vital that these activities are :-

- systematic : part of a planned, agreed, on-going program, not a once-only event.
- objective : as far as possible the methodology must obtain hard, factual data rather than subjective, anecdotal data. This allows the proper analysis and interpretation of the data. Anecdotal information can only assist with interpretation, at best.
- joint : working together allows both research and extension people to reach agreement, especially if there is mutual dedication. It also promotes team-work and inter-personal relationships. Involvement = Commitment.
- farm level : the opportunity for farmers to have a real say in the research planning process. The data is gathered at the grass-roots, not from secondary sources.

These factors are incorporated in the "rapid assessment" techniques of FSR, which were designed to improve the definition and prioritisation of on-farm problems. But - if a natural linkage is to develop, this work must be done by research and extension people, jointly. It is not the preserve of "farming system researchers" acting in isolation. FSR people must obviously be involved, but not to the exclusion of research and extension staff. It is vital that the people who will be doing the actual extension and research work participate fully, otherwise we have only added a new linkage problem, not solved one!

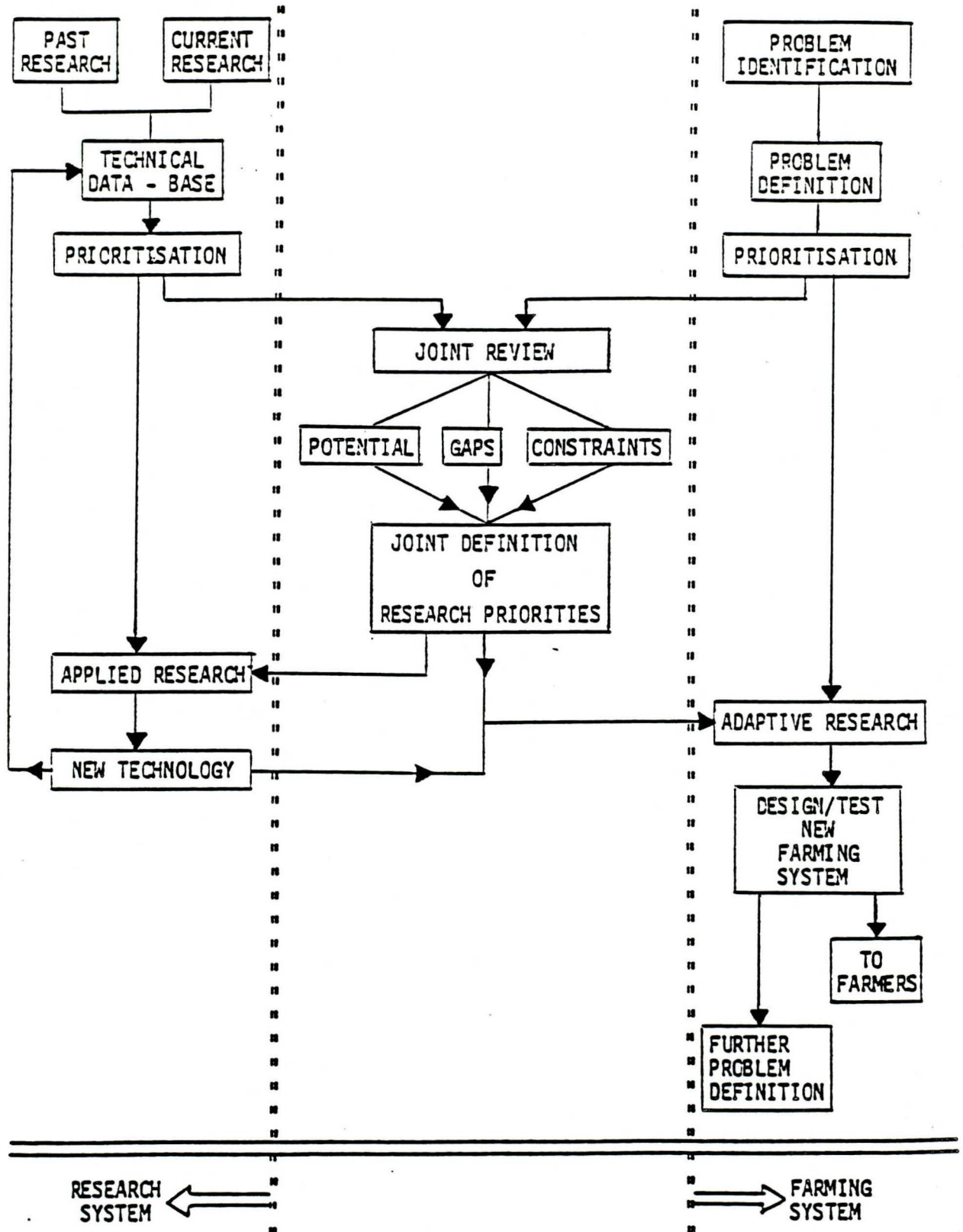
The proposal that extension and research people work together in this way will promote :

- a much better, mutual understanding of farmers' problems.
- a mutual interest and commitment to working towards solutions to these problems.
- the extension and adoption of improved technology arising from research.
- the planning of research from the "bottom-up".

How does the proposed system for joint problem definition fit into the overall research-planning process? What about contributions from "basic" research? What about new crops or techniques? What about past research findings?

The following generalised diagram indicates the way in which the various inputs can contribute towards development of research programs.

DIAGRAM



It is also possible for extension to proceed independently of the research system.

It is perhaps significant that in this model, as in the real world, it is possible for agricultural research to proceed quite happily as a self-contained and self-perpetuating system, without contact with farms or farmers.

A key feature of this model is the balance of inputs to the research planning process. Traditionally, emphasis is given to technical review aspects, with less emphasis on the problem definition aspects. Where emphasis is placed upon problem definition, it is usually (i) on problems defined by someone other than the scientists, with (ii) the presentation of weak or anecdotal data which compares unfavourably with the objective data from the research reviews.

The Natural Linkage requires that all parties be involved, right from the beginning, with the emphasis on the joint, accurate analysis of existing farming systems. The joint involvement of extension, research and FSR people in activities which decide upon research problems and priorities is the essential feature.

The involvement of researchers in this "grass-roots" definition of problems is valuable, per se, in the research process. This is because the systematic, objective analysis of problems in the field by researchers offers an excellent opportunity to expand the array of hypotheses about the problem through direct observation. This close, personal involvement of the researchers may also increase the frequency and range of creative "flashes" or insights.

It is important to note that involvement of extension in the definition of PROBLEMS and PRIORITIES does NOT mean involvement in the formulation and approval of research PROJECTS. The design of research activities to solve problems is the function of researchers and research management, but in the interests of continuing the Natural Linkage, there is merit in extension being represented on research centre committees. However, if the extension people have NOT been involved previously, there may be little point in them wasting time listening to research proposals with which they may not agree. There are other good reasons for this involvement, mainly when the committee comes to consider the on-farm research program and may need the advice and assistance of the extension people -- to plan a COOPERATIVE program. Involvement also ensures that extension is kept fully informed about the actual, total, research program of a Centre.

The natural linkage also demands that the extension people be invited to inspect experiments in progress at suitable times during the season, and to discuss developments with the researchers - which is one of the best and most natural "training" methods.

An even closer and more natural linkage is possible with experiments in farmers' fields. It is suggested that extension people, perhaps at Kaset Tambon level, should actually become involved in the field work of key experiments - jointly with the FSR or Centre research staff. This involvement may range from assistance in site selection and preparation, through monitoring, sampling and harvesting. In this way the natural interest, generated earlier in the planning process, can be maintained. It is very desirable that the "research" activities of extension officers always be in collaboration with research specialists, and NOT be conducted independently or in isolation by the E.O.'s. This will legitimise the "research" activities

of extension, and greatly increase the total resources available to work on agreed priority projects in farmers' fields. It is obvious that these cooperative activities would not take place without the earlier steps in the "natural linkage". They must occur voluntarily and enthusiastically, or they will be of little value.

Completing the Linkage

The final stages in the "natural linkage" are vital, because they complete the linkage and renew the cycle.

Once experiments are completed, it is important that the results be processed and analysed, and that they be communicated to extension as quickly as possible. This is a difficult and contentious issue, as there is need for some coordination of recommendations between regions, especially with subjects such as new variety releases. However it is worth noting that the communication of results to extension is simplified when the research has been conducted cooperatively with extension.

The final link in the process is the incorporation of progress results into the local farming systems by the design and testing of step-wise changes to these systems. This work is usually held to be the responsibility of FSR, and FSR has tended to develop as yet another, separate, activity. In fact, the on-farm research required to validate and develop new techniques is an obvious and "natural" opportunity for joint activities between research and extension, with extension working closely with FSR in the field. This also allows the feed back of problems into the research planning system, as a natural part of the joint planning process.

Students of Farming Systems Research will recognise the rather blatant way in which FSR functions have been grafted on to both ends of the normal research process. They will also note the blurred identity of FSR in the overall research process, and the absence of any formal "linkages" to join FSR with research or extension. Perhaps this is because FSR itself IS the linkage? Thought of in this way, FSR becomes part of a natural continuum of services which have responsibility to help solve agricultural problems. It is not just another organisation erected to serve bureaucratic needs, which has unfortunately become its fate in many places.

2.4 Improving Recommendations

Earlier we examined the complexity of the farmer's decisions, and pointed out that farmers need to "fit" new pieces of technology into their existing systems. Therefore, when research which was based upon carefully defined farm problems finally produces a result, it is important that the result be presented so as to allow its proper economic interpretation, under real-life conditions, where prices, costs, yield levels and risk are variables. An obvious exception would be a new variety with a clear-cut yield advantage and no disadvantages. The inflexible, recipe "recommendation" is one reason that farmers sometimes criticise and reject official recommendations as being economic nonsense. It is not the purpose of this paper to treat the problem in depth, but to point out that people who advise farmers must have a good grasp of biological and economic variability, and must be capable of adapting results to farmers circumstances. This is a long-term process, and is a two-way learning process - extension workers need to gradually improve their understanding of input/ output relationships and the economic interpretation of this data, while researchers need to become more conscious of the need to design their experiments and projects so that the output data can be used for decision making as well as for statistical analysis and publication.

Both these important processes are encouraged when extension workers and researchers work more closely together in the field and gain a better appreciation of each others work and problems.

This is also the province of the more complex techniques of modelling and farming systems analysis. These techniques have the potential to serve as a focus for cooperation between all areas of research by assisting extension workers, farmers, researchers and policymakers to make better decisions about technology, priorities and policy.

3. CONCLUSIONS

Detailed comparative study of research and extension management at regional centres in Thailand (see ACNARP reports by the author) suggest that a number of factors are necessary for successful extension - research communication. Taken together, they may even be sufficient. These factors are:-

- (1) Close personal and professional contact between research and extension staff.
- (2) Researchers involved in some direct contact with, and extension to, farmers.
- (3) Researchers who really know and understand the farming systems in their region or area of responsibility. This is facilitated by location of researchers close to the farmers, at the Regional Centres.
- (4) Extension officers with sufficient qualifications and training to achieve the respect of researchers through their ability to think critically and objectively about problems.
- (5) Extension workers actively engaged in field research in cooperation with the researchers. This involves actually working together in the field on experiments, --- not "talk-fests" in the office.
- (6) Leadership of research at the regional level which has a future - oriented, farming systems, multi-disciplinary approach to improving agriculture.
- (7) Research programs developed from the problems of farmers, which have been jointly defined by extension and research, i.e. there is a general agreement about the problems which require research.

These factors are proposed as the key elements required for a natural and effective linkage between "research" and "extension". An effective research - extension linkage is therefore built from a shared perception of the major problems of the farming system in a region. It is facilitated by mutual respect between research and extension workers, and by researchers who understand the complex, multi-disciplinary problems of the real world. It is a natural linkage, because it sees "research" and "extension" as inter-dependent parts of the same process.

The list is notable also for its omissions :-

- * There are no formal meeting or reporting or committee requirements. Emphasis is on informal links first and foremost.

- * There is no mandate that researchers and extension people work from the same administrative centre or that they live close together. Obviously being in the same office, in a rural centre, with shared progressive leadership will facilitate the linkage -- but it will not guarantee the linkage.
- * There is no formal "instruction" of senior extension workers by researchers.
- * There is no separate group of researchers doing "farming systems research". FSR is part of the research team at the Regional Centres.
- * There is no emphasis on "packages" of "recommendations", as the use of these is not supported by recent extension research.

4. IMPLEMENTATION

"The concept of the Training and Visit system is predicated upon the institutionalisation of the linkage between extension and research, and upon their simultaneous, mutually reinforcing development", (Cernea, 1981). The irony of this quotation is what is omitted --- that the T and V system is also founded on the institutional and functional separation of extension and research, and (in practice) on their separate development. Therefore our efforts to promote linkage and cooperation commence behind formidable institutional barriers. These barriers must be accepted as immutable, at least in the short term, and no useful purpose is served by using them as excuses for lack of cooperation. As was pointed out, a shared administration does not, *per se*, guarantee harmony between research and extension. Indeed, some of the most bitter conflicts between extension and research officers, in the author's experience, occurred where the officers had adjacent offices in the same building!

It is proposed that effective cooperation between extension and research, in the Thai situation, requires :-

- (1) Formal agreement between the highest levels of DOA and DOAE that cooperation is essential, and that it will be given full support by both bodies.
- (2) Establishment of formal mechanisms for dialogue and decision-making between the departments, as equal partners, at both executive and regional levels.
- (3) Support from both departments for the necessary budget and staff for liaison activities.
- (4) Recognition that the two-way communication of research information is a valid and necessary requirement for promotion and other rewards.
- (5) Cooperative activities at the regional level to focus upon joint activities which will develop a common, shared definition of the major problems of the farming system of the region. It is essential to note that the focus is on the definition of problems, and not on the derivation of the necessary research programs. The identification, definition, quantification and prioritisation of PROBLEMS is the basis of the linkage, because BOTH research and extension have useful expertise in these areas.

For implementation, it is suggested that this paper and its recommendations be considered by the DOA/DOAE Liaison Committee, and its recommendations be either rejected, or endorsed for action by the six Regional DOA/DOAE Liaison Committees.

The DOA and DOAE should consider the adoption of the following recommendations:

- (1) That the departments endorse the principles of natural linkage, as described in this paper, and that they work to providing the necessary administrative systems to bring this about.
- (2) That the six Regional Liaison Committees adopt as their first, and major on-going responsibility, the implementation of joint problem definition studies in high priority regions. Committees should initiate these studies but delegate responsibility for action to the appropriate Research Centre(s) and Kaset Changwat(s).
- (3) The Regional Committees should convene meetings for the specific purpose of collating all available information and ideas on the problems and priorities of agriculture in the Region. Contributions should be sought from all agencies working with agriculture in the region, including development assistance projects and Universities. Such meetings could provide the broad perspective which is necessary to supplement the specific, smaller, problem-definition studies. These meetings have a logical starting point in reviewing the published results of previous problem definition/survey projects in the region. In some regions, these existing studies are quite extensive, and the original exercise may be quite large.
- (4) Methodology for problem definition studies should be based initially on the CIMMYT, IRRI, NERAD and French models for Rapid Assessment. More intensive approaches such as agro-ecosystems analysis may be justified in some cases.
- (5) The Regional Liaison Committees should initiate and sponsor appropriate training of staff in survey, Rapid Assessment and analytical techniques.
- (6) Regional Committees should monitor progress with problem definition and prioritisation studies. The Committees should forward completed reports to the Bangkok Liaison Committee for use in policy formulation.
- (7) The Liaison Committees should ensure that inputs are obtained from all relevant sources including foreign projects, other departments and Universities, at both Bangkok and Regional levels.
- (8) The Regional Liaison Committees should sponsor regular technical reporting workshops to review progress results from the research program, and to ensure the rapid communication of results to extension. Such workshops should be held in the Regions, and should not duplicate the existing program of technical conferences.

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GROUP DISCUSSION
SUMMARY

Participants were divided into two groups, and asked to discuss the following questions:

1. How can FSRI and other Institutes cooperate to make FSR more effective?
2. How can DOA and DOAE cooperate to make FSR more effective?

The group reports are summarized below. Both groups concentrated on Question 1.

Group 1

- * Formation of an Adaptive Research Team (ART)
 - on a regional basis
 - composed of specialists from the research centres in the region, plus other experts as required.
 - team should be small, +/- 4 people.
 - team should have a coordinator from FSRI
- * ART should be on a regional basis, NOT one at each centre
- * ART should be located at the FSRI base for the region, (all but one of these bases are located on research centres).
- * No membership by DOAE at the beginning -- perhaps add them later.

Group 2

Group 2 could not reach agreement, hence the report represents several different, but not mutually exclusive approaches.

- * Each centre should have a group of FSRI staff, with responsibility for adaptive research. This should be a DOA policy.
- * FSRI and the Research Centre(s) should form working groups to identify and prioritise farmers problems.
- * FSRI should propose its projects via the Research Centre and Institute committees, for all experiments conducted at the centres.
- * There was a strong view expressed by FSRI that the research centres should first be responsible direct to the department, and not via the institutes, as at present. This would facilitate the operation of FSRI staff at the centres.

Editorial Comment:

Neither group reported directly on Question 2, presumably because of their pre-occupation with clarifying the relationship between FSRI and the DOA institutes.

17 July 1987

Director Chanuan Ratanawaraha
Farming Systems Research Institute
Department of Agriculture
Bangkok

Dear Director Chanuan,

I enjoyed participating in the recent workshop on "Farming Systems Research -- Future Directions", that we recently conducted at Rama Gardens. For a number of reasons, it was difficult for me to actively participate in the discussion sessions during that workshop. It occurs to me that I never got around to giving you a brief summary of my thoughts on possible "future directions" for FSR in Thailand. The purpose of this letter is to provide such a summary, to be used in whatever way you see fit.

My starting point is what I perceive to be a general agreement: that is, that FSRI should begin day-to-day collaboration with commodity Institutes and disciplinary divisions in adaptive research for defined areas. The following thoughts revolve around how this desirable goal might be attained.

- 1) Start "small": I would suggest that one or two Centers be picked for initial collaboration. These should not be Regional Centers or FSRI Units, but rather commodity Institute Centers. The easiest way would be to pick one Institute (my preference, obviously, would be the Field Crops Research Institute) and develop collaborative links in adaptive research with one or two Centers corresponding to that Institute.

I would also suggest that initial activities with the selected Institute and Center be limited to one "zone" per Center. This would allow your staff to become more comfortable with adaptive research procedures, while allowing you to "demonstrate" the procedures themselves to others within DOA. These initial zones may also serve as a "training base".

The larger questions of how to coordinate the adaptive research activities of several Institutes, Divisions and Centers within a Region might fruitfully be postponed for a year or two. This would allow you to concentrate on the question of how to gracefully and effectively integrate FSRI staff into commodity Centers -- it would give you time to define the precise role of FSRI staff posted to Centers, and the evolving role of FSRI Headquarters staff.

.../2.

- 2) The Role of FSRI Staff Posted to Centers: There seem to me to be several clearly defined roles which FSRI staff could play, while posted to commodity Institute Centers. These roles are consistent with our workshop conclusion that, "A shared diagnosis -- a shared understanding of major problems, their causes, and their possible solutions -- will usually lead to a consensus on what kinds of research activities are warranted for a zone, and what kind of disciplinary or commodity specializations are needed to implement these high-priority research activities."

-- FSRI staff posted to Centers could serve as a source of expertise on adaptive research procedures in general, and the procedures for diagnosis and priority-setting in particular. That is, they could help Center scientists organize their knowledge in such a way that reasonable research priorities could be set.

-- FSRI staff posted to Centers could take the leadership in farm survey activities. Diagnosis and priority-setting need as an input a good understanding of "farmer circumstances", problems, causes and solutions. Farm surveys of one kind or another will be needed, and FSRI staff, in the absence of sustained OAE input, could help implement these.

-- There will be occasions when "land use efficiency" is judged to be a major, priority research theme for a zone, and when cropping pattern testing is in order. FSRI staff would be the logical choice to implement this kind of trial.

-- There will be other occasions when "diversification" is judged to be a major, priority research theme for a zone, and when research aimed at this objective is in order. This is another obvious activity for FSRI staff.

- 3) The Role of FSRI Headquarters Staff: There seem to be several clearly defined roles which FSRI Headquarters Staff might play. These are, for the most part, tightly related to the activities of FSRI staff posted to commodity Centers:

I would like to stress the need for strong FSRI Headquarters support of FSRI field teams, because these teams will be "outnumbered" by senior commodity and disciplinary researchers, some of whom may not be overly sympathetic to the idea of adaptive research.

.../3.

17 July 1987

-- Procedures development: FSRI Headquarters staff should take the leadership in developing "Thai" procedures for FSR and for adaptive research. That is, they should critically review currently available procedures from different institutions, and select the best elements of each.

-- Training of FSRI field staff: FSRI Headquarters staff should develop and implement training courses for FSRI field staff (those posted to commodity centers) and for other interested researchers. These courses might cover such themes as rapid rural appraisal; techniques for setting research priorities; implementing zone-level agronomic trials; interpreting data at the zone level; etc.

-- Follow-up and support of FSRI field staff: FSRI Headquarters staff should travel around Thailand and visit FSRI field staff posted to Centers. They should visit on-going zone-level adaptive research programs, give advice and counsel on the research procedures being used, suggest alternative approaches, and generally make themselves useful.

-- Zoning: FSRI Headquarters staff can develop procedures for "zoning", as described in the workshop. FSRI field staff in cooperation with Institute and Division researchers, would take actual decisions on zones, but Headquarters staff could look into alternative ways of reaching zoning decisions.

These, then, are some of the thoughts that I wished to share with you. I have "assumed" a lot in making these suggestions: I have assumed that the DOA is interested in research efficiency and that DOA leadership is interested in adaptive research; and I have assumed that the Adaptive Research Teams discussed during the workshop will actually be formed, and that the "political" questions of team leadership are not impossible to solve.

Best of luck, and please let me know in what further way I might contribute to the future success of FSRI in adaptive research.

Best personal regards,

Larry Harrington
Economics Program

cc: Mr Bryan Gorddard

Notes on discussion : B. Gorddard/ K. Chanuan
23.7.87

SUBJECT: Follow-up to FSRI WORKSHOP
at Rama Gardens
July 8-9, 1987

- * Adaptive research, as presented by Dr Harrington, is very relevant and practical for DOA, but it will not solve all the problems of FSRI.
- * FSRI would prefer to consider the entire farming system.
- * Parts of Dr Harrington's system are immediately applicable to FSRI, e.g. problem definition, prioritisation and economic analysis.
- * FSRI would like to adopt the "tool-box" concept, and be able to use other techniques when appropriate - e.g. Conway's agro-ecosystems analysis.
- * Highest priority for FSRI is to train and strengthen its junior staff in both principles and practice of FSRI. This will be done by "in-house" training, within FSRI, using Thai-speaking experts from Universities or foreign projects. It is important that this training be in Thai language.
- * Khun Chanuan considers that Dr Harrington's approach to adaptive research is very suitable for use by the Research Centres, and could be readily implemented by the Centres, independently of the FSRI units. Perhaps later, when the FSRI staff had been trained, they would get involved in this work at the Centres.
- * There had been no feed-back from DOAE on the ideas discussed at the workshop.

Conclusion:

ACNARP and CIMMYT remain available to assist FSRI to strengthen its operations. ACNARP is also anxious to promote adaptive research from the NARP Centres, as the basis for improving the relevance of DOA research and its linkage with extension. ACNARP and CIMMYT will now wait for the DOA's initiative in these areas.

Bryan Gorddard
Project Manager
ACNARP

DISCUSSION PAPER

DATE : 14 July 1987
TO : K. Chanuan Ratanawaraha
FROM : Dr David Ivory
SUBJECT : Farming Systems research - future direction

I would like to take the opportunity to follow up on some aspects of the excellent workshop we had last week. I particularly want to emphasize aspects of future directions in FSR associated with research planning, implementation and cooperation of FSRI with the regional research centres, technical divisions and extension.

In this paper I wish to attempt to summarize my perception of how the various presentations and the general conclusion of the discussion group at the workshop fit together in the above context. I will include my own biases or personal perspectives, but hope that the whole paper will provide some opportunity for further discussion and some help to the FSRI in your goal of achieving a more effective program of FSR throughout Thailand.

Firstly I want to again discuss the structure and function of FSRI because I believe it is so important to building up a very effective country program of FSR. Secondly, I want to take a particular regional example to indicate how I believe FSRI can integrate its activities with the regional research centres.

1. STRUCTURE AND FUNCTION OF FSRI

The two official research groups in the FSRI, the Cropping Systems Group and Crop Environment Group, are internally organised into three further sections, as shown in figure 1. I believe however, this is not the most appropriate structure, for the following reasons:

- (i) The structure is not sufficiently strongly oriented towards a regional concept of FSR activities and operation. There should be a reduction in groups in Bangkok and greater transfer of staff to regional units.

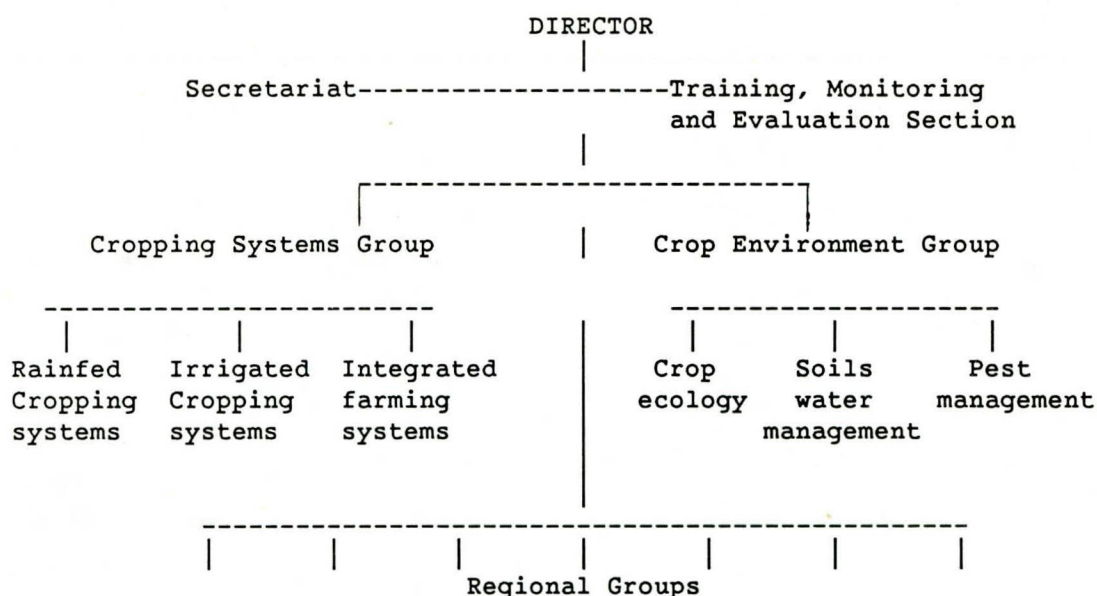


Figure 1: The present organization of the FSRI.

- (ii) The structure contains an integrated farming system group which is intended to provide integrated research in cropping, livestock, fisheries and forestry systems. I believe that there are insufficient staff with a livestock, forestry or fisheries background in FSRI and that integrated research should be on the basis of cooperative projects with the Livestock Development, Forestry or Fisheries Departments.
- (iii) There is a pest management group which is intended to provide research on weeds, insects and disease. I believe these functions should be covered by cooperative interdisciplinary research with staff of the respective technical divisions.
- (iv) There is no grouping which covers aspects of socioeconomic analysis and systems analysis. I believe these are very important aspects of FSR.

On the basis of these points I therefore suggest that consideration should be given to changing the structure of the FSRI, as shown in figure 2.

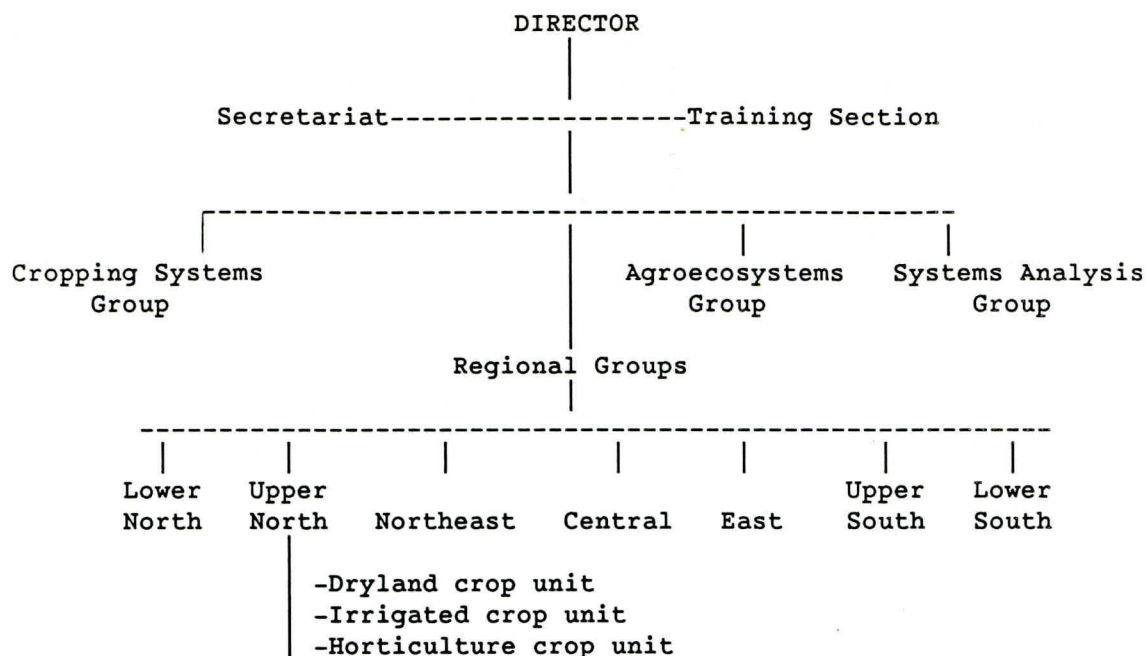


Figure 2: Suggested restructuring of FSRI.

In the new structure I suggest that the present Crop Ecology group could be renamed an Agro-Ecosystems group with its main functions to provide special emphasis to promoting a stronger biological and physical basis for assessing the suitability of cropping systems to the given climatic environments and soils of particular regions. Another group, a Systems Analysis Group, should be formed to cover aspects of Farm Resources, Systems Management and Economics, which are presently not covered. Specialists are required in farm resource survey, systems analysis, sociology and agricultural economics. It is noted that the FSRI has moved to remedy part of this deficiency by appointing one agriculture economics graduate who is presently undertaking post-graduate study. The majority of the staff of the present Cropping Systems Group should be transferred to the regional groups. Only a small core group should remain in Bangkok to coordinate the Cropping Systems activities. The other two groups should be based in Bangkok and provide a strong resource backup to the regional activities of the Cropping Systems Groups.

I believe that these changes to the structure and operations of the FSRI will improve the effectiveness of FSR and also provide a specific role and need for FSR in the DOA, that cannot be supplied by other divisions or institutes within the DOA. These are:

- (i) the need to integrate discipline-based research into systems or technologies for testing and development for use by farmers.
- (ii) the need for research information on the environment, physical resources, farming systems and socio-economic factors which affect the requirement and type of technology which is appropriate.
- (iii) the need to analyse new technologies and predict where they will be successful and what will be the expected economic or sociological returns.

- (iv) the need to provide a close link between research, extension and the farmer (this was emphasized in the paper of Mr Gorddard).

There is no need for the FSRI to duplicate the activities of existing research disciplines, such as soil science, pathology and entomology, that are already well catered for in existing discipline divisions in the DOA. The FSRI will necessarily require inputs from these disciplines to their on-farm research program but it should be achieved by encouraging multidisciplinary research at the regional centres where a number of discipline specialists of the DOA and extension officers from DOAE join together in solving a common problem or developing a farming technology.

Thus the FSRI, commodity institutes and technical divisions should come together at the regional centres and form an interdisciplinary workforce aimed at solving the regional problems of farmers and thus improving their socio-economic situation.

2. IMPLEMENTATION OF FSR - A REGIONAL ZONAL APPROACH





Rather than discuss how a regional concept of operations for FSRI might work in theory, I would like to take a specific regional example and describe how I perceive the various units of FSRI and the regional commodity centres, technical divisions and DOAE may interact and operate at a regional level. I have chosen for the example the Upper Northern region of Thailand. Many things that I describe may not be very accurate but the idea is to focus on the general operational methodology.

2.1 Zonation

Dr Harrington in his paper emphasized that there should be a zonal approach to FSR activities. The first step is to decide what agroecological zones are present in the region. In attempting to divide a region into zones the aim is to identify areas which have common soils, climate, land use and farming systems. Usually this is closely related to topography. The agroecosystems and systems analysis groups in FSRI have a key role to play in this process of subdividing the region into zones. As an example, I have subdivided the Upper Northern region into four zones, based on topography (figure 3). I am not familiar enough with the region to decide whether there should be only three zones or more than four. Perhaps zones 1 and 3 are sufficiently similar to be considered one zone.

Figure 3: Agroecological Zones Of Upper North

DIAGRAM

-  Zone 1 - Western mountains
-  Zone 2 - Central uplands
-  Zone 3 - Eastern uplands
-  Zone 4 - Lowland



2.2 Systems Analysis

Having decided on an appropriate number of zones, the agroecosystems and systems analysis groups then have an important task to use secondary data, rapid rural appraisal, etc, to describe each zone in terms of :

- agricultural output by crops
- cropping systems
- farm systems (including farm size, population, economic aspects, etc.)
- soils and climate - etc.

These activities were covered in detail by the papers of Dr Harrington and Mr Craig.

Together with a description and quantification of the natural resources, agricultural output and cropping systems of the zone, there should also be a documentation of the problems of agricultural production in each zone. At this stage a decision should also be taken about the relative importance of each zone in terms of FSR inputs. With limited staff located in the region, a decision has to be taken as to how many FSR units will be deployed in the region and which are the most important.

In the Upper Northern region it may be decided that there are three major zones in which FSR activities should be focussed. These may have the following general characteristics :

- lowland zone (zone 4) which has high farmer density, small farm size and agriculture production is dominated by irrigated rice, with other dryland crops and vegetable crops of secondary importance
- upland zone (zones 2 and 3) which has lower farmer density, larger farm size and agricultural production is dominated by dryland crops such as upland rice, maize, soybean, peanuts and mungbean, with horticultural crops of secondary importance
- highland zone (zone 1) which has low farmer density, larger farm size and agricultural production is dominated by upland rice and horticultural crops (vegetables, flowers and fruits, with dryland crops of secondary importance.

2.3 Deployment of FSRI staff

If it was agreed that there were three zones in the Upper North where FSRI should focus its activities, as suggested above, a decision would have to be taken as to how FSRI could effectively undertake FSR activities in the region. If there were sufficient staff I would suggest three FSRI units, one for each zone. It would then be logical to place each unit at each of the three regional centres in the region. The lowland unit would be based at Phrae Rice Research Centre, the upland unit at Chiang Mai Field Crops Research Centre and the highland unit at Chiang Rai Horticulture Research Centre. These would reflect the major focus of their FSR activities in terms of agricultural crops.

I believe there should also be a regional leader for FSRI, who should coordinate the activities of these three units. FSRI staff located at regional centres would be responsible on a day to day basis to the directors of those centres but their general research activities would be coordinated by the regional research leader in association with the directors of relevant

centres. Research proposals and research progress reviews should be the responsibility of centre committees which include the regional FSRI research leader and the Director of the FSRI. Both the regional FSRI research leader and the Director of the FSRI would be required to endorse all research proposals and allocate sufficient funds for the execution of the research programs.

Alternatively, regional FSR activities might be coordinated through a regional FSR committee, which includes the three Centre directors and representatives from each of the three regional FSRI units and chaired by the Director of the FSRI.

A natural apprehension with the deployment of FSRI staff to the regional centres is that this would mean the loss of staff from the FSRI to the commodity institutes. This should be unjustified if there is goodwill and commonality of purpose on all sides. Such an arrangement should permit FSRI staff based at centres to have a dual responsibility and interest, i.e. to the regional centre for interdisciplinary research, both at the Centre and on-farm, and to the FSRI for development of their own and the FSRI's disciplinary expertise.

2.4 Prioritization of research

Before priorities can be set for regional research there has to be a definition of the problems. FSRI should take a leading role in defining problems of agricultural production and their causes and solutions. FSRI should encourage participation from DOAE, regional research centres, technical divisions, industry and any relevant agricultural projects in the region. For example in the Upper North there is one German and two Australian agricultural development projects. There may be more. These can provide valuable inputs into zone description as well as problems and priorities for research.

In considering solutions to problems it will be evident that for some problems there is already research information available which may provide an effective solution. In this case the research is clearly adaptive research and the responsibility of FSRI for technological development on-farm. For some problems there may be no suitable solution. It is clearly then the responsibility of the research centre or technical division to undertake appropriate applied research.

Where the research is to be undertaken by staff of FSRI or technical divisions an appropriate amount of budget should be allocated to the regional centres. The administrative unit at the regional centres should be able to administer funds from the FSRI and technical divisions as separate budgets on behalf of the FSRI or technical division.

It is emphasized again that regional research prioritization should be a joint activity by all concerned with subsequent allocation of research tasks to the appropriate institutes or divisions.

2.5 Implementation of research

As emphasized by Dr Harrington, on-farm research should be systematic. In testing or developing a new technology, research should be based at several locations in the zone. These should not be chosen randomly. There should be a deliberate and systematic selection of sites so that the various soils, climate and areas of the zone are covered by the sites chosen. The agroecosystems and systems analysis groups should be involved in the selection

process. They should also be involved in the design of on-farm experiments to ensure that the appropriate information is collected for their ecosystems analysis or economic analyses.

After results are obtained from the on-farm experiments, these same groups should be involved in evaluation of results in both biological and economic terms. Following a review of research, plans can then be made for the next years' experimentation.

3. CONCLUSIONS

In this paper I have concentrated on suggesting possible operational procedures that the FSRI can follow in implementing its FSR activities at a regional level. In order to achieve this goal, I have stressed the importance of:

- (i) Considering a restructuring of FSRI in order to strengthen the regionalization of the Cropping Systems Group and strengthen the key resources groups for FSR in Bangkok (namely the Agroecosystems and Systems Analysis groups), that can provide vital inputs into the regional programs.
- (ii) Strongly supporting a zonal concept of operations within a region, where research priorities are decided on the needs of the zone and there is a close association with, and division of responsibility for, research between the FSRI, the Commodity Institutes and Technical Divisions.
- (iii) Using FSR units within the region which have a focus and responsibility to FSR within a zone. These units should be associated with the regional centres. There should be a clear understanding and agreement with the Directors of the regional centres as to how the FSR units will operate and how there can be considerable mutual benefits between FSRI and the regional centres. I favour the idea of specialization within these units so that within the FSRI, there are scientists who specialize in FSR in horticulture, field crops and irrigated rice based systems.
- (iv) There is sufficient expertise and knowledge available on FSR in Thailand for the FSRI to adopt a standardized approach to FSR, based on the procedures outlined in the workshop and procedures of other FSR projects in Thailand.
- (v) The FSRI has a vital role to play in agriculture research in the DOA. I believe there are a number of initiatives which can be undertaken that will improve the effectiveness and efficiency of FSR in the DOA and thereby enhance the reputation and standing of the FSRI. I would be willing to discuss these aspects further and hope I can provide you with any assistance needed.