



WAR AGAINST RATS!

MANAGEMENT OF RODENT
PESTS IN SOUTHEAST ASIA

Newsletter 9 (February 2000)

The Australian Centre for International Agricultural Research (ACIAR) funds a research project on the Management of Rodent Pests in rice-based farming systems in Southeast Asia. The project is coordinated by the Rodent Research Group of CSIRO Wildlife and Ecology.

DEVELOPMENTS IN THE ACIAR PROJECT

The new four-year ACIAR rodent project has been underway for a year, now, with the research carried out to date forming a solid base from which to proceed for the next three years.

Indonesia and Vietnam have collected valuable pre-treatment data for the village level studies, and now move into the treatment stage. Malaysia continues its biological control research, and Laos has

become a full partner in the project (see page three for a report on activities in Laos).

A very exciting development is the release and launch of the new book on Ecologically-based Rodent Management, towards which many colleagues involved in the project contributed. Published by ACIAR, the book was launched at CSIRO Wildlife and Ecology on the 10th of December, 1999. Three of

Launch of Book on

the four editors were in present at the launch – Dr Grant Singleton, Dr Lyn Hinds (CSIRO) and Dr Zhibin Zhang (Chinese Academy of Sciences). Dr Herwig Leirs (Danish Pest Infestation Laboratory) was unable to attend. We are pleased with the finished product and hope that it will make an important contribution to the international “war against rats”.

Some of the authors of the book; (clockwise from top left) Dr Luke Leung, Ms Lisa Chambers, Dr Roger Pech, Mr Peter Brown, Dr Zhibin Zhang, Dr Lyn Hinds, Dr Grant Singleton, Dr Greg Hood, and Prof Charles Krebs



Ecologically-based Rodent Management

On the 10th December, 1999, a new book on Ecologically-based Rodent Management was launched by Dr Bob Clements (Director of ACIAR) at CSIRO Wildlife and Ecology in Canberra. Published by ACIAR, the book was edited by Dr Grant Singleton (CSIRO), Dr Lyn Hinds (CSIRO), Dr Herwig Leirs (Danish Pest Infestation Laboratory) and Dr Zhibin Zhang (Chinese Academy of Sciences).

Amongst the 45 people present at the launch were Dr Brian Walker (Chief, CSIRO Wildlife and Ecology), Dr Jim Cullen (Chief, CSIRO Entomology), Dr David Spratt (CSIRO Wildlife and Ecology), Prof Charles Krebs (University of British Columbia and renowned small mammal ecologist), and a delegation from the Chinese Academy of Sciences headed by its Vice President Prof Chen Yiyu.



Present at the launch of the book; (from left) Dr Brian Walker, Dr Grant Singleton, Dr Zhibin Zhang, Prof Chen Yiyu, Dr Bob Clements (ACIAR), Dr Jim Cullen (CSIRO Entomology), and Dr Lyn Hinds.

Arising from the first International Conference on Rodent Biology and Management, held in China in October 1998, this book includes chapters from leading rodent researchers spanning seventeen countries, with an emphasis on Southeast Asian and African rodent control.

"The Editors", Dr Grant Singleton, Dr Lyn



Hinds and Dr Zhibin Zhang, with Dr Herwig Leirs "represented" by a Danish rat poster.

Authors of chapters in this book directly involved in the previous or present ACIAR rodent projects form an impressive list, and include Grant Singleton, Lyn Hinds, Peter Brown, Luke Leung, Monica van Wensveen, Lisa Chambers, Sudarmaji, Jumanta, Rahmini, Bounneuang Douang Bouphe, Onechanh Bounnaphol, John Schiller, Tran Quang Tan, Nguyen Quy Hung, and Nguyen Manh Hung.

Ecologically-based Rodent Management is a must-have on the bookshelf of any rodent researcher, and stakes its claim as a definitive and ground-breaking piece of literature.

For purchase inquiries, please contact:
CSIRO Publishing
<http://www.publish.csiro.au/whatsnew.htm> or
Bibliotech (Aust) <http://www.bibliotech.com.au>;
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Rodent Project in Laos - The battle begins

Farmers in the uplands of Laos practice a mixed cropping, shifting cultivation, slash and burn style of agriculture. Rice is a major crop (especially in the valleys), as are Job'stear or Mak Douay (a type of sorghum), banana, cassava and other vegetables. These rain-fed systems allow for one crop per year and thus they are extremely valuable in a self-sufficient culture. The uplands have serious problems with rodents as well as weeds. Rodents can easily cause 50% damage and sometimes devastate whole crops. The government is trying to reduce upland rice production and the slash and burn of forests practised with this shifting cultivation and encourage more diversity in crops.



The very steep uplands of Laos where slash and burn agriculture is practiced

The ACIAR-funded rodent project included Laos in 1999. The study is based in the uplands of Laos and will examine the rodent species present, their biology, ecology and dynamics, and their response to changes in the upland farming system. This will provide a base for Lao scientists to develop management techniques that the Lao farmers can use to aid them in this battle in the "War Against Rats".

In late October/early November 1999, the first field-based training and trapping effort was conducted in Laos as part of the project. Three CSIRO staff (Dr Grant Singleton, Mr Peter Brown and Ms Amanda Lewis) and Dr Ken Aplin of the Western Australian Museum joined Mr Bounneuang Douang Bouphe (National Agricultural Research Centre, Vientiane) in Laos for this very exciting and important trip. The aims of which were as follows:

- to conduct field based training for Lao scientists and technicians in field biology, taxonomy and population studies in the uplands of Laos;
- to collect data on a range of rodent specimens and identify those that are likely to be pests;
- to collect rat faeces, sera and tissues to be screened for zoonotic diseases, and;
- to examine the habitat use by various species, compare their local and scientific names, and decide on methods to monitor them.

We prepared museum specimens of all animals collected, and recorded breeding and age structure data and information on the capture habitat. We also tested a range of trapping methods in different environments including single-capture wire traps, snap traps, local bamboo traps, Elliott box traps and a Trap Barrier System (TBS) with multiple capture traps. Mr Onechanh, Head of Houay Khot Research Station whose facilities we used for the training and Mr Somphong Pradichit, Deputy Director of the provincial Department of Agriculture and Forestry both provided strong logistical support.



Hatxoua village in Luang Prabang, Laos

The trapping at Houay Khot, Luang Prabang province, involved all trapping methods in and around crops, forest and villages. The first morning of the training began by heading straight out into the field to check all of the traps. The opening ceremony that followed was attended by 22 people, and was officially opened by Dr Ty Phommasack, the Director of the National Agricultural and Forestry Research Institute. There were 13 course participants from 8 upland provinces and 1 lowland province. The project directly involves people from 5 provinces, Mr Simone Saleumsak of Luang Prabang – the focal province, Mr Khampheng Mouan Muangseum of Houaphanh, Mr Chanthi Manichit of Oudomxay and Mr Banxa Keomet of Sekong in the South. Mr Bounneuang of Vientiane is the Lao co-ordinator of the project.



Mr Bounneuang Douang Boupaha

Part of the training involved; practical and theory on trapping methods as indices of population dynamics; the use of linear TBS for population studies, and; TBS + Trap Crop as a control method. It was suggested that if TBS+TC were to eventually be adopted, then the trap crop would have to be an early maturing variety due to the restriction on planting an early crop in a rain-fed system. The rats were also found to be quite trap shy; the capture rate in single-capture cage traps was very low. So it was suggested that a combination of trapping methods be used for the census efforts once every 4 weeks. By the end of the workshop, 3 of the 4 provinces were able to start their trapping timetable.



Participants in the Laos training course

Some participants had attended a previous workshop and brought rodents preserved in salt. To Dr Aplin's delight, they were preserved perfectly. Dr Aplin brought great taxonomic expertise (as well as a fun if not quirky sense of humour) to this project. He now has the task of identifying all the specimens we collected from skulls and then to develop a taxonomic key for the rodents of Laos, hopefully by February 2000. And all of this in his spare time! As well as this, Dr Aplin provided instruction in taxonomic identification during the field workshop, and his great field skills from years of experience collecting mammals in remote areas in Asia, were invaluable.



Dr Ken Aplin



Simone Saleumsak and Amanda Lewis building a Trap Barrier System (TBS)

Mr Onechanh and Mr Bounneuang spoke at the closing ceremony and Dr Singleton presented participants with shirts with Australian mammals on them. An official dinner was enjoyed by all on the final night of the training course, as was the local Luang Prabang disco! The course participants were left with the tasks of adapting what they learned to their home province. They were asked to think which

trapping method would be the best, to question farmers about what they think are the major pest species, to collect historical oral data on rodent outbreaks, and to collect and preserve animals when problems occur.

An important focus for our work is to develop methods that will be able to be taken up by local farmers and integrated into their current farming systems. At Houay La, a village in Oudomxay where we travelled to after the course to conduct a trapping session there with Mr Chanthi, they already had a local form of a TBS in place. For 75m along the edge of the crop they had placed a bamboo barrier with traps. The bamboo sticks were about 40cm high and stuck close together into the ground. At 2-4m intervals along this barrier, traps in small gaps consisted of a high-tension piece of bamboo, poised with a delicate trigger, ready to whack down upon an unsuspecting rat.



A farmer from Houay La demonstrating a traditional form of the Trap Barrier System – note the bamboo trap which the man is setting

In all we collected 85 specimens to preserve in a museum collection and a further 10 bought at markets (barbecued on a stick) which will be able to be identified from the skulls. There were about 15-18 different species collected in all, including three different *Mus* spp, three different *Rattus* spp which were of similar size, *Bandicota* spp and *Chiropodomys* spp to name a few. This high species diversity, including some native non-pest species, is very interesting, especially for Dr Aplin, making the development of a key both exciting and challenging indeed.



Fea's Tree Rat (Chiromyscus chiropus), caught in riverine habitat; this species requires conservation status, not pest status.

The specimens have been lodged with the Australian National Wildlife Collection located at CSIRO Wildlife and Ecology in Canberra. Dr Greg Smith and Dr Lee Smythe of Queensland Health and Scientific Services will be screening tissues and sera for viral and bacterial diseases and the faeces will be screened by Dr Una Morgan of Murdoch University for cryptosporidium, giardia and the like. Dr Aplin is a classical taxonomist and is currently studying the bodies and skulls, while Dr Steve Donnellan of the South Australian Museum will assist with the genetic analyses for identification purposes. We will provide a summary of results in a later newsletter.

Lastly we need to thank Dr John Schiller and Mr Kouang Douangsila of the Lao/IRRI program for their excellent support of this project from the start. They greatly facilitated the establishment of the project in Laos and provided fantastic logistical support including drivers and vehicles and organisation of all in-country travel and accommodation.

This project is off to a fantastic start and with the continued enthusiasm and calibre of the project team in Laos, it is a very exciting and promising project with which to be involved.

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Reports from Abroad... .

Report on the Second European Vertebrate Pest Management Conference, Braunschweig, Germany (6-8 September, 1999)

Dr Grant Singleton (CSIRO) recently attended the Second Vertebrate Pest Management Conference in Germany. Here he reports on the proceedings of the conference.

This meeting was convened by Dr Joachim Pelz and held under the aegis of the Federal Biological Research Centre for Agriculture and Forestry, and the Technical University of Braunschweig. There were approximately 110 conference delegates from 18 countries. I was the only delegate from Australia and there were two from New Zealand (Charles Eason and David Morgan). Naturally there was a strong European dominance of delegates with Germany, England, Denmark and Finland having a strong presence. A noticeable change from the first meeting held in York, UK in 1997, was a much stronger presence by wildlife scientists from the USA.

In keeping with the general tenet of the inaugural meeting, there was a strong emphasis on the science of wildlife pest management rather than providing a forum for professional pest control operators or case studies on specific cases of human-wildlife conflicts. Nevertheless to maintain a balance, there were a number of professional pest managers and representatives from industry (e.g. Bayer, Cyanamid, Zeneca) in attendance and a couple presented posters and talks on their work.

There were two plenary talks each morning, key symposia speakers in the next session prior to lunch or a poster session. The afternoon sessions consisted of parallel symposia and there were workshops late afternoon. There were 11 symposia including sessions on integrated pest and behaviour management; the impact of wildlife on forestry, agriculture, environment and engineering; repellents as wildlife management tools; damage by waterbirds to agriculture and fisheries; optimising the effectiveness, safety and economy of field rodent control; vertebrates as carriers of parasites and pathogens. From a personal perspective

the meeting was extremely relevant with seven of the sessions including papers on rodents and three sessions devoted completely to rodents. A good mix indeed!

The small contingent from Australia and New Zealand had a high profile. Charlie and myself chaired separate sessions, I was the first plenary speaker, Charlie was a key symposium speaker, and David and myself presented papers in symposia sessions.

One symposium that I found of interest was the one on rodenticide resistance. There has been a great deal of progress on the geographic distribution and levels of resistance in rats in UK, Germany and Denmark, and on the mechanisms for resistance (including genetics) and biochemistry of resistance. The British, Danes and Germans are leading the field in this research - the rest of the world is a black hole. Although talking to Charlie Eason at the conference, he is thinking about developing some research on rodenticide resistance in New Zealand. The bottom line is that rodents in some regions are resistant to all of the anticoagulants except brodifacoum and flocoumafen. However, brodifacoum and flocoumafen are very toxic and their use is severely restricted in the UK, Denmark and Germany. There is also some debate about whether there are populations of Norway rats resistant to brodifacoum and flocoumafen. Some populations certainly have increased levels of tolerance but probably not high enough to be classed as resistant.

The focus now is on how to manage anticoagulant resistance. One suggestion was to stop the use of anticoagulants in high resistance areas and then to add susceptible animals to see if the balance of resistant genes could be quickly changed. This generated much discussion. The bottom line is that we need to know

more about the basic ecology of the Norway rat in rural areas. It is surprising how little is known about the population ecology and behaviour of the Norway rat given the level of research on rodenticides over the past 25 years. It appears as though the new book on "Ecologically-based Rodent Management" will be hitting the book stands at the right time!!

In summary, this was an excellent meeting. The organising committee led by

IPM of rodent pests - a different view

The following was written by Dr Herwig Leirs (DPIL) and Dr Grant Singleton (CSIRO) in response to an article in IPM Net (http://ipmwww.ncsu.edu/cicp/IPMnet_NEWS/archives.html). The IPMnet News published a brief summary of their response in September 1999. Following a number of requests for more details we publish the response in its entirety.

In a recent issue of IPMnet News (no 66, June 1999), several observations were made by Dr Kevin Gallagher (WHO) regarding the organisation of rodent control campaigns. We would like to point out that the problem is much more complex than it seems.

The mentioned rodent damage to crops in the field or stored harvested products is indeed a serious problem. For example, in Indonesia, nation-wide, rats cause annual pre-harvest losses of approximately 17% of the rice yield (this means that rats there consume enough rice annually to feed more than 25 million Indonesians for a year, providing 70% of their energy requirements). In several SE Asian countries, farmers consider rodents to be the number one limiting factor for increased rice production, before insects, weeds or fertilisation problems. During rodent outbreaks in Tanzania, rats consume more than 80% of the planted maize seeds. On average, annual combined pre- and postharvest damage by rats to maize in Tanzania is estimated to be around 10-15%; this corresponds to an amount of maize which could feed approx. 2.3 million people during a whole year!

Unfortunately, management of rodent damage is still not well developed. The reasons for this are multiple. They include the complex ecology and behaviour of rodents, the lack of specialised rodent scientists, an entomological bias in many organisations

Joachim Pelz is to be highly commended on how well the meeting ran and for their superb German hospitality. I look forward to reading the published papers from the conference that are scheduled to appear in mid-2000. Note that these papers go through a rigorous refereeing process and so are not simply the proceedings of the conference.

involved in pest control research, the need for community-wide control strategies, and a simple and misinformed assumption that promoting one particular predator will solve the problem. One other important factor is the belief, also among agricultural scientists, that the present level of rodent damage has to be accepted as a fact of life about which nothing much more can be done than the traditional ways of killing/deterring rodents.

There are many effective techniques to kill or control rodents. Two good books to give an overview of such technologies are:

- Prakash, I. (ed) 1988. Rodent Pest Management. Boca Raton, CRC Press, 480p.

- Buckle, A.P. and Smith, R.H. (ed) 1994. Rodent Pests and their Control. Oxon, U.K., CAB International, 405p.

However, many of the killing techniques do not result in sustainable management of damage level and there is a clear need for a better understanding of the rodents' biology in order to intervene more effectively. In a book to be published next month, we collated a number of papers related to this issue (with a focus on preharvest rodent problems in Asia and Africa):

- Singleton, G., L. Hinds, H. Leirs and Zhang Zhibin (eds) 1999. Ecologically-based management of rodent pests. ACIAR, Canberra.

Rodent damage to infrastructure and stored products can generally be avoided by using improved building construction and materials. However, this often (not always) requires a larger capital investment, which may not be affordable. In the field, rodent problems are largely of an ecological nature and therefore much more difficult to solve. By their very nature, agricultural fields are excellent habitats for rodent pests and the latter are well adapted to take advantage of good conditions. Rodents have a complex individual behaviour, making it much more difficult to predict what will happen at the population level. Control techniques that rely on baits require knowledge of the feeding habits and preferences of the involved species (and these differ a lot); other ecological interventions need detailed information about the community to which the rodents belong (incl. other rodents but also predators, parasites, larger mammal competitors,...). As a result, rodent control approaches are not generic, and there are no global solutions. Indeed, in SE Asia the greatest impact on rodent population dynamics at present is increased intensification of cropping systems. Many regions are now planting two crops per season rather than one, or three rather than two. Knowing something of the population ecology of the respective species in these regions (the Mekong delta rice fields have 12 species of rodents living there!!) help us anticipate which species are likely to increase in their pest status as these changes occur, and in developing appropriate management programs.

Moreover, rodenticides kill nearly all rodents alike (with some important exceptions) but that does not mean that rodent control always does the same job.

There is one telling example of the need to match the management actions to the agro-ecosystem and the particular rodent species. In Indonesia and Vietnam, it is possible to protect large irrigated rice field areas by having a central small field, planted a few weeks before the surrounding fields and surrounded by a fence with traps; rats are attracted to this field and then captured. However, this is of course only possible with species that

move over large distances and in agricultural systems where early planting is possible. In rainfed systems, this is much more difficult.

The "general principles" on campaign organisation that Dr Gallagher pointed out, are definitely not irrelevant, but they are rather empty as long as the appropriate management techniques for particular species have not been identified. It is a bit like educating people on traffic safety when roads still have to be constructed. "Know thy enemy", "Know thy territory" are nice selling lines but you do not buy much for them. Collecting information about rodent biology is a daunting, difficult and time-consuming task. Studying, for example, longevity or migration is very complex, both in collecting and in analysing data, and farmer participatory research is not the most appropriate approach there. Of course, this does not imply that farmers cannot contribute: most of us have, sometimes rather shamefully, experienced that our scientific approach not always gives the best result. But claiming the reverse would be equally unwise.

Every study on rodent management should of course consider traditional methods of rodent control, but that should be done extremely critically. Many of these methods simply do not help at all. They may kill a number of rodents, but may not contribute to damage reduction: this statement is not based on some sense of cultural superiority but a question of biological understanding. Some traditional methods definitely are effective, but then again one has to keep in mind that these methods were developed for special circumstances and cannot simply be copied to other conditions. Advising people to use control methods without thoroughly testing them in the conditions where they are to be used is not very wise. It is even counterproductive since bad experiences may make people less willing to take up new methods later.

In conclusion, rodent management needs to be based on a sound ecological understanding of the problem in its surroundings and control techniques require a biological basis. Unfortunately,

this means that much fundamental research is needed, but it is impossible to skip that phase. In the meantime, existing control techniques should be

applied, but this also requires a minimum evaluation of the conditions under which the problems occur. Generic solutions do not exist.

RODENT RESEARCH AROUND THE WORLD

AUSTRALIA

Managing Mice in Queensland

Dr Judy Caughley is a Zoologist in the Queensland Government. In her earlier years she worked on the management of a variety of animals including grey kangaroos and the rare mountain pygmy possum. For the past 4 years Judy has been involved with research on the management of mouse plagues

Research is under way in Queensland that will hopefully lead to:

- (i) registration of a rodenticide for in-crop mouse control
- (ii) improved strategies for monitoring mouse numbers, and
- (iii) development of integrated mouse management programs for the grain growing regions of Queensland.

The mouse causing the problems is the House mouse (*Mus domesticus*). It was probably introduced at the time of European settlement and now irrupts to plague densities at all too frequent intervals in the various grain-growing regions of Australia. In Queensland, the worst affected area is the Darling Downs, our premier grain-growing region.

Controlling mice at plague densities is very expensive and largely ineffective. We all agree that it would be more satisfactory and cost-effective to implement control at early stages of plague formation. In our area, the types of control could include strategic baiting in response to regular monitoring of mouse numbers, accompanied by farm management measures to limit mouse harbour and food supply.

Progress to date

(i) Registration of an in-crop rodenticide

Laboratory trials were run on two formulations of zinc phosphide bait — pellets and coated wheat grain containing 2% and 2.5% active constituent respectively. Both formulations were very effective in killing mice (mortality 95-



Researchers, Dr Judy Caughley and Ms Christine Donkin, who are based at the Robert Wicks Research Centre in Toowoomba, adjacent to the Darling Downs

100%). Mortality was still high (75-85%) when mice were simultaneously offered bait and unpoisoned wheat.

Field trials have been conducted with the grain-based bait formulation so far. At an application rate of 1kg/h, the mortality achieved was very high (>90%) when the availability of other food for mice was low (eg in crops prior to flowering and cleanly harvested stubbles), but when food was abundant (eg crops with maturing seed),

no significant reduction was achieved. These results indicate that the timing of baiting relative to food availability is very important for achieving effective control.

(ii) Improved strategies for monitoring mouse numbers

Mouse monitoring is regularly conducted by Queensland government personnel on a 32 km long transect on the Central Darling Downs. This gives us a broad picture of the numbers of mice at any time and an indication of the likelihood of a plague in autumn which is the time when the numbers peak each year.

Early in the project, we sent a questionnaire to growers asking how often they had had problems with mice in the past five years. Their answers showed how variable plagues are in their extent. Even during a major plague, the amount of damage varied greatly between farms and, if control (baiting and/or habitat management) is going to be cost-effective, farmers will really need to know how many mice there are on their own place. Possible methods of on-farm monitoring are being evaluated, including the use of paper squares soaked in canola oil.

(iii) Development of integrated mouse management strategies

In Spring, mice are found in maturing winter crops. Following harvest, they stay in the stubble but, at some time during the following months, most of them will move into adjacent summer crops. We therefore need to know when and where is the best

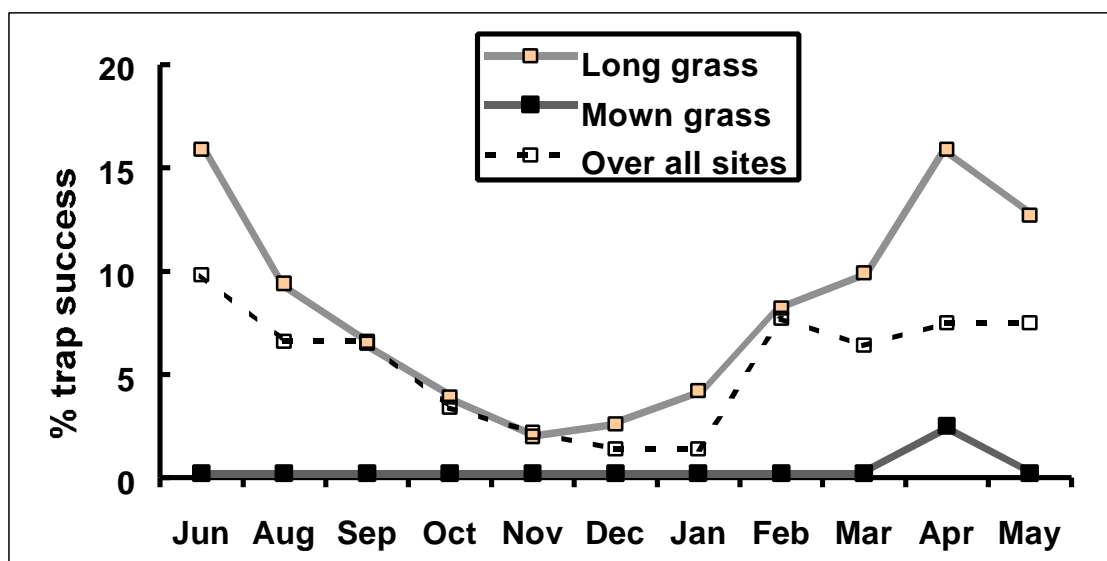
time and place to apply control measures. We also need to know how effective different control measures will be and our research at the moment is addressing these questions.

The benefit of reducing shelter is evident in our data on mouse numbers in grassy roadside verges. Mown verges have very few mice (see figure). Since stubble provides good shelter for mice, some working of stubble may be advantageous if mouse numbers are on the rise. However, stubble retention is important for conserving soil moisture and reducing soil erosion on the Darling Downs. We need to ensure that working stubble does reduce the suitability of the habitat for mice and by how much so that farmers can weigh this benefit against the recognised conservation benefits of retaining stubble.

We hope that with these data we will then be able to give good advice to growers on how to manage mice to minimise their impact on their crops.

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Trend in mouse numbers (indicated by % trap success) on the Eastern Darling Downs showing the effect of mowing on the abundance of mice in roadside verges.



Rat control at IRRI - a success story

The International Rice Research Institute (IRRI) is an agricultural research and training centre, established to improve the well-being of rice farmers and consumers, through helping farmers in developing countries produce more food. Dr Mark Bell is head of IRRI's Agricultural Engineering Division, and reports here on rat control within the confines of the research institute.

Rat control and damage at the International Rice Research Institute in the Philippines have seen dramatic changes over the last 10 years. A study in 1987 estimated that direct control costs combined with estimates of the value of lost experimental data cost the institute around US\$772,000 that year. The study showed that 86% of some 171 field experiments, including 11 trials that were completely lost, had rat damage. The value of this lost data was estimated to be worth around US\$370,000, while direct control costs were estimated at US\$402,000. Subsequent changes in field management and practices, saw control costs fall substantially to the present level of around US\$50,000. Most strikingly, there is almost no rat damage reported each season.

In early years at IRRI, rat control consisted of galvanized iron fences with a single electrified wire at the top. The system involved a team of 160 people and involved 24 hour/day surveillance. In 1989, an integrated system of control, involving seven management components was introduced with tremendous success in terms of decreased control costs and decreased damage.

The system which is still practiced today, involves:

Rat habitat removal

- removal of rat habitat by installing underground irrigation and drainage lines in place of open canals,
- periodic bund reconstruction to destroy established burrows in levees,

Food supply limitation and hygiene

- Implementation of a closed season twice a year such that little or no crop is left in the field,
- Fallow fields are kept clean by regular mowing

Number reduction

- Baiting stations are placed around planted fields



The active barrier system - introduced from Malaysia - is used each season on around 25% of experimental plots

- Flame throwing - levees are walked weekly and active burrows are flamed to remove rats
- Active barrier system (see figure)

While the control practices may seem intense, it must be remembered that experimental grain represents far more than its commercial value. Given this though, the implementation of a series of relatively simple measures, if properly integrated, can dramatically decrease rat problems.

Further, changes in rat control practices have allowed higher levels of field mechanization. For example, the removal of drainage ditches allows easy tractor access in to and out of fields

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New Website on Rodent Research

Dr Thomas Jaekel (GTZ – German Development Cooperation) has set up a website on his research with the Agricultural Zoology Research Group in Thailand on the “Biological Control of Rodents”. This site can be found at: <http://home.t-online.de/home/thom.jaekel/home.htm>

COMING EVENTS...

- ◆ 19th Vertebrate Pest Conference, San Diego, California, March 6-9, 2000. Contact Desley Whisson for details (dawhisson@ucdavis.edu)
- ◆ In our next issue of War Against Rats! The 1997 Masterclass - where are they now?

RECENT PUBLICATIONS OF THE RODENT RESEARCH GROUP

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Please Note: This is Alison Mills' final newsletter as editor. Alison is leaving CSIRO to commence a PhD. Therefore please direct further correspondence, comments and contributions to:

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This newsletter presents the personal views of the individual authors and not necessarily those of ACIAR, CSIRO, or collaborators in the project “Management of Rodent Pests in rice-based farming systems in Southeast Asia”