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Current Pest Management Problems Facing Farmers in North East Thailand: Key Research and Development Priorities

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PREFACE

This document has been printed and distributed by the Northeast Rainfed Agricultural Development Information and Coordination System (NERADICS) of the NERAD Project. The purpose of NERADICS is to establish, at the Northeast Regional Office of Agriculture, a system to manage Project-generated data and information in order to support the testing, transfer and dissemination of technologies, methodologies and approaches appropriate for integrated agricultural research and development in Northeast Thailand.

Technical working papers are produced with the objective of communicating project-generated information to the relevant research and development agencies in order to receive comments and feed-back and to help to ensure that the lessons learned within NERAD are made available to all interested individuals and organizations.

Working papers are produced on a number of topics and are grouped into three series according to their subject matter:

Technology Documentation Series

Documentation of technologies considered appropriate for rainfed agricultural development in Northeast Thailand

Methodology Description Series

Descriptions and methods of use of proven methodologies and techniques for the planning, analysis and evaluation of research and extension activities for rainfed agriculture.

Problem Definition Series

Situation papers on the problems or constraints currently facing rainfed agriculture and farm families in Northeast Thailand.

All papers in these series are listed in the Appendix of this report and are available on request from the Project Director. The papers are updated at appropriate intervals and NERAD invites comments and discussion from readers on any topic covered in the reports.

CURRENT PEST MANAGEMENT PROBLEMS FACING FARMERS IN NORTHEAST THAILAND: KEY RESEARCH AND DEVELOPMENT PRIORITIES.

INTRODUCTION

The NERAD Working group for Pest Management in Cropping Systems conducted a rapid rural appraisal (RRA) in all four of the Project Changwats with the following major objectives:

- To gain a better understanding of the ecology of pest populations in rainfed agriculture in Northeast Thailand.
- To identify the major problems facing farmers in the control of insects, diseases, weeds and vertebrate pests.
- To identify areas where further information is necessary in order to implement successful pest control programs.
- To select sites for a pilot pest control program for the cropping systems comoonent of NERAD.

The RRA impressed on all participants the severity, extent and level of damage caused by pests in the region. The size of the problem clearly emphasised the inadequacy of the pest management system within the NERAD Project.

The purpose of this report is to describe the problems identified, to make recommendations for their solution and to communicate these to the appropriate research and development agencies*. The report begins with a summary of findings of the survey and recommendations that specifically address the problems identified. This is followed by detailed reports on the situation for each Province visited and ends with a section that documents the roles and activities of the government agencies responsible for pest control programs in the region. Although only the Provinces covered by NERAD are covered in this report, the Project sites were chosen to be representative of the whole region and the findings can therefore be taken as a general indication of the plant protection situation for the entire Northeast.

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* This document is an edited version of a working paper prepared by the authors and previously published in NERAD Quarterly Report Number 8. Responsibility for errors in content and presentation are solely those of the editor, Iain A. Craig, and any queries should be addressed to him in the first instance.

SUMMARY OF GENERAL FINDINGS AND RECOMMENDATIONS FOR FUTURE RESEARCH AND EXTENSION NEEDS

1. The severity of insect pest problems in the Northeast region has been considerably under-estimated in the past for both rice and upland crops. Yield loss assessment trials have not been systematically conducted for the Northeast making it difficult to set economic thresholds and make appropriate pest control recommentations.

    * Yield loss assessment trials need to be conducted on a systematic basis for the major pest species identified in order to formulate appropriate economic thresholds for the region that reflect the relatively low yields that are obtained because of other production factors.

2. Plant disease problems are serious, usually in localised areas in some yers. They are however, sufficiently widespread to warrant more attention than they currently receive. Farmers' knowledge of diseases is extremely poor and knowledge of fungicide bactericide and nematacide chemicals is virtually non-existent.

    * Farmer training programs in pest control should include the major diseases of the region and instructions on appropriate control measures.

    * Practical ways of controlling papaya ringspot virus and other diseases should be investigated. After rice, papaya is one of the most important subsistence foods of the region; production, however, is severely limited by disease problems at presentive.

3. Weeds are not generally a severe problem. In wet years, adequate weed control in rice is achieved by maintaining standing water in the paddy. In dry years, water-stress reduces rice yields to such an extent that even heavy weed infestations are not economic to control. In upland crops, adequate labor is generally available for hand-weeding on the small areas cultivated.

    * Herbicide programs in rice should currently be limited to direct-seeded situations.

    * Weed control generally should concentrate on ways of promoting and improving hand-weeding operations. Demonstration of the simple implements available from DOA's Engineering Division should be considered as an appropriate means of achieving this.

4. The rice pest ecology of the Northeast, with the exception of the stemborer, tends to be characterised by specific and fairly localised pest problems occurring in some years rather than being common, widespread and occurring every year as is more often the case in the Central and Northern Regions. This has important implications for control programs which must be capable of rapid local responses to problems as and when they occur. This will require a much greater 'bottom-up' orientation in control programs for the region with a delegation of responsibility to local staff.

   * Regular monitoring of pest populations should be conducted. In addition, economic thresholds should be established for all important pest-crop complexes as guidelines for local staff so that control measures can be taken on a timely basis as and when the thresholds are exceeded.

5. Farmer knowledge of pests and the nature of their damage is generally very poor with the exception of some common pests such as stemborers or armyworm. Farmers generally respond to heavy leaf-eating insect damage on upland crops with a pesticide application. However, identification of the species responsible for leaf damage is commonly incorrect and in more than one instance farmers were observed attempting to control predators of a pest in the mistaken belief that these were responsible for the damage.

   * Programs where farmers are involved in pest identification and population monitoring in the field should be emphasized. By this means, farmers will learn to correctly identify pests, their characteristic damage patterns and their effect on crop yield.

   * Pest control programs will need to allow field personnel to make control decisions in conjunction with the farmers on a timely basis often without recourse to superiors in the region or in Bangkok. This will require a set of simple guidelines and instructions in the form of economic thresholds and appropriate control practices. This will also require some basic training for field level staff in pest monitoring and control procedures.

6. There is an acute shortage of well-organised information on the type, severity and extent of insect pest problems in the region making it extremely difficult for control programs to be implemented in areas where they will be effective.

   * It is recommended that further research and survey is sponsored in order to identify the major problems in terms of both the presence of pests and the constraints to their effective control.

7. Farmers rarely use more than two and often only one type of insecticide for all pests of all crops. Commonly, this is a compound with which they have experienced satisfactory control of a pest in the past, e.g. Furadan (carbofuran) for stemborers in rice or Lannate (methomyl) for tobacco pests. There are 3 major problems associated with this practice. First, control measures are often ineffective as a compound suitable for one pest may be completely inappropriate for another. Secondly the practice poses the danger of contamination of food; for example carbofuran may leave toxic residues in vegetables or peanuts. Finally, because these insecticides tend to be broad spectrum materials, they often also cause high mortality rates in beneficial species leading to resurgence or secondary pest problems.

   * It is recommended that training courses for both farmers and line-agency personnel emphasize the fact that different pesticides are appropriate for different pests and that the use of the wrong chemical can actually increase rather than reduce pest problems. In addition, it is recommended that the use of broad spectrum insecticides should be minimised for the above mentioned reasons and also to retard the rate of resistance development.

   * Monocrotophos, being a broad spectrum insecticide of high acute toxicity, should not be recommended for use by research and extension personnel as regularly as it is currently.

8. It is common farmer practice to use pesticides (most notably carbofuran) at rates much lower then those recommended (often less than 25 percent of the recommended dose). At these low-rates, application may be completely ineffective or even detrimental due to higher mortality rates in predators and natural enemies and may also increase the rate of pesticide resistance development. Other common farmer practices to reduce costs include nursery-bed treatments and spot treatment of infected plants. Both of these practices reduce the area covered and thus input costs, and can be an effective means of control in certain situations.

   * Simple demonstrations should be implemented to show the ineffectiveness of extremely low doses of insecticide in areas where this is a common practice. Granular carbofuran would be an appropriate candidate for this demonstration as this high cost insecticide is commonly used at extremely low rates by farmers.

   * Spot treatment and nursery application of pesticides can be an effective, low-cost means of pest control. Trials should be implemented to assess the potential of this technology especially in areas where paddy fish culture is important.

9. Insecticide tends to be applied prophylactically to upland crops rather than according to the presence of pests ot economic levels. This leads to a situation where pesticides are often applied unnecessarily or are sometimes ineffective as the chemical used was not selected for the pest species which was actually present.

   * DOAE's current IPC programs are beginning to define appropriate treatment thresholds and control measures which are modified as more data become available. As experience is gained, this program should be expanded to cover other areas.

10. The majority of farmers recognise the potential dangers of pesticide misuse. However, in most cases only minimal precautions are taken during application and extreme misuse of pesticides is fairly common. Unsafe and innappropriate use of pesticides appears to be caused in many cases by a lack of farmer knowledge of safety procedures.

   * Farmer training in pest control cannot hope to effectively cover all aspects of pest control. It is therefore recommended, that a few topics are dealt with in more depth. Pesticide safety is considered a high priority topic for emphasis in these courses.

11. Almost without exception, farmers use two-handed, piston-type sprayers with which it is extremely difficult to get good coverage because of the large droplet size. In addition, these sprayers are prone to leakage and are consequently a potential health hazard.

   * The knapsack sprayers loaned to farmers for use in cropping systems trials are a good demonstration of how good spray coverage can improve the effectiveness of pesticides. If there is sufficient farmer interest it is recommended that Cooperative Promotion Department (DCP) consider farmer-group procurement and shared use of pesticide application equipment.

12. Paddy-crab, rat and bird damage is significant especially so for the latter two in off-season, irrigated rice. However, these pests are also significant sources of food for the rural papulotion and some level of control is achieved because of this.

   * Rodent, etc. pest problems should be carefully monitored in order to better assess the extent of the problem. Any proposed control measures should, however, take careful consideration of the fact that these pests are often important protein pood sources for farm families.

13. Anecdotal evidence suggests that the brown planthopper is gaining in importance as a pest in the Region. Considering its damage potential and the problems associated with its effective control, this is an extremely alarming trend. The increase is most probably due to a combination of factors including some of the following which are listed according to their likely importance:

1. Off-season rice in irrigated areas acting as a year-round host for the pest.
2. Increasing use of 'improved' rice varieties.
3. Increasing use of fertilizer.
4. Trends in weather conditions favourable to the pest.
5. Increasing use of pesticides in rice.

* It is recommended that priority be given to monitoring brown planthopper populations in the North East. Although not yet a key pest in any single locality, its potential for damage in the future warrants special attention in the region.

14. Despite extremely dedicated officials of the Plant Protection Clinics in the Region, the effectiveness of these centers is currently constrained by a serious shortage of technical staff. This is reflected in site selection for the pilot programs which, in most cases, are chosen for ease of access rather than for the presence of a particular problem.

* It is recommended that NERAD collaborate closely with the plant protection clinics of DOAE. Implementation of some of DOAE's pest control programs in the NERAD area could help DOAE overcome some of their staffing constraints as project field personnel are already based permanently in these tambons. In addition the large amount of data on these tambons that NERAD has already obtained will help to direct these programs to where problems are most serious and thus increase their effectiveness.

15. A common problem associated with pest control in the region's cropping system trials is that there is a tendency for field agronomists to press for a high level of control of pests in order to maximise potential yields. Farmers, however, can rarely afford this level of control, which is usually not economic anyway.

* It is suggested that a of economic thresholds for the key crop-pest complexes in the region be established to solve this problem. These thresholds should be continually modified as more data become available through research trials. The 'superimposed trials' technique could be used to rapidly and economically generate this information as part of the currently implemented cropping systems trials in the region.

1. SRI SAKET

Amphur Utumpornpisai

Rice pest problems:

(i) Stemborer is a problem in rice every year with damage levels ranging from 5-30 percent. Yellow stemborer (Scirpophaga incertulas Walker) is the most commonly observed species.

(ii) Major insect pest problems in rice in the Province as reported by DOAE are: leaf folder (Cnaphalocrosis medinalis Guenee), stem borer and green planthopper (Nephotettix sp.).

(iii) An extremely severe infestation of Common Armyworm (Pseudaletia unipuncta Haworth) devestated the rice crop in some areas 2 years ago.

(iv) Brown planthopper (Nilaparvata lugens (Stal)) was present at economic levels in some locations and hopperburn was observed in very limited areas.

(v) The major diseases of rice, as reported by farmers and government officials, are bacterial leaf blight and leaf streak virus.

(vi) Paddy-crabs are reported to be a problem by some farmers and chemical control measures are taken in some cases.

Upland crop pests:

(i) Beanfly (Melanagromyza phaseoli) was observed on virtually all legume crops with the exception of peanuts. It was well over economic threshold levels in cowpea and mungbean crops and damage levels in excess of 50 percent were observed in some plots.

(ii) Beanfly was observed on Yard long bean which appeared to be acting as a pest reservoir for infestation of newly emerged pre-rice legume crops in the area.

(iii) White grub was observed at economic levels in sweet corn plots where it had significantly reduced the crop stand.

(iv) Weeds were identified as a serious problem in upland crops such as peanuts and sesame and in rice in some fields. This is most probably due to the comparatively high rates of fertilizer applied in Tae and Taket and the shortage of labour available for hand-weeding.

Farmers' Pest Control Practices:

Relatively few farmers apply pesticides to rice paddies for two commonly cited reasons. First, they are too costly to apply over large areas and secondly, they are harmful to fish (both natural and stocked) which inhabit the paddies during the rainy season. Rice-nursery application or spot-treatment of infected areas in a paddy are practised in some limited cases. Pesticide use is very high in upland crops, especially yardlong bean which may be sprayed as often as every other day. Other crops receiving high rates of insecticide include water-melon, cucumber and vegetable crops.

Carbofuran is the most commonly used insecticide on rice especially in the nursery beds. It is, however, often used at rates of less than a quarter of the recommended dose. In the case of upland crops, there has been a long history of using Tamaron (methamidophos) and folidol (methyl parathion). Despite heavy applications over long periods, especially on yardlong beans, these chemicals still appear to give effective control. Carbofuran is also sometimes used on upland crops with consequent potential toxic residue effects in vegetable crops. DDT is still available in the area (local shops still hold stocks) and is used in limited quantities.

Farmers' knowledge of insect pests and control measures appeared to be comparatively high in Sri Saket compared to other Changwats. Choice of insecticide tends to be governed mainly by the experience of the farmer and/or his neighbors. Smell of the formulation also appears to influence farmer preference.

Pesticide Safety/Misuse:

The 3 major chemicals used in the area: methamidophos, methyl parathion and carbofuran are all of high acute toxicity and are classified by WHO as 'highly hazadous', 'extremely hazardous' and 'highly hazardous' respectively. With the widespread use of chemicals of this nature, it is no wonder that accidental poisonings do occur and are cited by farmers. There is considerable variation amongst farmers as to how seriously the potential dangers are taken and protective clothing at most consists merely of a "pha khamaa" wrapped around the mouth and nose.

Serious pesticide misuse is also evident and includes such practices as feeding methyl parathion to pigs for parasite control, spraying vegetable crops immediately prior to marketing to ensure a pest-free product and the use of carbofuran on vegetable crops in which it may leave toxic residues.

2. ROI ET

Amphur Muang and Amphur Selaphum

Rice pest problems:

(i) Stemborer (*Scirpophaga incertulas* Walker) is a serious problem every year. Although accurate data were not available, it is believed that this pest occurs at or near economic threshold levels in most years. Unusually heavy infestations were reported where rice was grown in areas used for kenaf retting and in areas of heavy manure application.

(ii) Armyworm (*Spodoptera mauritia* Boisduval) was a problem in the nursery last year but is not usually a severe pest.

Upland crop pests:

(i) Subterranean ant (*Porylus orientalis* Westwood) is a common pest of peanut and causes approximately 10 percent damage in most years.

(ii) Beanfly (*Melanagromyza phaseoli*) infestations at economic threshold levels were observed in mungbean and cowpea plots. Potential damage levels were extremely high in areas where mature yardlong bean was present and acting as a pest reservoir.

(iii) Heavy Scarab beetle grub (*Scarabacee* sp.) damage (70 percent of crop stand destroyed) was evident on Cuban Kenaf in Selaphum. An adjacent Thai Kenaf plot exhibited only minor damage from this pest.

(iv) Adult Scarab beetle damage (leaf eating) was observed in Cuban and Thai Kenaf but this pest was probably not at economic levels as kenaf can withstand heavy defoliation before yield is significantly affected.

(v) Leaf-eating caterpillar damage on sesame was reported to be causing a 50-60 percent reduction in leaf area in infected plants but there was no estimate of the effect on yield which will depend on the growth stage at which the crop was attacked.

(vi) Papaya plants throughout the area appeared stunted with yellowing of the leaves and had extremely low fruit production. A number of factors are considered responsible for this but papaya ringspot virus is thought to be the main cause of the poor growth.

Farmers' Pest Control Practices:

Very little insecticide is usually applied to the rice crop; in some cases carbofuran is applied but generally at extremely low rates. This is despite some of the heaviest stemborer damage in the four NERAD Changwats and it is hypothesised that farmers are reluctant to use pesticides because of the importance of fish in the paddies. Lannate (methomyl) is sometimes used in the rice nursery beds for armyworm control.

One farmer who was interviewed, reported that a local rice variety that he grows (Niow Ee Khao) has good resistance to stemborer. This is unlikely to be a true varietal characteristic because no stemborer-resistant varieties have as yet been identified. However, significant varietal-cultural interactions may be reducing pest populations and further investigation should certainly be made.

Methyl parathion, monocrotophos and carbaryl are used regularly on upland crops. Lannate (carbaryl) was introduced by Adams International for tobacco and is now used generally for a variety of pests on a number of crops. In many cases, application rates of the pesticides used were considerably lower than those recommended.

Pesticide Safety/Misuse:

It was stated by the village headman of a NERAD village in Nong Kaew that pesticide safety was a serious problem. He felt that the majority of farmers understood the potential dangers but were unwilling to take even rudimentary safety precautions.

Farmers commonly use methomyl (Lannate) on a variety of crops other than tobacco because they have experienced its effectiveness on that crop. Not only does this practice often increase the costs of pest control, but it may also increase the danger of accidental poisonings because as well as being expensive, methomyl is of high acute toxicity (classified by WHO as 'highly hazardous').

3. NAKORN PHANOM

Amphur Ban Phaeng and Amphur Na Wao

Rice pest problems:

(i) Rice thrips (*Baliothrips biformis* (Bagnall)) are a problem in the nursery in most years.

(ii) Stemborers are present every year but it is not known whether they regularly exceed economic threshold levels.

(iii) Armyworm (*Spodoptera mauritia* Boisduval) have been a problem in the nursery for the last two years.

(iv) Gall midge (*Orseolia oryzae* Wood Mason) causes heavy damage in some years. Farmers state that this pest is more severe in dry years, however, in other areas the opposite is normally true with economic thresholds being exceeded in wet years.

(v) Brown planthopper (*Nilaparvata lugens* Stal) is a problem in localised areas.

(iv) Green planthoppers (*Nepthotettix* sp.) are reported by farmers to be a problem at the tillering stage. Although this pest may be present in large numbers it rarely reaches economic threshold levels in areas with no Tungro virus.

(vii) Rats and paddy crabs were reported to be a problem during the vegetative phase of rice.

Upland crop pests:

(i) Subterranean ant (*Parylus orientalis*, Westwood) appears to be a common problem in peanuts with damage levels of approximately 20 percent in most years. The relatively high yields of peanut (approximately 200 kg/rai) would warrant control measures against this pest.

(ii) Subterranean ant was also reported as a pest of melons.

(iii) Mole cricket damage was observed on a kenaf trial in Nao Ngua. The infestation was spotty however, and did not warrant the use of carbofuran which was applied prophylactically last year. Further experimentation on low-cost control measures such as seed-treatment with carbofuran or carbosulfan would be valuable for mole cricket control.

(iv) Anthracnose disease of papaya completely destroyed a papaya trial as the crop was reaching maturity.

Pesticide Use of Farmers:

Pesticide use in rice is limited to nursery bed application where spraying of carbofuran and Sevin (carbaryl) is most common against stemborer and army worm. Gall midge has been recognised by farmers as a problem for over 30 years but no action is taken as farmers do not know of any effective control measures.

Insecticide use on upland crops is relatively heavy and includes the use of sevin, methyl parathion, carbafuran, malathion and monocrotophos. It was apparent that this heavy pesticide application is often unnecessary. This was demonstrated by instances of farmers spraying:

- at infestation levels well below economic thresholds
- at stages too late to have any effect
- to control a predator of a pest which was at sub-economic levels.

Pesticide Safety and Misuse:

The farmers interviewed generally demonstrated a high degree of responsibility as regards safe use of pesticides. Methyl parathion was used less frequently than in other Changwats and the reason most commonly given for this was its high acute toxicity. No instances of accidental poisoning were reported but an instance of a farmer spraying a sweet corn plot when the plants were too tall for safe application was recorded.

4. CHAIYAPHUM

Amphur Jatturat and Amphur Phukhiaw

Rice pest problems:

(i) Stemborer (Scirpophaga incertulas Walker) is a problem every year with damage levels ranging from 5 to 50 percent.

(ii) Armyworm (Pseudoletia uniquneta, Howorth) is a problem in the rice nurseries in some years and was a serious pest last year.

Upland crop pests:

(i) Leaf-eating, insect pests of mungbean are a serious problem every year.

(ii) Leaf folder on mungbean was a serious problem on the second mungbean crop last year.

(iii) Disease problems of mungbean are serious when the crop matures during the rains.

(iv) Subterranean ant (Porylus orientalis, Westwood) was reported as a pest of peanuts but it was not possible to establish damage levels.

(v) Leaf-eating pests of kenaf, mainly adult Scarab beetle and Snout beetle, were evident on both Thai and Cuban Kenaf in high numbers that were most probably at economic levels.

(vi) Root rot disease (Phytopthora nicotiniae) of Thai kenaf is a serious problem when this crop is cropped continuously in upland fields.

(vii) Papaya ring-spot virus was observed to be endemic in this province and was greatly reducing production of this extremely important subsistence crop.

Pesticide use by Farmers:

Only 3 insecticides are commonly used by farmers. These are: carbofuran (a relatively recent introduction by extension officials for rice); methyl parathion which the farmer have used for over 20 years and Lannate (methomyl) which was introduced to the area by Adams International for use on tobacco in recent years.

Carbofuran was reported to be effective but too expensive for regular use on rice except in the nursery bed or for spot application in infected areas. Lannate was used by some farmers agoinst armyworm in the rice nurseries and gave good control.

Farmers commonly complained about the increasing ineffectiveness of methyl parathion. Some of the uses reported for this compound were completely inappropriate (e.g. for control of stemborer in rice) and this may, in part, account for its apparent ineffectiveness. Poor coverage and low dose rates may be other contributing factors but the possibility of resistance development should not be ruled out as parathion has such a long history of use in the area.

One farmer who rears ducks uses these for Armyworm control in the rice nursery. This technique is apparently extremely effective although there is some slight damage to the rice seedlings. Another farmer stated that RD6 exhibited better resistance to stemborer than his local rice variety. This is unlikely to be a varietal characteristic as no stemborer-resistant-varieties have ever been identified. It is an important observation, however, as it would indicate that resistance to pests is a factor affecting farmers' choice of rice varieties.

Pesticide Safety and Misuse:

The 3 most commonly used insecticides in this area are of high acute toxicity and fall under the WHO categories of 'extremely hazadous' (methyl parathion) and 'highly hazadour' (carbofuran and methomyl). Despite this, there were no reparted instances of accidental poisoning but this was quite possibly due to the small sample size of farmers interviewed.

GOVERNMENT AGENCIES WITH RESPONSIBILITY FOR PLANT PROTECTION IN THE NORTHEAST

1. Department of Extension (DOAE)

The DOAE have number of Plant Protection Clinics responsible for each of the 6 pest control zones in the Northeast region as shown in Table 1.

Table 1. Organization of extension pest control zones and plant protection clinics in Northeast Thailand.

PEST CONTROL ZONE	LOCATION OF PLANT CLINIC	AREA OF RESPONSIBILITY
1.	Korat	Korat, Chaiyaphum
2.	Khon Kaen	Khon Kaen, Mahasarakam, Loei
3.	Sakon Nakorn	Sakon Nakorn, Nakorn Phanom, Kalasin, Mukdahan
4.	Ubon	Ubon, Sri Saket, Yasothorn
5.	Surin	Surin, Roi Et, Buriram
6.	Udorn	Udorn, Nong Khai

During the RRA, it was only possible to visit 2 out of the 4 Plant Protection Clinics in the region. Considerable time was spent, however, with Officials at the Ubol and Sakon Nakorn Clinics discussing DOAE's regular programs and pest control problems in the area. All members of the RRA team were impressed with the high calibre of the DOAE pest control personnel and the high quality of the work being done.

The Plant Clinic in Sakon Nakorn has responsibility for a number of pest control programs which are probably fairly representative of the DOAE programs in all of their pest control zones. These programs include:

1. IPC program in rice including insect pests and weeds.

2. Thai/German Project on surveillance of insect pests of rice (currently planned for Sakon Nakorn).

3. Gall midge chemical control program over 3125 rai in Sakon Nakorn and Nakorn Phanom.

4. Rat control program (in all provinces under their jurisdiction).

5. Paddy crab control program (in all provinces under their jurisdiction).

6. Fruit fly control program (in all provinces under their jurisdiction).

Owing to a shortage of technical staff, site-selection for these programs appears to be based on accessibility and convenience criteria rather than presence of a particular pest problem. A number of the programs, most notably IPC in rice, rice pest surveillance and Gall midge control, will produce important results for the region.

2. Department of Agriculture (DOA)

DOA has responsibility for plant protection research for the region through the Technical Divisions (Entomology - including vertebrate pests, Pathology and weeds) which are headquartered in Bangkok. Plant protection scientists with responsibility for research on pest control for specific crops are also located in some of the commodity institutes' research centers and stations located in the region.

With the exception of some crops of regional importance such as kenaf and other fibre crops, research conducted by the Technical Divisions has a national emphasis. As a result, many of the plant protection problems identified in this document are not receiving the priority that they warrant from a regional perspective. The plant protection specialists located in the region's research centers conduct applied research on specific crops that helps to overcome this problem to a certain extent. However, because they are responsible to their respective Research Institutes rather than to the Technical Divisions, communication of regional pest problems back to the agency responsible for basic research is still somewhat lacking.

3. National Biological Control Research Center (NBCRC)

The NBCRC which is located in Bangkok, was established under the National Research Council in 1975 in collaboration with Kasetsart University. It has responsibility for research on biological control for the whole of Thailand and has sub-stations located in each region. The Northeast sub-station is located at Khon Kaen University and comprises a committee of five researchers who donate time to the NBCRC.

Much of the NBCRC's field research work is currently centred around the headquarters in the central plain where farming is more commercialized and pesticide use is already widespread. The plant-pest ecology of the Northeast, especially in the case of rice, is as yet relatively undisturbed by the use of pesticides and is considered a unique and potentially rewarding area for research and development of low cost biological pest control technologies.

4. Northeast Regional Office of Agriculture (NEROA)

NEROA was established in 1963 under the Office of the Permanent Secretary for Agriculture as a regional research center for all aspects of agriculture including plant protection. Its role was later changed to being responsible for coordination at the regional level and although research continues, responsibility for plant protection now lies mainly with the other line agencies of the MOAC. Research and development on technologies for papaya ringspot virus control currently accounts for the major research thrust in plant protection of the Center.

The Center still retains a responsibility for farmer training and information dissemination at the regional level on all aspects of agricultural development including plant protection. As far as plant protection is concerned, current programs include radio and television broadcasts, farmer training using mobile teaching units and responding to farmer requests for assistance on pest problems.

5. Khon Kaen University (KKU)

Khon Kaen University's Faculty of Agriculture has well staffed Departments of Entomology, Plant Pathology and Weed Science and valuable research on regional plant protection problems is currently being conducted by them. The majority of the research is basic rather than applied in nature but the Faculty's Farming Systems applied research program has drawn heavily on the expertise of plant protection personnel within the Faculty and is producing valuable results with immediate relevance to pest control problems in the region.

The University's links with other line agencies with responsibility for plant protection are generally good and channels for information exchange exist and are being effectively utilized.

APPENDIX

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

NERADICS Problem Definition Series

P1 Effects of Paddy-bund-planted Eucalyptus Trees on the Performance of Paddy Field Crops. Craig, I.A. and Wasunan, S., 1987. (English)

P2 Overview of Rainfed Agriculture in Northeast Thailand. Craig, I.A. and Pisone, U., 1987. (English)

P3 The Upper Paddies in Northeast Thailand: The Current Situation and Implications for Development. Craig, I.A., and Baker, G.P., 1986. (English)

P4 Current Pest Management Problems Facing Farmers in Northeast Thailand: Key Research and Development Priorities. Katanyakul, W., Amaritsut, W., Keerati-Kasikorn, M. and Craig, I.A., 1987. (English)

NERADICS Technology Documentation Series

T0 Executive Summary NERAD Promising Technologies. Thamabood, S. (Editor), 1986. (Thai)

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