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Farmer Learning and the International Research Centres: Lessons from IRRI

Stephen Morin, Florencia Palis, Karen McAllister, Aida Papag, and Melina Magsumbol

2001

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The Gatekeeper Series produced by IIED's Sustainable Agriculture and Rural Livelihoods Programme aims to highlight key topics in the field of sustainable agriculture and resource management. Each paper reviews a selected issue of contemporary importance and draws preliminary conclusions for development that are particularly relevant for policymakers, researchers and planners. References are provided to important sources and background material. The Series is published three times a year – in April, August and December – and is supported by the Swedish International Development Cooperation Agency (Sida).

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Executive Summary

The International Rice Research Institute (IRRI) is one of 16 centres in the Consultative Group for International Agricultural Research (CGIAR). IRRI has a huge mandate: to conduct research and training to improve the lives of rice producers and consumers, particularly those with low incomes. This broad mandate means that whilst IRRI generates knowledge and products such as improved pest management methods or new varieties and machinery, it is the role of extension workers from other organisations to promote and disseminate these to the farmers. This means that the dissemination of the research outputs is outside IRRI's control.

However, some IRRI researchers have recently developed 'decision aids' as a way for farmers to adopt and adapt technologies on a much wider scale than can be achieved through focused research projects alone. In this paper we highlight one of these innovative approaches, the development and promotion of the 'no early spray' (NES) technique in integrated pest management in Central Luzon, Philippines, and discuss its implications for farmer learning within the institutional culture of IRRI.

The NES technique grew from research revealing that farmers' belief that leaf folders caused yield-reducing damage in rice was incorrect. The research showed that in fact spraying for leaf folder is not necessary up to 40 days after transplanting. This simple message was tested by farmers in the Philippines, prompting them to conduct site specific research and to entirely cease spraying their fields for leaf folder when they found it to be true.

These experiences suggest that decision aids work best when the decisions farmers are encouraged to take are not mandated or fixed, but prompted by the research process itself. The NES started out as a decision aid and, through farmer experimentation, turned into a learning tool.

The success of NES indicates that decision aids offer ways to have impact and foster farmer learning at the farm level within the corporate culture of IRRI, and other similar International Agricultural Research Centres.

FARMER LEARNING AND THE INTERNATIONAL RESEARCH CENTRES: LESSONS FROM IRRI[1]

Stephen Morin, Florencia Palis, Karen McAllister, Aida Papag, and Melina Magsumbol

Introduction

The International Rice Research Institute (IRRI) is one of 16 centres in the Consultative Group for International Agricultural Research (CGIAR). IRRI's broad mandate is to conduct research and training to improve the lives of rice producers and consumers, particularly those with low incomes. This is a huge task and means that whilst IRRI creates products, typically in the form of either knowledge (eg. improved pest management or fertiliser application methods) or physical technology (new varieties or machinery), it is the role of extension workers from other organisations to promote and disseminate the product to the farmers.

However, some recent innovations by IRRI researchers have involved 'decision aids' as a means for farmers to adopt and adapt technologies on a much wider scale than can be achieved through focused research projects alone. In this paper we highlight one of these innovative approaches, the development and promotion of the 'no early spray' (NES) technique in integrated pest management in Central Luzon, Philippines, and discuss its implications for farmer learning within the institutional culture of IRRI.

We close with policy and research implications of this research for IRRI and other international institutes.

Linking IRRI and farmers: the extension paradox

IRRI has neither the financial, cultural, nor legal capacity to conduct extension effectively for the diverse countries and peoples it serves. Therefore, technology delivery must be done through the national agricultural research and extension systems (NARES). NARES are a diverse group and can include the public sector, NGOs, and the private sector. The institutional diversity of the NARES is matched by their variable occupational linkage with IRRI. NARES activities include, but are not limited to, research collaborations, technology dissemination, training, and extension.

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1 A version of this paper was first published in Deepening the Basis of Rural Resource Management. *Proceedings of a workshop. RIMISP and ISNAR, 2000.*

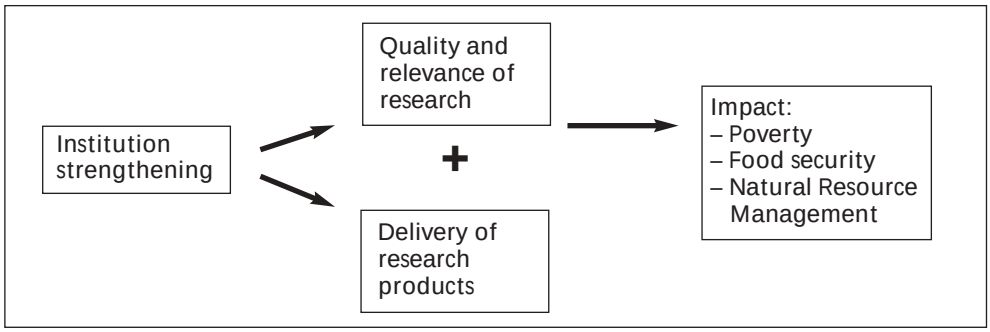
By working through NARES, IRRI fosters a transfer of technology approach (Deugd *et al*., 1998; Roling and Jiggins, 1998). Research products are defined and developed at the institution level, while the communication or 'delivery' of these products to the end users is managed by another party. This poses a significant dilemma for IRRI, which needs to demonstrate that its research outputs coincide with its mandate, poverty alleviation or livelihood improvement at the farm level. This requires communication with farmers (the intended beneficiaries). However, by devolving responsibility for dissemination of the research outputs to other agencies this aspect is outside IRRI's control.

To resolve the dilemma, IRRI has opted to support local research and extension services through 'institution strengthening' initiatives (Figure 1). These activities include supporting the training of scientists, collaboration through research consortia, research planning and so on. In this way, the improvement of the NARES' capacity for research and delivery is viewed as the next best thing to delivering the technology itself. In fact, IRRI would argue that improving local capacity for research is preferable to improving the well-being of a small number of farmers because of the potential future gains from increased research capacity. IRRI management views its future role, in light of this institutional structure, as a source of "advanced information" and as a "broker or co-ordinator" for the dissemination of information (Cantrell, 1999).

Working directly with farmers with an aim of changing behaviour, ie. extension or extension-like activities, is debated at many levels at IRRI, with no clear consensus over the institute's proper role. One of the most often cited reasons for not becoming involved in extension is the enormous diversity of IRRI's constituency and the limited potential of effective extension with such a large group. The issue may not necessarily be the role of IRRI, as much as the capacity of its scientists to effectively reach this diverse audience. Thus, if a researcher is able to reach thousands of farmers in a cost effective and efficient manner, even if it resembles extension, the work is supported, even though the process itself contradicts IRRI's basic strategic vision.

Some IRRI scientists have opted for decision aids as a way to circumvent the dictum "*we don't do extension"* while at the same time working directly with farmers in a learning

Figure 1. IRRI model of its relationship with NARS partners regarding extension services (From IRRI, 1999)



and change environment[2]. The 'no early spray' (NES) approach is one such aid (Heong, 1999; Heong and Escalada, 1997b; and Heong *et al*., 1998), based on the research finding that leaf folder pests on rice plants have little or no effect on yield, yet farmers regularly spray against them. What has emerged over time is the IRRI decision aid model. The following case study describes farmer response to the NES message in the Philippines.

The No Early Spray Case Study

The NES method is the work of Heong, an IRRI entomologist, and various colleagues. It is based on Bentley and Andrews' work with smallholders and IPM in Central America (Bentley and Andrews, 1996). Bentley and Andrews suggested three basic steps for incorporating farmer knowledge and experimentation into technology design and dissemination:

1. identify gaps in farmers' knowledge;
2. fill in the missing information (assuming the information is available); and
3. help farmers develop technology that fills the knowledge gap and fits other criteria.

A gap in knowledge can take many forms. It may be a lack of knowledge about particular practices, knowledge that was once relevant but is now outdated due to systemic changes (see Dobermann and White, 1999), or the result of a miscommunication between technology developers and farmers (Morin, 1998). The gap can be derived by comparison of 'emic', or local understanding, and 'etic', or observers' understanding of the natural environment (Headland, Pike and Harris cited in Harris, 1993).

Filling in observed knowledge gaps must be based on careful research, as was the case with Heong (Heong *et al*., 1997). Heong *et al*. suggest that it is preferable to emphasise information that contradicts local beliefs, thereby encouraging farmer experimentation. Like technology gaps, the type of contradiction can be varied, representing new technological options, or modifications of old ones. The model also has the benefit of focusing on participatory technology development, recognised as an important component in successful technology generation (Deugd *et al*., 1998).

In the NES case the identified knowledge gap was farmers' incorrect belief that leaf folders caused plant damage which reduced yields (Heong *et al*., 1998). The knowledge gap, derived from research on the biology of these pests, was that spraying for leaf folder was not necessary up to 40 days after transplanting.

Heong added to Bentley and Andrews' method by incorporating a means of disseminating the missing information using 'heuristics' (Heong *et al*., 1998; Heong, 1999). A

2 IRRI also has process projects, ie. projects that deal explicitly or implicitly with technology dissemination, but the focus of the research is on the process of reaching farmers rather than on technological change at the farm level. IRRI's plant participatory breeding project is such a case. The rice varieties developed in the project are location-specific but the generative process can be taken to other locations.

heuristic is a simple decision rule to synthesise data and improve decision-making (Kahneman and Tversky, 1972, 1973 cited in Heong, 1999). In Heong's work the simple decision rule stated: *"spraying for leaf folder control in the first 40 days after sowing (or 30 days after transplanting) is not necessary"* (Heong, 1999).

The new way of thinking about leaf folders contradicts accepted farmer practice. The contradictory nature of the heuristic is a source of "cognitive dissonance", which needs to be resolved by the farmers receiving the message (Festinger, 1957; Heong and Escalada, 1997a). Ideally, farmers resolve the contradiction through experimentation in their own fields, either accepting or rejecting the practice (Heong, 1999). In either case, the farmers will judge the efficacy of the new information for their farms, simultaneously up-scaling and conducting site specific research. Farmers prefer this type of experimentation because it fosters immediate and observable feedback on potentially useful technologies (see Öhlmer *et al*., 1998).

Using Heong's experience we can modify Bentley and Andrews' method:

1. Identify gaps in knowledge;
2. Fill in gaps with research information useful to farmers using heuristics, emphasising cognitive dissonance in heuristic design;
3. Aid farmers in the resolution of the dissonance through on-farm experimentation and testing;
4. Re-evaluate new farmer-developed technology for broader outreach.

This revised method is flexible and powerful because it shares with the earlier method an emphasis on gaps in farmer knowledge, but concludes with a plausible mechanism for disseminating corrective information. In the process of identifying knowledge gaps researchers deal with the farmers' knowledge in a way that responds to problems identified by farmers. The following case illustrates how this theory works in practice.

The NES Experiment

The Barangay Integrated Pest Management (BIPM) project was a collaborative project between scientists from IRRI, Philippine Rice Research Institute (PhilRice), Department of Agriculture (DA), and the Food and Agriculture Organization (FAO). It ran from 1992 to 1995 and was an IPM experiment at the *barangay* (village) level to determine the costs, benefits, institutional requirements, farmer training needs, and constraints to IPM implementation among irrigated rice farmers.

It was conducted in three villages in the province of Nueva Ecija, Central Luzon, an area known as the 'rice granary of the Philippines'. Farmers grow two rice crops a year: dry season (DS - December to May) and wet season (WS - June to October). The BIPM experiment was started in 1992 and encompassed three 'treatments', each level of treatment represented by a particular village:

- Treatment 1: Farmers not trained in IPM but who agreed to refrain from insecticide spraying for at least 40 days after planting. This is often called No Early Insecticide Spraying (NES).
- Treatment 2: Farmers trained in IPM at a season-long field school training (IPM-FFS).
- Treatment 3: Farmers not trained in IPM and who conducted their normal pest control practices (FP).

The village of La Torre, in the municipality of Talavera, Nueva Ecija was chosen for the NES research (Treatment 1) for a number of reasons, including:

- Of the 11 villages surveyed, La Torre had the highest use of insecticide sprays, ranging from one to seven applications per season; and
- The area under rice farms was contiguous and large, at least 150 hectares. Thus, the NES experiment could be located in a contiguous 60 hectare rice area.

The most critical initial task was to convince farmers to participate in the NES treatment. Every farmer interviewed believed if they stopped their insecticide spraying entirely the result would be at least a 30% reduction in yield. So a mini-plot experiment was conducted in the farmers' fields in the 1992 wet season (92WS) and 1993 dry season (93DS). It was hoped that the results of this pre-implementation phase would convince the La Torre farmers to participate in the actual NES whole farm experiment. In 92WS, 15 farmers agreed not to spray insecticide in at least 500 sq. m. of their rice fields with the assurance of being paid in the event of a yield loss. Yield loss was defined as the difference between actual and expected yields in the 500 sq. m plot.

Initial Results

The research design required that no insecticide spraying was to be done in the first 40 days. However, farmers implemented it for the whole cropping season. The small, untreated plot was called the 'mini-treatment 1' area and the larger insecticide-treated portion of the farmer's field was called the 'farmer-practice' area. Both plots were monitored by IRRI entomologists for natural enemies, pests, pest infestations, crop management practices, and yields. Two 5 x 4 sq. m. crop cut samples of grain yield were collected from each plot. Results showed that there was no significant difference between the yield of the untreated and insecticide-treated plots. Insect pest populations were very low in both plots in 1992 WS.

At harvest, no farmer had obtained a yield lower than their normal expected yield. Participating farmers had observed themselves that the yield from the unsprayed plot was the same as from the sprayed plot. Some farmers had even better yields in the unsprayed plot. Thus, in the following 1993 dry season (93DS), farmers did not spray their entire farms, not only for the first 40 days, but for the whole duration of the crop. The NES farmers practised no insecticide spraying at all.

The official implementation of NES was in the 1993 wet season. As well as the 15 original participating farmers, an additional 18 neighbouring farmers were recruited to join the

project, giving a total of 33 participating NES treatment farmers. Surprisingly, these 18 farmers were already practising NES in 93DS because they imitated the original 15 NES farmers who decided not to spray their entire farms for the duration of the cropping season.

Assessing the long term effect of disseminating 'No Early Spray'

In 1999 the authors conducted a restudy to understand the effects of time on the diffusion and farmer adaptation of the technology. As initial tests on the NES approach date back to 1992, we took this as the starting point and included in the restudy a sample of farmers from the original group and a completely new set of farmers to determine the diffusion of NES. In all, 32 farmers were interviewed, 21 from the original group and 11 from a new group. All of the 21 farmers from the original group had NES experience. In addition, nine of them had Farmer Field School (FFS) experience, having attended an FFS in 1997 which was conducted by the Department of Agriculture. The remaining 11 farmers had neither NES or FFS experience, and thus acted as a control group for the diffusion effects of NES and FFS.

Among the original group of 21 farmers, 20 and 18 did not spray insecticides during the 1999 dry and wet seasons (designated here as the NS or 'No Spray' group, Table 1) respectively. One farmer is 'NES compliant', i.e. he/she does not spray for insects in the first 40 days of planting but continues to spray afterward. Two did not spray in the dry season but switched to spraying in the wet season (designated as S or 'Spray' group). Among the 11 new farmers, there is a nearly equal distribution of farmers who did not spray at all (NS) and farmers who sprayed throughout the growing season (S).

The reasons farmers gave for spraying in the wet season of 1999 are not particularly varied. Among the NS or NES compliant groups, 62% (13 of 21) cited saving money as a reason for not spraying. Saving money was not as important for the five new NS farmers, as it was mentioned by only two of them (40%). Savings in labour and the fact that yields were not affected were cited in roughly equal proportions by all farmers, except for the new NS farmers, 40% of whom mentioned labour, and 20% no change in yield. Likewise, a good crop stand was cited by many farmers, as was the environmental benefits of lowering or eliminating spraying.

All of the farmers who continue to spray (S) do so because they observe harmful insects in their fields. Plant vulnerability, especially in the flowering stage, is also a reason given for spraying. Of less importance are issues of yield,[3] weather, and whether or not neighbouring fields were sprayed. This last point is often cited as a reason for spraying among the new farmers, based on the belief that once a field is sprayed the invading insects will be forced to leave the sprayed field and invade a neighbour's. This belief has been previously documented (Palis, 1999).

3 Few people mentioned yield as a reason for spraying, unlike the predominance of no changes in yield for non-sprayers, although among sprayers and non-sprayers alike, yield is implicitly involved in every case.

Table 1. Farmers' insecticide spraying practices in 1999 dry and wet seasons

Insecticide spraying practices	Original farmers[a]				New farmers[b]		All farmers	
	With FFS		Without FFS		Without FFS			
	N	%	N	%	N	%	N	%
Dry season[c]								
No spraying at all (NS)[d]	9	100	11	92	4	40	24	77
No early spray compliant (NES)[e]	0	0	1	8	2	20	3	10
Spray any time during the season (S)	0	0	0	0	4	40	4	13
Total no. respondents	9	100	12	100	10	100	31	100
Wet season								
No spraying at all (NS)	9	100	9	75	5	45	23	72
No early spray compliant (NES)	0	0	1	8	0	0	1	3
Spray any time during the season (S)	0	0	2	25	6	55	8	25
Total no. respondents	9	100	12	100	11	100	32	100

a Farmer participants in the NES study since 1992

b Additional farmers included in the 1999 survey

c One farmer planted tomatoes in the dry season, so there is one fewer farmer in the dry season than the wet

d Did not spray insecticide during the entire season

e Did not spray in first 40 days of the 1999 wet and dry rice growing seasons but sprayed afterwards

Among the 11 randomly selected new farmers, the fields of those who stopped spraying were located near the NES fields while those who continued spraying were far from the NES fields. Farmers who stopped spraying learned about the NES technology from NES participants. At the same time, they were able to observe the impact of NES on their farm enterprise. On the other hand, most of those who continued spraying have not heard at all about NES. Though two farmers had heard about NES from fellow farmers, they still opted to spray because neighbouring fields were sprayed. This, again, is associated with the belief that insects from the sprayed field will transfer to the unsprayed field.

Discussion of the NES case study

The NES method prompted farmers and extensionists alike to conduct research. The research was an outgrowth of the cognitive dissonance of the heuristic. The dissonance questioned farmers' understanding of the relationship between insects, insecticides, and

yield, offering an alternative view. It suggested that these relationships are not fixed, ie. not every case of insect infestation requires insecticide. For farmers this is a valuable lesson. It implies that there are other ways to control and/or live with pests.

Decision aids work best when the decisions farmers are encouraged to take are not mandated or fixed, but prompted by the research process itself. The NES started out as a decision aid and, through farmer experimentation, turned into a learning tool. This is evidenced by the fact that both old and new farmers in the sample took the original decision aid and went beyond its formal recommendation. They successfully extrapolated the effectiveness of the technology from the first 40 days to the entire season.

NES expanded from a 500 m^2 plot to whole fields based on farmers' experience and experimentation. Farmers integrate new technology best when the technological innovation is tested in the context of their own experimentation. One of the most important roles of researchers is to indicate the fruitful areas of experimentation and help farmers explore potential solutions. NES worked, in part, because it offered a context for farmer research within the existing labour and farming system.

Not all farmers have adopted the NES technology. This suggests the degree of effectiveness varies between farms. Presumably farmers understand the agroecological context under which NES works and have adapted the technology to their own conditions. It is probable that insect pest populations vary between locations and seasons. Incorrect information regarding pest ecology may also persist among farmers, leading some to avoid adoption of NES.

This study suggests that NES experimentation should be done in groups, using fields close to one another, because many farmers believe that a neighbour's spraying affects their own pest pressure. Further, when farmers conduct NES experimentation together, they can learn from each other and experience the benefits as group. This improves the learning by making it more rapid and experiential, as well as improving the dissemination of information among neighbouring farmers.

Conclusions

Decision Aids and IRRI's Institutional Culture

In IRRI's institutional culture, decision aids and tools are only likely to be used under strictly defined circumstances, such as when:

- They appeal to a wide audience. The fact that many farmers may use an aid like NES, implies that many farmers share the problem(s) it solves (in this case, unnecessary insecticide use). Local management of problems contradicts IRRI's basic 'all of Asia' mandate. Although properly chosen research targets can be both locally specific and widely shared.

- The information that is conveyed cannot be easily contradicted or confused. The NES is a simple message that would be very difficult to lose or distort in translation or transmission. This makes it amenable to dissemination through mass media such as TV, radio, brochures and the like. This, in turn, reduces the need for farmer training, which is not part of IRRI's institutional culture or its historic mandate.

- Training requirements per farmer are very low. It takes virtually no training for farmers to understand and implement NES, they simply do less of what they are currently doing. In this sense it is truly a knowledge intensive technology. Because training is limited the number of dissemination pathways increases. Farmers can learn of NES in conjunction with intensive field school type training or through mass media. The latter are more likely pathways for IRRI because of their generic nature.

- The up-scaling options are obvious, or the technology is transportable to other locations. The relative homogeneity of irrigated Asian rice growing areas favours the application of NES to new sites. Not all potential technologies share this feature. The wide applicability of NES implies that researchers working on NES and similar technologies, are not conducting site specific research. In general terms, this research is problem specific, not site specific, even though the site will play a role in the overall effectiveness of the technology.

- The information transmitted (the knowledge) is fairly simple. Since dissemination activities are usually undertaken by local extension services, or indirectly by farmers, for maximum efficiency the disseminated materials or concepts must be simple enough to be easily conveyed. Something that can be understood and internalised in a one hour conversation over coffee is much more likely to be diffused than embedded concepts linking various environmental components that may take days of conversation and demonstration to convey.

IRRI's work with other decision aids, including CD-ROMs, Internet-based training applications, and simple technologies, must fit IRRI's corporate climate. This implies that any farmer-based training will probably be similar in context to the NES system, ie, with wide appeal, straightforward information, low training requirements, obvious upscaling options, and a simple message.

Decision aids and IRRI's research agenda

This case is instructive because its starting point is the existing practice of farmers. This means technological innovations like NES will be linked closely with what farmers are already doing, thereby reducing the cost of dissemination and ensuring the appropriateness of the technology. In addition, the selection of technologies will be driven by farmer demand, necessitating a close link with farmers and local extension personnel.

The use of decision aids is not necessarily participatory, even though farmer learning may take place. NES, based on research with farmers, is not a model of participatory

extension. The learning tool aspect of NES is centrally developed and disseminated. The power of NES is its basis in sound on-station research accompanied by independent farmer-based research.

Farmer participation is not appropriate in all of IRRI's research programmes. Where and how participation should be utilised is debated. An initiative to investigate this issue is IRRI's "Project 12: Facilitating rice research for impact" (Morin *et al.*, 2000). In Project 12, a method is under development to link IRRI researchers with NARES researchers and practitioners. The goals of Project 12 are to increase the pool of potential research and extension partners, to conduct research on dissemination in pilot sites, and to link IRRI's training centre with its researchers. Eventually a suite of techniques, of which the NES method is one, will be available for reference by IRRI's researchers and partners.

In conclusion, IRRI's serious and comprehensive mandate is both liberating and constraining. It opens the door for the institute to do a range of activities, from strategic research on basic biological questions, to country or Asia-wide policy analyses. It also puts limits on the institute's interaction with farmers.

The success of NES indicates that there are ways to have impact and foster farmer learning at the farm level within the corporate culture of IRRI. Decision aids will continue to play a role in the development aims of IRRI, due to their simplicity, clarity, ease of transfer, and historic success. However, IRRI's decision aids, based on the institute's method of extension, are somewhat unique, because they are driven by IRRI's capacity to reach farmers and its corporate culture.

Farmer training often requires large investments of time and money for success. Cultural, ethnic, or linguistic competence is required for effective teaching and learning at the farm level. The other International Agricultural Research Centres (IARCs), like IRRI, do not typically employ staff with those competencies and therefore will face many of the constraints IRRI has faced. Decision aids, such as NES, will be one way for the other IARCs to reduce the cost of enhancing farmer decision-making capacity. These aids will not be appropriate for all learning situations, but if based on sound research they can be efficient and effective learning tools.

References

Bentley, J. and Andrews, K. 1996. Through the roadblocks: IPM and Central American smallholders. *Gatekeeper Series* No. 56. International Institute for Environment and Development, London.

Cantrell, RP. 1999. International collaboration and future challenges in rice research. *India Grains* 1(5):19-25.

Deugd, M., Röling, NR. and Smaling, EMA. 1998. A new praxeology for integrated nutrient management, facilitating innovation with and by farmers. *Agriculture, Ecosystems and Environment* 71 (1998):269-283.

Dobermann, A. and White, PF. 1999. Strategies for nutrient management in irrigated and rainfed lowland rice systems. In: Balasubramanain, V., Ladha, JK and Denning, GL. (eds.) *Resource Management in Rice Systems: Nutrients.* Papers presented at the international workshop on natural resource manage in rice systems: technology adaptation for efficient nutrient use, Bogor, Indonesia, 2-5 December 1996.

Festinger, L. 1957. *A Theory of Cognitive Dissonance.* Stanford University Press, Stanford.

Harris, M. 1993. *Culture, People, Nature: An introduction to general anthropology.* 6th ed. Harper Collins College Publishers, New York.

Heong, KL. 1999. From-research-to-farmer practice: a case study in rice pest management. In: Baalasubramanian, V., Ladha, JK. and Denning, GL. (eds.) *Resource Management in Rice Systems: Nutrients.* Kluwer Academic Press, Netherlands.

Heong, KL., Escalada, MM., Huan, NH and Mai, V. 1998. Use of communication media in changing rice farmers' pest management in the Mekong Delta, Vietnam. *Crop Protection* 17(5):413-425.

Heong, KL and Escalada, MM. 1997a. Perception of change in rice pest management: A case study of farmers' evaluation of conflict information. *Journal of Applied Communication* 81(2):3-17.

Heong, KL. and Escalada, MM. 1997b. A comparative analysis of pest management practices of rice farmers in Asia. In: Heong, KL. and Escalada, MM. (eds.) *Pest Management of Rice Farmers in Asia.* International Rice Research Institute, Los Banos, Philippines.

IRRI. 1999. *Rice: Hunger or hope.* International Rice Research Institute, Los Banos, Philippines.

Morin, SR. 1998. *Rice Variety Classification Among Farmers in the Cagayan Valley Philippines. Its utility from on-farm conservation.* Unpublished report.

Morin, SR., Marcotte, P., Bell, M., Balasubramanian, V., and Palis, F. 2000. Research for development: IRRI's strategy for enhancing research relevance and application. Paper presented at the conference on *The Impact of Agricultural Research for Development in Southeast Asia,* Phnom Penh, Cambodia, 24-26 October, 2000.

Öhlmer, B., Olson, K. and Brehmer, B. 1998. Understanding farmers' decision making processes and improving managerial assistance. *Agricultural Economics* 18 (1998):273-290.

Palis, FG. 1999. Changing farmers' perceptions and practices: the case of pest control in Central Luzon, Philippines. *Crop Protection* 17(7): 599-607.

Röling, NR. and Jiggins, J. 1998. The ecological knowledge system. In: Röling, NR. and Wagemakers, A. (Eds.) *Facilitating Sustainable Agriculture. Participatory learning and adaptive management in times of environmental uncertainty.* Cambridge University Press, Cambridge.

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