INTEGRATED PEST MANAGEMENT AS SUSTAINABLE AGRICULTURAL PRACTICE: THE PROCESS OF INNOVATION-ADOPTION BY DURIAN GROWERS IN THAILAND AND THE ROLE OF AGRICULTURAL EXTENSION WORKERS AS CHANGE MANAGEMENT AGENTS

Barry Elsey* and Kittipong Sirichoti**

Abstract

Integrated Pest Management (IPM) is a well-known innovation that accords with modern sustainable environmental management principles. In this paper it is examined in two ways. First, a recent IPM diffusion project in a region of Thailand, where durian is extensively grown, is described and analysed in relation to the adoption of both its philosophy and methods by growers. Particular use is made of a theory of innovation (Rogers) to depict the intensity, rate and scale of adoption by the durian growers. Second, attention is focused on IPM as an expression of theory and practice in change management. What is shown is that successful adoption of IPM depends upon a number of factors, notably durian growers' perceptions of 'relative advantage' and the way the approach is communicated and learned by them through practical application. In terms of change management theory, the intelligent way IPM knowledge was transferred, though the mediating role of Agricultural Extension Workers (AEWs) reflected the current emphasis

*Dr Barry Elsey (*International Graduate School of Management, University of South Australia)* is currently engaged in the supervision of Ph.D research in a specially designed programme for corporate executives in the Asia Pacific region. His field of interest is in workplace change management. Previously he specialised in adult and continuing education and has published extensively in both knowledge disciplines.

**Dr Kittipong Sirichoti teaches in the MBA programmes in Assumption University of Thailand and in Mahidol University. He is also the general manager of an agricultural chemical company in Bangkok. Dr. Elsey was his adviser during his doctoral studies.

on collaborative partnerships and learning as an effective means of managing change in complex environments. In relating the theory of change management to practical application and outcome attention is focused on the mediating and learning facilitation role of AEWs. These are the human agents of change that make things happen and turn theory into reality.

INTRODUCTION: THE FOCUS OF THE STUDY

This study considers the process of adopting Integrated Pest Management as an approach to sustainable environmental management from the perspective of the small-scale farm or holding in rural regions of Thailand. This is where the very popular exotic tropical fruit durian is grown as an important cash crop by local farmers, often on a family basis. Considerable attention is given to effectively managing to control the pests that damage the durian crop. A recommended method is the application of Integrated Pest Management (IPM). IPM is regarded in well-informed circles as an excellent holistic approach to sustainable agricultural practice and active principles of environmental management, with its balanced mix of traditional and modern pest control methods (Dent, 1995 Smith, 1976).

This case study reports a research project on the various factors involved in the adoption of the innovative approach of IPM by durian growers in the eastern region of Thailand (Sirichoti, 2000). It uses the case study, which is at the inter-section between some basic agricultural practices, underpinned by active principles of environmental management (EM) and the complex process involved in adopting the agricultural innovation of IPM theory and practice, to reflect generally on change management. Particular attention is paid to the learning facilitator role of Agricultural Extension Workers' (AEWs) as the agents of change management.

For the purpose of providing both contextual and conceptual background it is necessary to define and describe IPM, the nature of the tropical fruit durian and the pests that attack the crop. The model of innovation selected to identify the factors involved in the adoption of IPM by the durian growers also needs to be depicted. Finally, the research design and methods used to survey the sample population is also described. After the main research findings have been highlighted it is then timely to connect the IPM project with some general reflections on change management, notably the key role of facilitating change by the AEWs.

There is a core generalisation underpinning this study. Persuading durian growers to comprehend and adopt IPM as a method of pest management provides an excellent illustration of change management in

both theory and practice. IPM is an innovation that has to be communicated as a change strategy through a process of knowledge diffusion and active learning, led by the facilitating role of AEWs. Within this seemingly simple process are embedded many of the key ideas that give change management credibility as a body of knowledge. More about this follows later.

The meaning of Integrated Pest Management and how it works

IPM is understood as a low cost and holistic approach to environmental protection that combines modern chemicals with some traditional methods to control rather than attempt to eliminate pests. IPM is considered an advance on the indiscriminate use of expensive agricultural chemicals and a means of preventing the build up of resistant strains of pests. As a method of pest control it has gained the acceptance of the Thai government as a sensible alternative to chemical pesticides that cause long-term environmental damage, including genetic mutation and resistance.

The history of pest management has been divided into a number of phases: subsistence, exploitation, crisis, and disaster, through to the current emphasis on integrated control (Metcalf & Luckmann, 1982). The last part of the twentieth century was considered the crisis to disaster phases. Increasing population needs lead to environmental degradation of air, water, soil and food, which becomes a clear and present threat to many plant and animal communities of the ecosystem. Part of the problem was caused by over-reliance on synthetic insecticides. These were discovered to foster insect resistance and also the elimination of their natural predators.

To deal with these problems a new philosophy emerged, which became known as integrated control. Integrated control is based on two primary considerations: the extent of ecosystem disruption caused by pests and the valid economic threshold that can be tolerated by crop growers. IPM evolved as a development from this paradigm shift (Huffaker, 1980). The IPM approach places emphasis on the need to better understand crop dynamics and its influence on pest numbers. On a practical basis integrated control, such as IPM, is sought by using all suitable techniques, including traditional ‘organic’ methods, to reduce pest populations or maintain them below the economic harm level (van der Bosch, et al, 1982, Bottrell, 1979, Broschen, 1992). In principle, the use of chemicals is as a last resort line of defence, after biological and other means of pest control have been applied. Taken overall, IPM embraces a holistic management concept involving pest identification, decision-making about control techniques and the monitoring of the effectiveness of the various control methods. It is regarded as a long-term strategy of

pest management.

Durian is the fruit of the tree *Durio zibethinus* of the *bombax* family. The durian crop is grown in many parts of Asia. Durian is prized for its pulp and it is either eaten as a raw fruit or as an ingredient in cakes and ice cream or preserved in a sugar solution and mixed with spices as a relish. Durian is vulnerable to pests and about 10 are noted for their destructive effects on the fruit at various stages of growth. For many years chemical treatments yielded good results and international companies aggressively marketed products. The growing concern about the impact of such treatments forced a rethink and at this juncture IPM gained acceptance as a more sensitive environmental management approach to pest control. At present the Thai government has promoted IPM projects across a range of crops, including durian.

Basically, IPM works in several ways. A precondition for a successful IPM program is the planting of healthy stock. Nursery production is important in this approach. Another method is to undertake extensive pest monitoring, to determine what kinds of pests can be tolerated and which treatments seem appropriate. At one level of infestation simple tree pruning is useful or controlling humidity through irrigation, at a more serious level chemical treatment is required. Before embarking upon such a drastic treatment biological control is encouraged. This entails replacing a monoculture, which tends to encourage pests by providing an abundant food supply, with greater diversity of other crops so that the natural enemies of durian pests are fostered. This process takes time and requires much patience, as unlike chemical treatments results are slow to emerge. Basically, IPM has to be founded upon a change of thinking, a paradigm shift in mind-set. This is a challenging task in tradition-bound farming communities with very conservative ways of thinking.

Explaining IPM to durian growers

The philosophy and practice of IPM has to be communicated to growers through a learning program. Participatory learning is at the core of the process-driven strategy for explaining, implementing, monitoring and evaluating IPM. Growers are gathered together on a voluntary basis and encouraged to talk about their pest problems and, after explaining IPM, given support to experiment with the method. Regular forums are conducted to obtain feedback on progress experimenting with IPM. The Thai government has established a basic infrastructure designed to operate at the local level with the active participation of the farming community. The government bureaucracy has created two levels of provincial and regional agricultural specialists and they work with the field-level AEWs in an advisory capacity. The AEWs are

called by the title *Kaset Tambon* and they have direct contact with the durian growers. It is their prime responsibility to explain IPM and facilitate the learning process. As will be argued more fully later, the AEWs perform the important mediating role between IPM and the durian growers. In the process of facilitating the learning of the growers and encouraging them to adopt IPM they act as change management agents.

Conceptual background: the innovation adoption model and active principles of environmental management (EM)

As IPM is considered an important innovation in agricultural practice it is useful to provide a brief background context of the term. Some basic ideas define the term. Innovation is in the minds of the beholders, wanting a solution to a problem. An innovation in this perspective need not be a new idea but rather a useful and novel one (Rogers, 1995). There is a distinction between 'hard' and 'soft' innovation, with the former including tools and equipment, drugs and hybrid seeds, and the latter as concepts and practices. IPM straddles both meanings. Innovation implies the diffusion of knowledge and the acceptance of what it has to offer by those willing to adopt it for their purposes. The adoption of an innovation involves change, which can be at an individual, organisational or a whole society level. Change might happen by chance but in the case of IPM and the durian growers it is a planned process of knowledge transfer and organised learning facilitated by the AEWs.

Taking the many studies of innovation-adoption as a whole, a pattern emerges that centres around several kinds of factors. These comprise socio-economic and psychological factors and mainly refer to perceptions about benefits and needs. Another is the actual characteristic of the innovation, which entails knowledge and understanding of its useful qualities. Hence the factor of communication plays a vital part in knowledge diffusion. Finally there are institutional factors, which essentially means the role played by agencies such as government and private sector commercial organisations in promoting the adoption of an innovation.

The approach to understanding innovation in this study is largely based on a well-known authority (Rogers, 1995). His focus was on the adoption of an innovation and five features were identified that could be used empirically. These are relative advantage, compatibility, complexity, trailability and observability. The first simply refers to the perception that adopting an innovation will or might confer some economic, social or other advantage over the idea or practice it replaces. Compatibility is the extent to which the innovation is perceived as being consistent with the norms and

values of the adopters. Durian growers were already conversant with pest control methods, yet they needed to be convinced that IPM was not only advantageous but also would sit comfortably with their commonsense. As already indicated, IPM had to be 'sold' as a total package, which involved a change of thinking as well as farming practices. Part of the 'selling' of IPM was it's environmental sensitivity, which accorded well with traditional farming community values. IPM also had to be communicated as an approach that any durian grower could readily comprehend. This passes the complexity test. Another feature of IPM is that it can be tested or given a trial, which means that application requires patience and the ability to monitor its effectiveness over a given time period. Finally, others, as well as the immediate adopters can see the results of trials. IPM is open to observation of its methods and results. For all these reasons the model proposed by Rogers for understanding the process of adopting an innovation was simple to use as the framework for the fieldwork phase of the research.

The innovation adoption process outlined above is complemented by further work done by Rogers (1995), with more emphasis on a number of linked stages in decision-making and communication. Prior to the decision-making process taking effect there has to be a perceived need for change. Three initial stages in the process are knowledge diffusion and persuasion, followed by the decision to adopt the innovation. These stages embrace at least three of the five characteristics briefly described above (relative advantage, compatibility and complexity). The next two stages of implementation and confirmation tally with trialability and observability.

The study of innovation-adoption has attracted much attention in agricultural development literature, most with a focus on the nature of communication and seeking to understand the interplay of a diverse range of socio-cultural factors that drive the process. For example, in examining the dynamics involved in adopting an innovation five groups of social behaviour have been identified (Rogers & Beal, 1958 Adams, 1982). One group has been described as *innovators*, a minority willing to try new ideas and maybe take risks. The second group is called *early adopters* and they appear to be more integrated into the community, often with leadership roles. The third group is known as the *early majority.* They listen and respond to opinion leaders although they are slower to react than the other two groups. Finally there are the *late majority* and the *laggards*. These two groups range from the sceptical through to those who only make change with reluctance, preferring to look backwards rather than into the future.

The focus on innovation-adoption would now be expected to accord with contemporary ideas on environmental

management. There may well be a legislative framework regulating practices, such as IPM and specific pest control measures. Moreover, environmental management has grown into a profession with many experts and an increasing body of knowledge. Thus decision-making has become more complex, not only for technical effectiveness but also for resource efficiency, legal sufficiency and social acceptability. In that regard good management is essentially consultative and collaborative with the many stakeholders in an environmental issue. Hence the considerable interest in the communication and learning of knowledge. Finally, the concept of sustainability has entered into the framework of environmental management principles, which means the adoption of a long-term perspective rather than short-term gains.

What this overview shows is that the IPM case study was conceptualised in relation to a well-known theory of innovation-adoption, practically based on a non-formal approach to voluntary adult learning and set within broader principles of sustainable environmental management

The IPM project: research design and methods

The research project was located in the district of Chantaburi, which is in the eastern region of the country where the majority of durian is grown. The growers were introduced to IPM techniques, which included pruning, fertilizer and soil management, water management, stimulate flower flushing, using sticky traps, biological control, pest monitoring of natural enemies and pesticide selection for adoption by the growers. More than 600 growers who had formed into 30 groups participated in farm-based discussions and exercises. They had expressed an interest in sharing their experience and a willingness to learn from each other. The Thai government were behind the IPM project, not only for durian but many other crops, all of them capable of export earnings and therefore 'room for improvement' in production yields, quality and value-adding.

According to Rogers, the starting point for diffusion research is the community, defined as the durian growers of the region, with the case study approach chosen as the most suitable way of observing the process and outcomes involved, notably adopting IPM. The community context also includes the Thai government, notably through the agency of AEWs and other agricultural experts and infrastructure.

Specifically, the research used a descriptive survey design. Probability sampling identified a group of respondents whose characteristics reflected those of the larger population of durian growers. Field-based interviews using the survey instrument were the most effective

method of acquiring information. In addition, secondary data was collected from past IPM project reports and through informal interviews with the AEWs. The research was conducted as a 'one-shot' situation and concentrated on those durian growers with the longest experience of learning about and applying IPM. The sample size was 120 durian growers.

The data-set analysis followed a path common to most studies on innovation-adoption, that is, testing the relationships between the adoption of an agricultural innovation (such as IPM) and selected independent variables. The aim of the analysis was to build a prediction model for the adoption of IPM from various factors in order to compare their relative strength. Analysis of variance, correlation analysis and multiple regression analysis were used to identify the most significant factors associated with the adoption behaviour.

The dependent variable (adoption of IPM) was measured three ways: in terms of (1) intensity of adoption, (2) rate of adoption and (3) scale of adoption. Because the grower constitutes the basic unit of analysis in this study, the score on the dependent variable was designed to reflect the growers' total adoption responses in relation to selected independent variables. The three dependent variables were defined as follows- (1) Intensity (the extent to which the growers applied IPM as a practice in the total area of production); (2) Rate (the speed which the growers adopted IPM); and (3) Scale of adoption (the number of IPM practices growers applied on their durian crops and farms generally).

The independent variables were determined from the literature of previous innovation-adoption studies and by consulting with AEWs and other experts. The independent variables were identified and grouped (1) as socio-economic, (2) psychological, (3) innovation characteristics, (4) communication system and (5) institutional system. The first two variables focused on the role and status of growers and their social participation in the IPM project. The third variable dealt with the characteristics of IPM. The fourth focused attention on different ways in which knowledge of IPM was communicated, disseminated and learned. The final variable concerned itself with the kind of organization and resources needed to support the adoption of IPM.

Highlights of the IPM research findings

The central focus of the research was to identify those factors that played a more important part in persuading durian growers to adopt IPM as a method of pest control. The research was built around six questions that explored the adoption process. Each question was designed to elicit the

perceptions and the behaviour of the growers with regard to the adoption of IPM. The first sought to identify the most important sources of information about IPM, as perceived by the growers in adopting the approach. The second and third questions paid attention to the way the various factors (socio-economic, psychological and so forth) played their part in the adoption process and which of these ranked more importantly. The fourth question examined the process of adoption. The following question dealt with continuing to use IPM once it had been adopted. The final question sought perceptions from the growers estimating how efficient and effective they thought IPM was in their experience. The central research focus and the six specific questions in various ways addressed the related themes of intensity, rate and scale in the adoption of IPM as an innovation in agricultural and environmental management. The main findings are reported below under a number of sub-headings.

1. Reporting some demographic and social participation findings

The population sample comprised 120 durian growers, over 64% being male and head of the family household. The average age was between 31-40 years. The majority (78%) completed their formal education at the primary stage. Just over 37% of respondents had participated in the IPM project for around two years, with a few having more direct experience and the rest having less time to become knowledgeable of the pest control methods. This finding broadly represented the majority of growers involved in the IPM project in the region. Over 50% had worked as farmers before they had reached twenty years of age and most had been durian growers for more than six years. They cultivated on average about 36% of their land for durian.

A high degree of social participation was recorded within the sample population, with over 60% belonging to an agricultural group association and 33% to a cooperative group (many growers belonged to both). Most regularly attended meetings of these bodies but another main way in which they learned about agricultural issues (and IPM specifically) was through exposure to AEWs and mass media (radio, television programs and reading matter such as newspapers, magazines, agriculture extension hand-outs and other printed material). Daily exposure to television programs was the most popular form of indirect and informal communication and learning. Thai television devotes time and attention to farming matters as a matter of general economic and social interest.

2. The most important sources of diffusion information about IPM practice.

The most influential sources of information were attending IPM meeting (83%) and learning from

AEWs (81%). The AEWs play a key role in explaining to growers what the technical expert knows about IPM. They also influence the information and ideas exchange during IPM meeting attended by the growers. In addition, on-site visits to farms and durian plantations to explain IPM and check progress was also considered important in transferring information and learning generally.

In effect the communication process about IPM underpinned the intensity, rate and scale of adoption. Using the ideas of Roger's, for IPM to influence the thinking and subsequent actions of durian growers it is vital that they perceive and comprehend the approach as a method of pest control that is compatible with the way they farm, and that it is easy enough to understand, apply in a practical way and see for themselves the results over a suitable time period. Communication and learning are the keys to gaining enough knowledge of IPM to consider its merits and apply the methods in a practical way.

3. The key factors that influence the adoption of IPM

Following from the above findings, the most important factors influencing the adoption of IPM was the amount of satisfaction growers had with the quality of IPM information and explanation given during the meeting and through the AEWs. It seems the more satisfied they are with the information about IPM, both as a concept and its various techniques, the more likely they are to adopt its practices. This is a clear example of the intensity of adoption and, more generally, knowledge management based on the orderly transfer of ideas and information from the experts, though the mediating role of AEWs to the growers. It should also be noted that IPM meetings gave an opportunity for growers to reflectively learn from the experiences of each other. With regard to the rate and scale of IPM adoption, it seems that the longer grower's participated in the project the more likely they were to broaden the ways and means of using the techniques.

What this shows is that the adoption of IPM is influenced by a combination of good knowledge management linked to psychological incentives and a particular innovation characteristic, in which growers perceive the approach in terms of relative advantage, that is to say, the prospect of higher productivity, lower labour costs, less use of costly chemicals and greater pest control. Expressed simply, for IPM to become adopted there has to be a change of mind and attitude in which previous practices are put aside, otherwise perceptions of relative advantage cannot take effect. For IPM to be continued there has to be satisfaction with using the approach and evidence of useful outcomes within an acceptable time period.

4. The most important factors in the adoption of IPM

If one factor has to be given greater emphasis then perceptions of relative advantage emerges as the key to the adoption of IPM. As explained previously, relative advantage comprised a number of farming practice factors that could be reduced to economic benefits. But this would not happen unless other factors played their part. This is obvious from the explanations given above. In short, growers had to have confidence in IPM and this was built upon acquiring knowledge of its uses and then the experience of practice. Together these provide the pre-conditions for relative advantage and the willingness to adopt IPM as a long-term pest control strategy.

5. An interim summary of the strength of various factors involved in the adoption of IPM

In order to examine the four questions in greater depth, that is, to discover whether each independent variable was predictive of the dependent variables, and to measure the strength of their relationship, a multiple regression model was used to analyse the survey results. The findings from multiple regression analysis are summarised and only the statistically important correlations are reported.

These findings show that innovation characteristics such as relative advantage, and communication system variables like the number of IPM meetings attended, and institutional system variables, notably satisfaction with IPM information, emerged as statistically significant predictors of the ***intensity of IPM adoption***. This clearly shows that the communication channel is an important factor in determining the success of diffusion and adoption of an innovation. Psychological variables that effect a change in behaviour, socio-cultural variables such as numbers of social meetings, the innovation characteristic of relative advantage, and institutional system variables such as source of IPM information, emerged as statistically significant predictors for the ***rate of adoption***. The variables of innovation characteristics such as relative advantage, and institutional system variables such as source of IPM information, emerged as statistically significant predictors of the ***scale of adoption***.

It could be concluded that relative advantage was the most significant factor to affect adoption behaviour, in that it affected the rate and scale and intensity of adoption. The source of IPM information was found to be the second most significant factor in relation to adoption behaviours, since it affected only the rate and scale of adoption. Thus, if project organizers need to develop innovation effectiveness, they would be best to emphasise the innovation's relative advantages, and promote the sources of

IPM information, of which the AEWs constituted the most active source.

6. The continuation of IPM as a longer-term pest control strategy

Rogers' adoption model, despite being one of the earliest theories in this area of interest, is still widely used by contemporary research. The adoption process or the innovation-decision process, as defined by Rogers, is a process occurring over time and consists of knowledge, persuasion, decision, implementation and confirmation.

At the first stage, that is to say, of formal knowledge about IPM knowledge, the growers were exposed to IPM practices such as pruning, fertilizer and soil management, water management, stimulate flushing, using sticky traps, using light traps, biological control, pest monitoring, natural enemies and pesticide selection. Many discussions took place concerning the problems most frequently encountered, and solutions were suggested both by the AEWs and by the grower members to each other.

Knowledge about IPM as a philosophy and applied practices was persuasive in helping durian growers change their old habits of work behaviour in order to embrace the new thinking required in IPM. Most growers realised that there was a need for change in the ways in which pest control was performed. Similarly, most growers were highly interested in IPM practices. They attempted to seek information about it. Information came from many sources such as published materials, radio, television, and so on. The major information sources they used to gain knowledge of IPM technology included AEWs, crop protection officers, friends, relatives, and meetings.

Next was the stage at which the grower evaluates an innovation in the line of individual or community needs. Each grower would form a favourable or unfavourable attitude at this point. The findings indicate that the growers held favourable attitudes toward IPM technology, and their perception was that meetings were of high quality. At this stage, the grower becomes more psychologically involved with the IPM practices; hence they actively seek more information as the basis of learning an applying knowledge in a practical way.

The clear message that emerges is that IPM has been successfully communicated to durian growers and that they had adopted its philosophy and applied its methods with enthusiasm and intelligence, supported in their decision-making by the non-formal learning and overall facilitation role of the AEWs.

An overview of past and current ideas on organisational change management

It is not the purpose of this paper to

review the extensive literature on organisational change management (Elsey, 1997, Collins, 1998, Dunphy and Griffiths, 1998). Instead some of the salient features of the conceptual and practical terrain will be connected to the IPM project and briefly discussed. This is intended to provide a background to the particular focus on AEWs as change agents, that is to say, the experts who make things happen at the operational level. It is the AEWs who work closely with the durian growers to inform, persuade and encourage them to adopt IPM as an innovative approach to pest control and farming practice generally. No theory or conceptual model of change management would work unless people turn ideas into concrete actions.

As contextual theory background, a central theme lay behind the various conceptual frameworks and practical concerns of change managers, or agents, as in the case of AEWs. This is the belief in different kinds of instrumental rationalism: scientific and technical, economic and managerial. In that regard change management is more often than not conceived as a planned process propelled by goals and objectives to achieve agreed outcomes (Lippitt, et al, 1985). As the IPM project has many features in common with mainstream ideas about change management in theory and practice attention now turns to these connections.

Relating change management theories to the IPM project

The role of IPM conforms to several features of the brief explanation outlined above. An identified problem (pests that attack the durian fruit) acts as an external driver that brings about the need for a change management strategy. IPM arises as a rationally conceived and organised response to the economic losses arising from pest infestation of the durian crop, reducing growers' incomes and national export earnings. As a planned approach to change IPM reflects certain beliefs about the role of human learning. At its most lofty IPM regards knowledge as power and its diffusion empowers those who learn and apply the method. In more modest terms IPM induces change by circulating ideas, which leads to a longer-term developmental process that involves people in an action learning experience (Lippitt, et al, 1985). In all these ways IPM reflects the complex nature of pest control and the need for a comprehensive strategy to manage the problem in a long-term way.

Organisational analysis forms a central part of change management. An early work called *force field* analysis, adopted an organism analogy to identify the sources of resistance to the driving forces of change and the role of managers as change agents (Lewin, 1951). A major practical task is to strike a balance with the adaptive

process of change and the need for integration, notably between people, technology and financial resources. The simple assumption is that organisations are comparable to natural organisms, in which inter-related parts function as a whole. As in nature the social systems of organisations can be disturbed by changes in the external environment and malfunction. The task of management is to find ways and means of achieving effective changes while restoring 'functional fit' and organisational integration.

In the example of the IPM project the integration theme manifests itself through implicitly adopting an organic view of change management. In this instance the organisational form is based on a formal association of durian growers representing their economic and social interests. Although the structural form might be looser than a typical work organisation, common economic interests band them together. Moreover, the durian farmers belong to a community with strong cultural values and conservative traditions. Natural enemies that damage the durian crop threaten the integration of the entire community. Finding a solution to the problem ideally has to go beyond immediate measures, so that managing pest control is a sustainable, long-term process of benefit to the community as a whole. In this context IPM might be regarded as an opportunity to deal with an external threat and a means of ensuring economic and social continuity among the durian growers and their families. The strategy of using IPM serves as the organised means of managing the immediate environmental problem caused by the durian pests. Moreover, controlling the pests more effectively enables the growers to secure their incomes and for the wider farming community to restore stability.

IPM is an example of instrumental-rationality in which scientific analysis has resulted in a proven practical method of pest management. IPM is also sensitive to the wider environment by incorporating traditional control practices, avoiding the long-term risk of encouraging pest resistance and thereby worsening the initial natural problem. IPM is also rational in an economic sense by planning for financial security in the longer-term rather than the immediate benefits that might come from radical eradication. Managerial rationality is implicated in the application of IPM, notably by communicating and implementing its knowledge and skill content in a planned and orderly way over a long time period, involving regular monitoring and evaluation of its effects. In all these ways IPM upholds the values and practices of planned and managed change, rather than undertaking activities without an empirical basis. This is practically achieved through the instrumental actions of AEWs using structured role responsibilities and professional knowledge as the means of managing the change process. Behind them is the

power and authority of the Thai government and the principles of bureaucratic-rationality.

The ideas expressed above generally relate change management to the IPM project. The following explores the connection in more applied terms, by focusing on the central part accorded to human resources and learning as a strategic means of effecting organisational change management. A pivotal role in the case of the IPM project is the part played by AEWs as facilitators and agents of the innovation-adoption process and the management of change in overall, strategic terms. This is highlighted in the paragraphs that follow.

In the context of the IPM project diffusion is essential, so that the pest control method is applied in as many smallholdings as possible, to achieve wide geographical coverage. Hence it is vital that as many durian growers as possible are enlisted into using IPM and that they effectively learn how to use the method. This is a simple knowledge transfer process, but to gain the active and voluntary participation of the growers they have to be persuaded that IPM is worthy of their time and attention. They also have to cease established pest control practices. In conservative minded farming communities this is not an easy 'selling' task. Once they are willing to give IPM a try then a patient process of knowledge and skill transfer can begin, but only on the basis of consensus that the method can be understood easily, from basic principles through to practical application. In this process management action is a joint partnership, not a directive one from a remote bureaucracy. It involves obtaining consensus that the problem requires concerted action, with a strong sense of ownership, and that the vision for change is clear sighted with an attendant need for a planned strategy.

AEWs as change agents sits comfortably with a useful conceptual framework (Tichy, 1983), who argued that the role of managers is essentially about bringing together people, technology and financial resources into what is widely known as a socio-technical system, in order for them to act in a functional way. Tichy goes further by arguing that change agents also need to incorporate an understanding of the political and cultural 'systems' of organisations.

In the case of durian growers' such advice is fundamental to success. They live in relatively closed communities bound by tradition, including a system of leadership power, long-standing beliefs and values that comprise the way of life that give stability and meaning to its members. In the best practices of community development access to and collaboration with people living in a particular area and/or sharing a common way of life has to be negotiated. Moreover, any action plan that emerges should ideally have a strong sense of local ownership;

otherwise it is a form of invasion and is likely to be rejected by the community. The AEWs in the IPM project had the professional sensitivity to abide by this commonsense approach, while embracing a holistic conception of their role as change managers.

The final point of note is the issue of the substance and sustainability in change management. The world of business is fast moving and change management is prone to fads and fashions, with the panacea of today quickly replaced with another cure for organisational ills (Collins, 1998). In traditional farming communities 'quick fixes' have a long history of failure and durian growers would be right to adopt a sceptical position with regard to 'outsiders' coming along with yet another remedy. IPM is a tried and tested method with a record of modest success. It only focuses on pest control within acceptable limits, not elimination, and its goals and vision is decidedly long-term. Good environmental management accepts these limitations and uses them to achieve substantial results that are sustainable into the longer-term. The IPM approach to change management quietly puts into practical operation the holistic conception of Tichy and other writers (Dawson, 1994 Patrickson and Bamber, 1995) and attains good outcomes.

Conclusion

The paper has explored the connections between a particular method of pest control, using the philosophy and practices of IPM, with the more conceptual knowledge of change management. This is more than academic speculation for the IPM project shows several tangible ways and means in which the method reflects leading ideas in change management. The most notable of these include an emphasis on planned change, and, as importantly, on action-based, participatory learning involving a high level of collaboration between the various stakeholders. What is also interesting to note is that IPM adopts an eclectic approach to change management, rather than drawing its inspiration and methods for any one 'school of thought'. To an outsider this appears somewhat unusual as its strongly empirical approach might suggest a more deterministic mind-set. Although the truth of this assertion is open to debate, nonetheless it is reasonable to observe that IPM has digested many of the lessons learned about involving people in the change process as a pre-condition for successful change. Maybe the key observation is that change management by necessity has to include a good deal of commonsense.

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