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WORKING PAPER NO. M2*

# TRIAGE: A METHODOLOGY FOR SCREENING AGRICULTURAL TECHNOLOGIES AND PRIORITIZING RESEARCH AND EXTENSION ACTIVITIES

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* Other papers in this series are listed in Appendix 2 of this report and are available on written request from the Project Director.

# TRIAGE: A METHODOLOGY FOR SCREENING AGRICULTURAL TECHNOLOGIES AND PRIORITIZING RESEARCH AND EXTENSION ACTIVITIES

## Background and Justification:

The Farming Systems Research and Extension (FSRE) approach involves the on-farm testing of agricultural technologies in order to refine and improve these technologies in line with farmer needs according to the lessons learned in the early testing phases. Most FSRE projects begin with testing a selection of agricultural technologies which may be defined by the project paper, baseline surveys, agroecosystems analysis, rapid rural appraisals, etc. In many cases there is a reluctance to drop poor technologies, test new technologies or to re-define research and extension priorities in the light of the experience gained in the early years of on-farm testing.

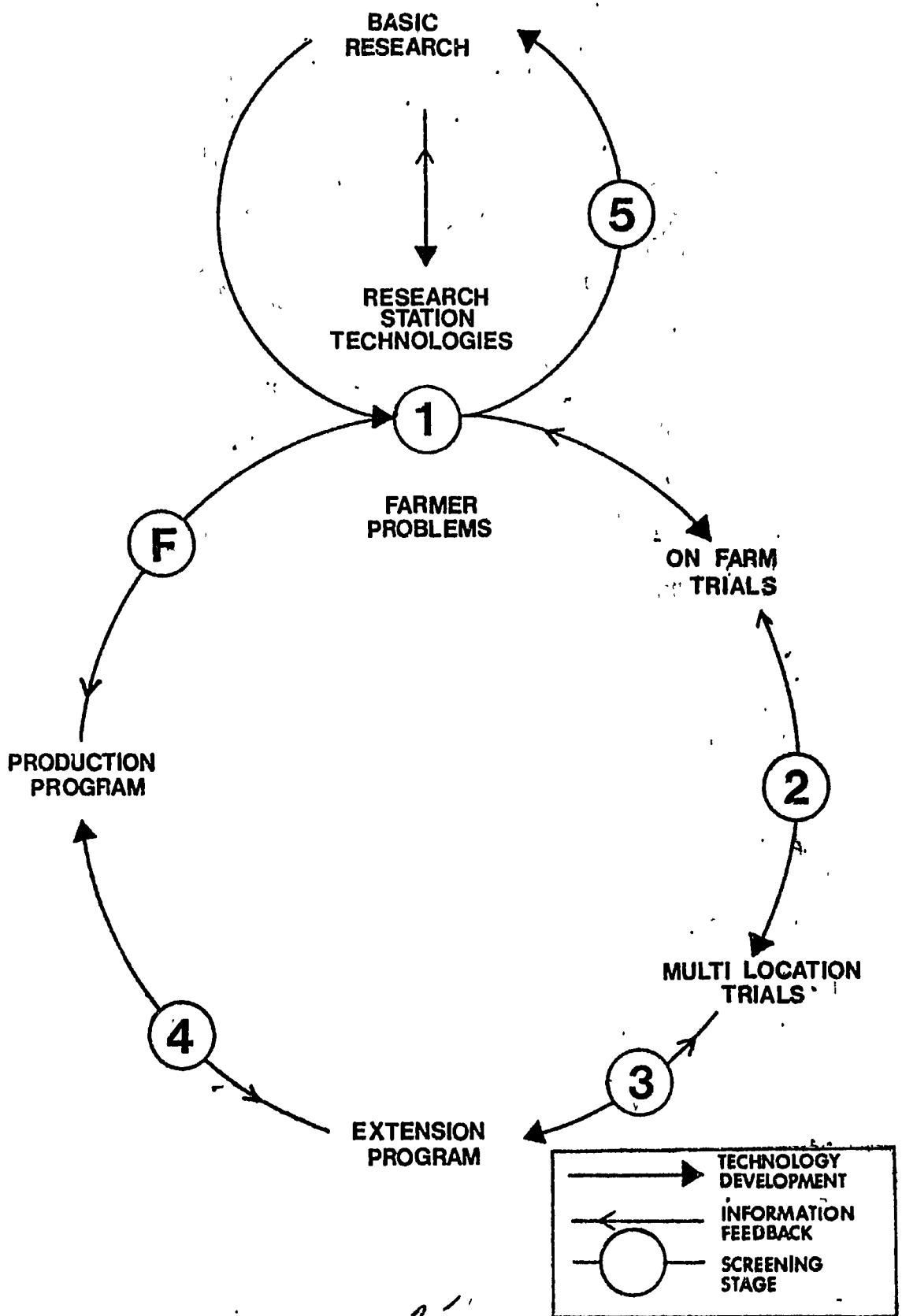
Any agricultural technology testing and development process requires decisions to be made on which technologies are worthy of further testing and the form in which testing should be conducted in order to gain information on how to improve the performance of that technology in the future. In many cases, these are very subjective decisions made by one or, at best, a small group of applied researchers often from a single discipline.

The triage process attempts to improve objectivity and introduce multi-disciplinary analysis into the technology screening process by developing a step-by-step interdisciplinary analysis procedure for rating the performance of the technologies tested in the target area and defining further research and extension needs. In the final analysis, triage is a useful tool for organizing and improving objectivity in the application of expert knowledge and judgement; it is not, however, a substitute for them.

## Description:

Triage is used as a screening tool in the development of cropping systems technologies (See Figure 1) to analyse the results of all the technologies tested in order to decide which have a high potential for success in significantly benefitting a large proportion of farm families in the target area. It is also used to define further research and extension needs and to prioritize effort on these in the future.

Figure 1. Cropping Systems Development



Triage works by classifying the technologies tested in an on-farm trials program into 3 categories:-

1. Successful technologies which are considered suitable for extension to other farm families.

2. Promising technologies which still require further modification or refinement by component technology research.

3. Technologies which under present or expected future conditions are unlikely to be successful and require further basic research.

Those technologies allocated to category '1' are further tested in the MULTI-LOCATION phase of the technology development cycle (See Figure 1). Technical recommendations on how to implement the technology and the conditions necessary for its success are documented in as guidelines for conducting multi-location or extension trials.

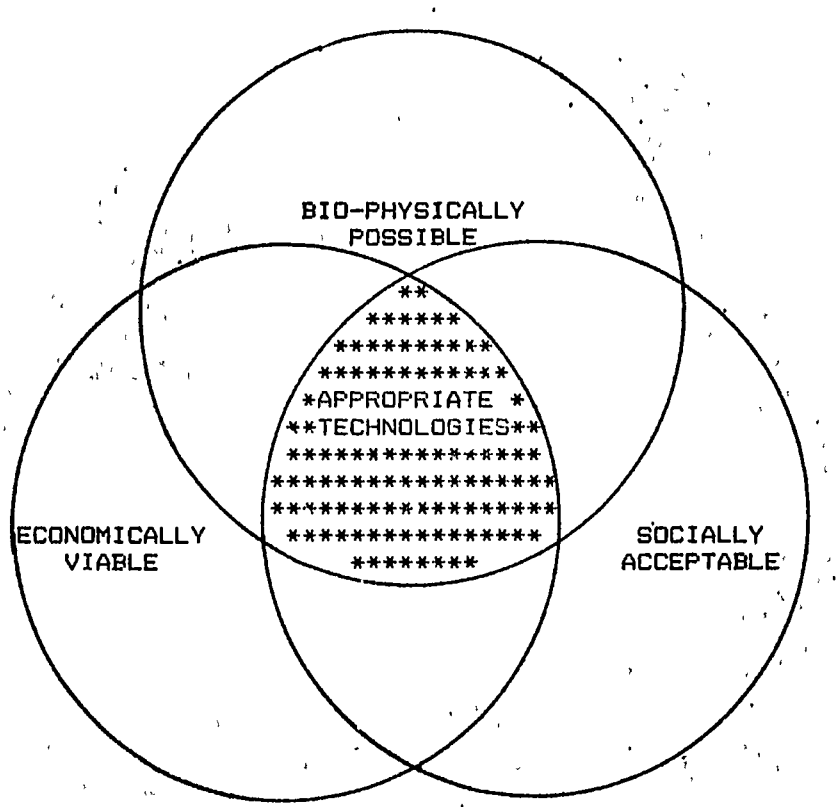
Those technologies allocated to category '2' are modified by further component technology research in the ON-FARM TRIAL phase of the technology development cycle (See Figure 1). The major unsolved problem(s) associated with the technology are documented in order to help decide what further component technology testing is still needed and to assist with trial design and implementation.

Those technologies allocated to category '3' are referred back to the appropriate agency for further BASIC or ON STATION RESEARCH aimed as solving the problems encountered in the trials. The problems encountered and the reasons for the failure of the technology are documented in order to define research needs and priorities.

For triage to be successful, clear guidelines need to be established for deciding which technologies should be allocated to each category. Specific criteria will vary according to the type of technology being considered whether it be a cropping system, water resource, livestock, or other technology. However, there are some general guidelines which should be considered for screening any technology.

First, for any technology to be successful, it must satisfy 3 basic criteria (Figure 2). It must be biologically or physically possible, economically viable and socially acceptable to the farmers. Consequently, the screening or triage process must be conducted in an interdisciplinary manner. Biological or physical scientists will be needed to assess the technical feasibility, economists will have to help analyse the economic potential and extension personnel or the farmers themselves must be consulted to judge the social acceptability of the technology.

Figure 2. Essential screening criteria to be considered during the Triage process.




Obviously, the magnitude of the potential benefit from any technology must be considered during the triage process. This will most commonly be measured in economic terms but other indirect or non-economic benefits such as improved soil condition, improved health or nutrition, etc. should also be considered. The applicability of the technology to wider areas is also an important screening criteria that should be considered during the triage process; some technologies deserve priority because their potential benefits are very high, others should receive high priority because they are replicable over large areas.

Implementation Guidelines:

The following section explains the various steps in conducting triage using cropping system trial technologies as an example and makes reference to the sample triage forms which are reproduced in Appendix 1 of this report.

Triage is best conducted by an interdisciplinary group of about 10-15 people. One team should be formed for each project site and a chairman and secretary should be nominated. The disciplines of agronomy, soil-science, plant protection, agricultural economics and extension should be represented in each triage team. In addition, it is essential that field-level personnel with day to day experience of the trials are included on the teams.

White-boards, flip charts of pre-prepared triage forms, over-head projectors and other visual aids should be available for use by the triage team. Clearly summarized data on the following should also be available for each member of the group:

- Trial results for each technology for every year tested.
- Climatic conditions for all test years.
- Market price information for all test years.
- Agro-ecological conditions of the test site (soils, topography, etc.).
- Socio-economic information for the test site (farm type, size, income, etc.).

Each team should then conduct triage according to the following instructions using the forms referred to which can be found in Appendix 1 of this report. For each project site:

1. Prepare cropping trial results summaries for every year tested following the format presented in FORM A (Ideally, these will be prepared in advance of the triage process and copies made available to all members of the triage team).

2. List every trial conducted in the first column of FORM B.

3. Using the data from the completed FORM A's, fill in columns 1-[illegible] on FORM B for each trial listed according to the instructions on that form.

4. Using the completed FORM B's, triage each technology by following the instructions in FLOW CHART C.

5. Depending on the result of the triage, complete the relevant form (D, E, F, or G) with the required details for each trial according to the instructions on that form.

The completed forms (D to G) are then used to design and implement further research and extension activities as defined for each technology. Ideally, those responsible for future basic or on-farm research or extension of the technologies triaged should have been present on the triage team. This may not always be possible, however, and therefore the forms should be completed in sufficient detail to be useable by someone with no previous experience of that technology.

Future Development Requirements:

To date, triage has only been used to: (i) match available agricultural technologies with farmer problems; (ii) screen technologies tested during on farm trials and (iii) screen technologies tested during the multi-location phase of technology development (screening stages 1, 2 and 3 in Figure 1). The triage methodology has had to be slightly modified for the specific needs of each screening stage but has not yet been used for a complete cycle of technology development from identifying a problem all the way to farmer adoption. It is anticipated, therefore that as the later screening stages in the process are reached then the triage methodology will have to be further modified.

Further refinement of the triage process is necessary to adapt it for screening agricultural technologies other than solely cropping systems. In addition, standardized means of rating the technologies on Form B are necessary and detailed refinement of the approach generally is required.

The authors have found the triage process useful in the planning, design and evaluation of cropping systems trials in Northeast Thailand. However, the limitations and shortcomings of the process are also recognized and any comments or suggestions for improvement would be gratefully appreciated.

Anyone requiring further information concerning triage is invited to contact the authors at the following addresses:

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# APPENDICES

# CROPPING SYSTEMS TECHNOLOGY DATA SUMMARY FORM

SITE ..... YEAR ..... REPORTER .....

LAND TYPE ..... SOIL SERIES .....

| SOIL SAMPLE ANALYSIS TEST REULTS | pH | | | O.M. (%) | | | P (ppm) | | | K (ppm) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mean | min | max | mean | min | max | mean | min | max | mean | min | max |
| | | | | | | | | | | | | |

| CROPPING SYSTEM | FIRST CROP | SECOND CROP |
|---|---|---|
| | | |
| SUPERIMPOSED TREATMENTS: | CULTURAL PRACTICES IN FIRST CROP | CULTURAL PRACTICES IN SECOND CROP |
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |

MAJOR OBJECTIVES OF THE RESEARCH TRIAL:

CROPPING SYSTEMS TRIALS RESULT SUMMARY

| FIRST CROP | NUMBER OF REPS. | SUPERIMPOSED TREATMENTS | YIELD (KG/RAI) | | | SELLING PRICE (BAHT/KG) | | | INPUT COST (BAHT/RAI) | | | NET RETURNS (BAHT/RAI) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mean | min | max | mean | min | max | mean | min | max | mean | min | max |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

MAJOR PROBLEMS:

SUGGESTIONS FOR IMPROVING CROP PERFORMANCE:

| SECOND CROP | NUMBER OF REPS. | SUPERIMPOSED TREATMENTS | YIELD (KG/RAI) | | | SELLING PRICE (BAHT/KG) | | | INPUT COST (BAHT/RAI) | | | NET RETURNS (BAHT/RAI) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mean | min | max | mean | min | max | mean | min | max | mean | min | max |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

MAJOR PROBLEMS:

SUGGESTIONS FOR IMPROVING CROP PERFORMANCE:

10

FORM B

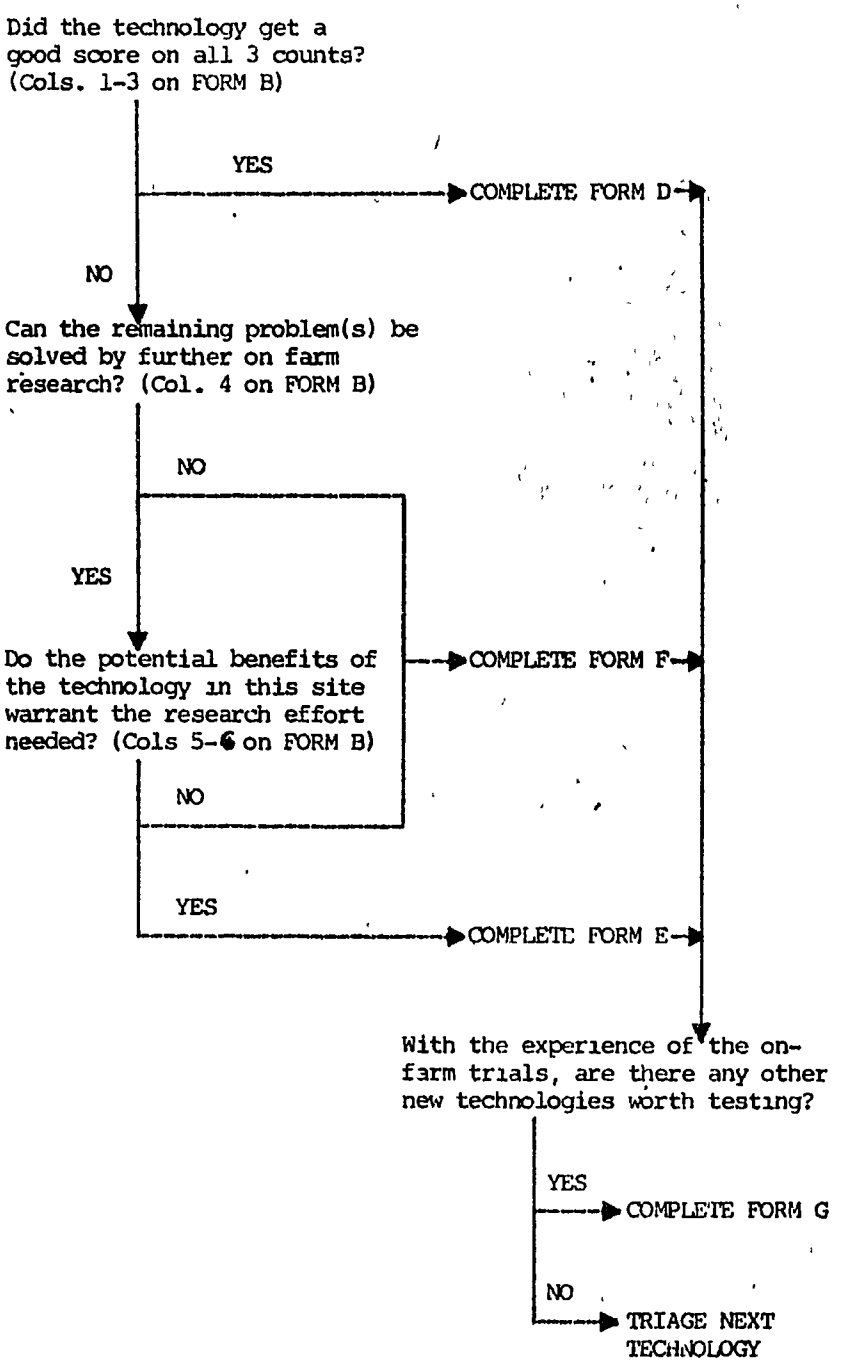
DATE OF TRIAGE .....

SITE .....

| TRIAL CONDUCTED (list every trial conducted) | ACTUAL PERFORMANCE | | | 4. MAJOR UNSOLVED PROBLEMS & CONSTRAINTS REMAINING | Assuming the problems in Col. 4 can be solved: | | |
|---|---|---|---|---|---|---|---|
| | 1. AGRONOMIC PERFORMANCE (0-3) | 2. ECONOMIC PERFORMANCE (0-3) | 3. FARMER ACCEPTANCE (0-3) | | 5. POTENTIAL BENEFITS (0-3) | 6. PROPORTION OF SITE FOR WHICH TECHNOLOGY IS APPROPRIATE | |
| | | | | | | % of farm-families | % of land area |
| 1 ..... ..... | | | | | | | |
| 2 ..... ..... | | | | | | | |
| 3 ..... ..... | | | | | | | |
| 4 ..... ..... | | | | | | | |
| etc. ..... ..... | 0 = ZERO OR INSIGNIFICANT YIELD.<br>1 = POOR YIELDS.<br>2 = SATISFACTORY YIELDS.<br>3 = HIGH YIELDS.<br>Possible Indicators<br>0 = Zero<br>1 = Mean yield below Changwat average<br>2 = Mean yield above Changwat average<br>3 = Mean yield close to research station yields. | 0 = NEGATIVE OR VERY LOW RETURNS.<br>1 = LOW RETURNS.<br>2 = SATISFACTORY RETURNS.<br>3 = HIGH RETURNS.<br>Possible Indicators<br>0 = -ve or zero returns<br>1 = 0-200 ฿/rai<br>2 = 200-800 ฿/rai<br>3 = 800 ฿/rai | 0 = ZERO OR INSIGNIFICANT FARMER INTEREST.<br>1 = LOW FARMER INTEREST.<br>2 = SATISFACTORY FARMER INTEREST.<br>3 = HIGH FARMER INTEREST.<br>Possible Indicators<br>0 = Farmers abandon trials<br>1 = Some farmers will not continue trial next year<br>2 = All farmers want to continue trial next year<br>3 = Other farmers want to participate in this trial. | DESCRIBE THE MAJOR UNSOLVED PROBLEMS REMAINING FOR EACH TECHNOLOGY. | 0 = LOW BENEFITS.<br>1 = MEDIUM BENEFITS.<br>2 = GOOD BENEFITS.<br>3 = CAPABLE OF EXTREMELY HIGH BENEFITS.<br>Possible Indicators<br>0 = less than current farmer practices<br>1 = equal to current farmer practices<br>2 = higher then current practices<br>3 = at least double current practices. | 0 = NONE OR INSIGNIFICANT.<br>1 = 0-33%<br>2 = 33-66%<br>3 = 66-100% | 0 = NONE OR INSIGNIFICANT.<br>1 = 0-33%<br>2 = 33-66%<br>3 = 66-100% |

## FLOW CHART C

For each technology to be triaged use the results in the completed FORM B's to answer the following questions:



FORM D

To be completed for technologies considered ready for further testing in the MULTI-LOCATION phase.

| NAME OF TECHNOLOGY..... | SITE TESTED..... |
|---|---|
| MAJOR OBJECTIVES OF THE TECHNOLOGY | |
| RESULTS SUMMARY | |
| RECOMMENDED PRACTICES | |
| APPROPRIATE CONDITIONS FOR MULTI-LOCATION TESTING AND LIMITATIONS OF THE TECHNOLOGY | |

FORM E

To be completed for technologies requiring further component technology testing in the ON FARM trials phase.

| NAME OF TECHNOLOGY..... | SITE TESTED..... |
|---|---|
| MAJOR OBJECTIVES OF THE TECHNOLOGY | |
| RESULTS SUMMARY | |
| MAJOR PROBLEMS REMAINING | |
| SUGGESTIONS FOR FURTHER COMPONENT TECHNOLOGY RESEARCH | |

## FORM F

To be completed for technologies to be referred back to the relevant agency for further problem solving BASIC RESEARCH.

| NAME OF TECHNOLOGY..... | SITE TESTED..... |
|---|---|
| MAJOR OBJECTIVES OF THE TECHNOLOGY | |
| RESULTS SUMMARY | |
| MAJOR PROBLEMS THAT CANNOT BE SOLVED BY ON FARM TRIALS | |
| SUGGESTIONS FOR FURTHER BASIC RESEARCH | |

FORM G

To be completed for NEW TECHNOLOGIES considered appropriate for testing in the light of experience gained from the on farm trials

| NAME OF TECHNOLOGY..... | SITE FOR TESTING..... |
|---|---|
| MAJOR OBJECTIVES OF THE TECHNOLOGY | |
| RESULTS OF ON STATION TRIALS CONDUCTED | |
| REASONS WHY THE TECHNOLOGY IS CONSIDERED APPROPRIATE | |
| SUGGESTIONS FOR COMPONENT TECHNOLOGY RESEARCH | |

APPENDIX 2

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., 198 .

(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. Northeast Regional Agricultural Development Information and coordination system (NERADICS). Pisone U. and Hopkins, J., 1987.

(English)

M4. Rapid Rural Appraisal: the NERAD experience. Alton, C. 1987.

(English)

NERAD Technology Documentation Series

T0. Executive Summary of the NERAD promising technologies. Thamabood, S. (Editor), 1987.

(Thai)

T1. Direct sown rice technology documentation. Craig, I. A. et al., 198 .

(Thai and English)

T2. Modified shallow well technology documentation. Ragland, J.L. and Thamabood, S., 198 .

(English)

T3. Demonstration farmer buying groups: a technology documentation. Meyer, L., 198 .

(English)