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Rice farmers' unnecessary insecticide use for leaf folder control is due to misperceptions. A mass media campaign was organized to motivate farmers to test a conflict information expressed as a heuristic. After the campaign, insecticide use dropped from 3.35 sprays per farmer to 1.56. Proportions of farmers spraying at the early and late tillering and booting stages decreased from 59%, 84% and 85% to 0.2%, 19% and 30%, respectively. Leaf folder control perceptions, expressed as the belief index, changed from 11.25 to 7.62. Proportions of farmers believing that leaf folders could cause damages, yield loss and needed sprays, dropped from 66%, 70% and 77% to 24%, 25% and 23%, respectively. The study showed that mass media could effectively transfer some elements of knowledge-intensive pest management, especially simple non-site specific information designed to motivate.



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Most rice farmers in the Mekong Delta apply insecticides in the early crop stages to control leaf-feeding insects (Heong et al., 1994). Their main target pests are rice leaf folders. However, damage by these pests in the early crop stages often does not have yield loss consequences. Besides, the pest densities are generally very low (< 2 larvae/hill). Research has shown that the rice crop could easily compensate for leaf injuries (Heong, 1990; Way & Heong, 1994) and there is no evidence that early insecticide applications are beneficial. It thus seems that farmers are over-reacting to the damage symptoms (Escalada & Heong, 1993). Similar observations where farmers over-react to insect damages have been reported in Honduras which led Bentley (1989) to suggest that indigenous attitudes, such as a belief that all insects are harmful, had made farmers become victims of insecticide abuse.

The insecticide decisions farmers make are based on perceptions of the pest problems and benefits from spraying under uncertainty. In such situations, people often rely on decision rules or “heuristics” to simplify information processing (Einhorn & Hogarth, 1981; Eiser, 1986; Payne, Bettman & Johnson, 1992; Kahneman & Tversky, 1974). Heuristics are developed through experience and guesswork about possible outcomes and may have inherent faults and biases (Tversky & Kahneman, 1974; Slovic, Fishhoff & Lichtenstein, 1977). Farmers’ spraying insecticides as reactions to damages by leaf feeding insects may well be due to faults in their beliefs or the heuristics they use.

Since early season spraying, especially in the first 40 days after sowing, is widespread in South Vietnam and many rice-growing countries in Asia (Heong & Escalada, 1997b), there is a need to develop mechanisms to initiate change and improve current farm practices. Such mechanisms can complement extension and farmer training programs. Face-to-face training is an effective way to bring about adoption of improved pest management practices. Rice farmers who had undergone a 15-week training in integrated pest management reduced insecticide sprays (Useem, Setti, & Pincus, 1992; Matteson, Gallagher, & Kenmoore, 1994; Gallagher, Kenmoore, & Soogawa, 1994). However the task and related resources required to train Asia’s more than 200 million rice farmers would be enormous.

With the shortage of extension personnel, the inaccessibility of large numbers of farmers living in remote areas and poor transportation facilities, farmers’ access to new information is limited

(Adhikarya, 1994). It has been estimated that, on a regular basis, most extension technicians can only serve 50 to 100 families. Farmers not within extension service areas will have to learn indirectly from others (Hornik, 1988).

Mass media have been shown to be effective in settings outside the reach of the regular Extension Service (Hornik, 1988). In this study, we explored the use of communication media as a means to motivate farmers in the Mekong Delta, to test and adopt an innovation. The innovation was presented as conflict information expressed as a heuristic. We report the process of the motivation campaign, results of monitoring surveys and discuss implications for further use of the media to improve farmers' pest management.

## **Methods**

### *Study Sites*

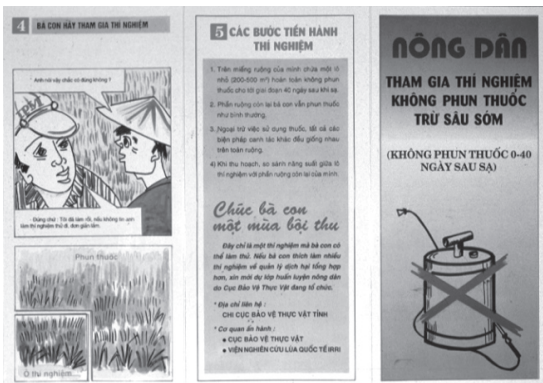
The study sites covered two districts in Long An Province, the Mekong Delta of Vietnam. Tan Tru District occupies a total of 10,200 sq. km, while Tan Thanh District is spread over 42,600 sq. km. Agriculture is the main economic activity in these two districts, with rice as the principal crop. In addition, watermelon, groundnuts, vegetables and other cash crops are cultivated. Most farmers grow two rice crops a year, while some grow three. The two study sites produce a total of 244,000 tons of rice per annum, about 20% of the province's production of 1.2 million tons. The total farm households in Tan Tru are about 11,000 and in Tan Thanh, about 10,000, which account for 10% of the province's household population of 210,000 (Cuc, 1995).

## **Campaign Process**

### *Prototype Materials Development*

A message design workshop with participants from research, extension and agricultural communications was conducted in South Vietnam in May 1994 to develop prototype campaign materials to motivate farmers to test the heuristic: "Spraying insecticides for leaf folder control in the first 40 days after sowing is not needed". At the workshop, participants designed messages and selected media materials to promote farmer participation in testing the heuristic and developed the institutional arrangements and coordination for launching, material delivery and monitoring instruments.

The prototype materials consisted of several versions of a poster, a leaflet, and a radio drama, which were pretested by the authors using focus group interviews. The pretest involved four focus groups with a total of 97 rice farmers from the two study districts. From the discussions, the campaign materials were modified. The final leaflet was a multi-color one-page foldout presenting a conversation between two farmers about the experiment (Figures 1a and b). The poster (Figure 2) had a yellow background to draw attention, emphasizing the benefits of reducing insecticide use. The radio drama depicted a conversation between a farmer who had conducted the test encouraging another farmer to try it. Three local actors voiced the drama which was recorded on a cassette tape. The leaflet and poster also included a message to encourage farmers to contact the Plant Protection Department to learn more about pest management. Table 1 summarizes the content of each campaign material.



Figures 1a & 1b  
Leaflet used in the campaign in Long An province, Vietnam.





Figure 2.  
Poster used in  
campaign in  
Long An province,  
Vietnam.

### Campaign Implementation

A campaign management committee, chaired by the Vice-Chairperson of the Peoples' Committee of Long An Province, was formed to coordinate the launching and material distribution. The committee developed the project management plan to facilitate delivery of the materials. The campaign was launched in Tan An, the capital of Long An Province, by the Deputy Minister of Agriculture on 6 September 1994 in a ceremony attended by more than 400 participants including farmers, agriculture officials, researchers, administrators, technicians, the press and the public. At the launch, the baseline survey results were presented and three farmers who had earlier carried out the test narrated the outcomes of their experiments. A total of 21,000 leaflets were distributed to all households in the two districts. The 4,000 posters were displayed in village billboards, coffee shops, pesticide supply shops, government offices and stores in the market. The 40 cassette tapes were distributed to Ho Chi Minh Radio and the Long An radio station which broadcast the drama twice a week during the crop season (September 1994 to January 1995). The tapes

<b>Table 1</b> Contents of Campaign Media Materials			
<b>Content</b>	<b>Leaflet</b>	<b>Media Poster</b>	<b>Radio Drama</b>
<b>1. What is the innovation?</b>			
1.1 Insecticide spraying for leaf folder control within 40 DAS* is not necessary.	÷	÷	÷
1.2 Plants can compensate from early defoliation by leaf folders.	÷		÷
1.3 Leaf feeding insects do not cause yield loss.	÷	÷	÷
1.4 Early spraying can kill beneficial insects and cause pest outbreak.	÷	÷	÷
1.5 Spraying insecticides can destroy the food source of natural enemies.		÷	÷
1.6 To confirm what scientists say, do your own experiment.	÷		÷
<b>2. What are the consequences of the innovation?</b>			
Stopping early sprays can save money, protect human health, protect beneficial insects, save the environment	÷	÷	÷
<b>3. Referral to training</b>			
If you would like to know more, please join a Farmer Field School.	÷	÷	
*DAS – Days after sowing			



were also distributed to coffee shops in the study sites for broadcast over their audio playback systems. In addition, the Long An government built nine billboards measuring 3m x 2m placed along road junctions and market places. Vehicles with public address systems and posters were also used. Thirty-two demonstration farms were also set up and 1,134 farmers were invited by the local extension officers to experiment with the innovation.

## Monitoring Surveys

The research design used in the study was pretest-posttest design (Campbell & Stanley, 1973; Neuman, 1991). This involved a pretest, the intervention, a monitoring survey and three posttests. In all surveys, quantitative research methods were used to gather data and qualitative methods to complement the data. The qualitative methods included non-structured interviews with farmers which provided opportunities for probing into individual farmers' responses, focus group interviews to obtain group consensus in responses and direct observations.

Five evaluation surveys were conducted during the research period:

1. pretest,
2. management monitoring surveys,
3. posttest in February 1996, 18 months after campaign launching, and
4. posttest in March 1997, 31 months after campaign launch.

Variables and questions in each survey were determined from the exploratory field interviews carried out by the authors. Each questionnaire was translated into Vietnamese and pretested with 30 respondents. Ambiguous questions were modified to ensure clarity and further pretested, if necessary. In order to capture farmers' direct responses, we used open-ended questions wherever possible. Students from the local agricultural institute, supervised by the agricultural technicians, conducted the interviews. Prior to the survey, the authors conducted a training course, which included practical sessions for all student interviewers, to ensure quality and consistency in all surveys. The students were trained to record farmers' responses to each question. As they had little prior knowledge of the subject matter, they were less likely to prompt farmers for answers. We directly supervised each survey and the field data obtained were immediately

coded and entered into computer using a spreadsheet program on-site. Open-ended responses in Vietnamese were translated to English by a team of agricultural officers. Whenever errors in data entry were encountered, they were referred back for clarification. We also conducted random quality assurance checks when the surveys were being conducted.

The pretest survey, conducted in August 1994, collected data on farmer profiles, pest management knowledge, perceptions, attitudes and practice from a sample of 633 randomly selected respondents in the two districts. A management monitoring survey was conducted in November 1994 with a sample of 2,226 randomly selected farmers, to monitor the distribution and reach of the campaign materials. The first posttest survey was conducted in February 1996 with a sample of 452 randomly selected farmers. Using the same instrument, the second posttest was conducted in March 1997 with a sample of 628 randomly selected farmers.

## **Analyses**

Frequency distributions and cross tabulations were generated by using Statistical Analysis Systems (SAS 1985) and SPSS for Windows 7.5 (SPSS 1997). Means were compared using t-test procedures and both parametric and non-parametric statistics were used for correlation and regression.

### ***Belief and Media Exposure Indices***

Farmers' beliefs were quantified through the use of five statements to which respondents were asked to state whether they agreed, disagreed with them or had no opinion. A three-point Likert scale (1 for the preferred answer, 2 for indifference and 3 for the not preferred) was used to score responses. The three statements used to assess the components of belief in leaf folders were: "Leaf folders in the first 40 days after sowing (DAS) can cause severe damages to the crop"; "Leaf folders in the first 40 DAS will cause yield loss" and "Spraying in the first 40 DAS to control leaf folders is necessary". Two other statements were related to general insecticide use: "Applying insecticides will increase yields" and "Killing natural enemies by insecticide spraying will not cause more pest problems". The belief index for each respondent was computed by summing across the scale ratings and statistically compared. The questions were framed in such a way that the bipolar points would be 5 and 15 (5 means that all the state-

ments were the preferred answers and 15 means that all the statements were not preferred).

Media exposure was quantified by asking farmers about their sources of information on the heuristic. This question elicited multiple responses and each information source mentioned was given a score of 1. The media exposure index for each respondent was computed by summing all the scores.

## Results

### *Farmer Respondents' Profile*

Table 2 presents a summary of the background characteristics of farmer respondents in the pretest and the two posttest surveys in the study sites, Tan Tru and Tan Thanh. Most farmers interviewed were in the 31 and 50 age bracket and had one to nine years of schooling. Only a small proportion (<8%) had not attended school. On the whole, farmers cultivated farms that were less than one hectare and the yields reported varied from three to five tons per ha.

### *Farmers' Access to Communication Media*

About 66% of the farmers interviewed owned a radio. Of those who did not own one, only 1% said they did not listen to radio programs. Farmers in the two districts generally listened to two radio stations, Radio Ho Chi Minh (49%) and the Long An provincial station (46%), which were used to broadcast the drama. The preferred times for broadcasts were between 5 to 8 AM (40%), 6 to 8 PM (29%) and 12 - 2 PM (16%). Farmers said they preferred programs with farming information (46%), news (17%) and drama (16%). Among the printed materials farmers frequently read were newspapers (47%), leaflets (37%) and magazines (8%). About 44% of the respondents owned a television set and the most common stations they watched were TV Ho Chi Minh and TV Can Tho.

### *Delivery and Reach of Media Materials*

In the management monitoring survey conducted two months after the materials were distributed, 97 % of the farmers interviewed were aware of the campaign. The most commonly cited source by farmers who heard about the heuristic was the leaflet (89%), followed by the radio drama (72%), poster (69%), the demonstration plots (43%), friends (34%) and the billboards (33%). The radio drama was heard over radio Ho Chi Minh (76%) and the provincial radio station

**Table 2** Profiles of Randomly Selected Farmer Respondents in the Surveys in Long An

<b>In project sites, Tan Tru and Tan Thanh</b>			
	<b>Pretest</b>	<b>Posttests</b>	
	Aug. 1994 N = 633	Feb 1996 N = 452	Mar 1997 N = 628
<b>Age group (years)</b>			
< 31	14.8%	16.5%	17.4%
31 to 40	35.1%	27.3%	33.7%
41 to 50	19.8%	25.1%	24.1%
51 to 60	15.1%	16.9%	13.3%
61 to 70	12.1%	11.3%	7.7%
> 70	3.2%	3.2%	3.8%
<b>Education (number of years in school)</b>			
Did not attend school	5.9%	5.3%	7.7%
1 to 5	54.7%	45.3%	45.9%
6 to 9	25.8%	31.8%	38.6%
10 to 12	13.3%	17.6%	12.8%
> 12	0.3%	0	0
<b>Farm sizes (hectares)</b>			
<0.5	31.8%	25.6%	24.8%
0.6 to 1	30.0%	31.8%	29.5%
1.1 to 2	25.9%	24.2%	23.9%
2.1 to 3	8.4%	10.0%	12.0%
3.1 to 4	1.4%	4.4%	4.5%
> 4	2.5%	4.0%	5.3%
<b>Yields (t/ha) reported</b>			
< 2	15.5%	6.7%	5.9%
2.1 to 3	26.7%	11.1%	17.7%
3.1 to 4	34.7%	25.8%	33.5%
4.1 to 5	18.2%	28.0%	26.4%
> 5	4.7%	28.5%	16.5%

(22%). The posters displayed in buildings along the road were also an important source (60%), followed by those displayed in the coffee shops (16%), in the markets (5%), in schools (4%) and in houses (3%).

After the campaign, 53% of the farmers interviewed cited interpersonal channels as their information sources on the simple rule, followed by 47% who mentioned mediated sources. Interpersonal channels included agricultural technicians, neighbors, friends and relatives. Mediated sources consisted of radio and TV broadcasts, leaflets, poster, billboards and newspapers. Farmers considered the TV as the most influential medium (25.6%), followed by village meeting (21.6%), leaflets (16.3%), radio broadcasts (15.9%), neighbors (6.6%) and demonstration plots (6.6%).

#### ***What Farmers Learned From the Campaign***

From the campaign, 69% of the farmers learned that there was no need for insecticide spraying against the leaf folder in the first 40 DAS. In addition, 30% learned that avoiding the use of insecticide during this period would save money and labor and 20% learned that spraying early in the season could be detrimental to natural enemies. About 14% learned how to conduct an experiment, 11% learned that leaf folder damage during the early growth stages would not reduce yields, 13% learned that insecticide spraying could be detrimental to health and 6% learned that insecticides would pollute the environment.

About 56% of the farmers said that they conducted the experiment after the campaign, 15% reported that they stopped spraying for leaf folders in the first 40 DAS, and 15% stated that they did not do anything. The main reasons given for not taking action were that they were worried about pest attacks when they did not spray (37%), afraid of yield loss (20%), did not believe in the message content (12%), had no time to experiment (9%) and about 6% did not understand the message.

#### ***Changes in Farmers' Beliefs***

Farmers' beliefs significantly decreased over the 31-month period as indicated by the reduction in the belief index from 11.25 ( $\pm$  0.18 at 95% CL) in the 1994 pretest to 8.22 ( $\pm$  0.27 at 95% CL) in the 1996 posttest and to 7.62 ( $\pm$  0.24 at 95% CL) in the 1997 posttest. Table 3 shows changes in farmers' beliefs in the three statements related to the rice leaf folder problem to the two statements relating

to insecticide use. Except for the statement “Applying insecticides will increase yields”, farmer responses to the four other statements were significantly changed.

### ***Benefits From Not spraying in the Early Season***

In the posttests, farmers were asked an open-ended question about the benefits for not spraying insecticides in the first 40 DAS. Savings in costs (insecticide and labor) was cited by 89% of the farmers, followed by reducing health risks (25%), less pollution to the environment (17%) and protecting the natural enemies (12%). These benefits were shown in the poster displayed in various public places. Most of the farmers (97%) said that they would continue not using insecticides in the first 40 DAS in the next season.

### ***Changes in Farmers' Insecticide Use Patterns***

Changes in farmers' insecticide use over the 31-month period are shown in Table 4. The mean number of sprays farmers applied declined from 3.35 per farmer to 1.56 at 18 months after campaign implementation. A year later, the mean slightly increased to 1.76, although not significant. The proportion of farmers who did not use any insecticides increased from 1% in the pretest to 20% in the first posttest and to 32% in the second posttest. The insecticide spray frequency distributions shifted from a mode and median of 4 to 1 after the campaign was implemented. The proportion of farmers spraying during the early tillering, late tillering and booting stages declined significantly (Friedman test chi square = 7.6,  $p < .05$ ). In the pretest, 59% and 84% of the farmers sprayed during the early and late tillering stages, respectively. In the first posttest, the proportion of farmers spraying in the early and late tillering stages, dropped to 28% and 42%, respectively, and in the second posttest, these proportions further declined to 0.2% and 19%, respectively. The proportion of farmers spraying in the reproductive and maturing stages initially declined in the first posttest but increased in the second posttest, but were still lower than that in the pretest.

Although the number of insecticide sprays was reduced over the period, farmers' spray targets had not significantly changed (Friedman test chi square = 0.33,  $p > .05$ ). The rice leaf folder and other leaf feeding insects remained their main targets, accounting for 44%, 52% and 53% of farmers' applications in the 1994 pretest, 1996 posttest and 1997 posttest, respectively (Table 5).

**Table 3** Comparison of Farmers' Responses to Belief Statements in Tan Tru and Tan Thanh Districts in the 1994 Pretest, and 1996 and 1997 Posttests in Long An Province

Belief statements	Percent farmers who agreed to the statements			
	Pre-test	Post-tests		
	1994 n=633	1996 n=452	1997 n=628	
Applying insecticides will increase yields	39.0	35.6	29.7 <sup>a</sup>	
Killing natural enemies will not cause pest infestation	27.2 <sup>b</sup>	52.9	68.3 <sup>a</sup>	
Leaf folders in the first 40 DAS can cause severe damage	66.1 <sup>b</sup>	27.2	24.0	
Leaf folders in the first 40 DAS will not cause yield loss	69.8 <sup>b</sup>	26.2	24.8	
Spraying insecticides for leaf folders has to be done in early season	77.2 <sup>b</sup>	21.6	23.2	
Belief index	Mean	11.3	8.2	7.6
	Std dev.	2.3	2.8	3.0
	Mode	13	7	5
	Median	12	7	7
Critical values of chi square at df = 2 p = 0.05, 5.99 and p = 0.01, 9.21				
<sup>a</sup> Significant differences at p = 0.01 and p = 0.05 probability levels, respectively, from posttest 1996.				
<sup>b</sup> Significant differences at p = 0.01 probability levels, respectively, between pretest (1994) and posttest (1996).				

	Pre-test			Post-tests	
	August	February	March		
	1994	1996	1997		
Number of farmers interviewed	633	452	628		
Total number of insecticide sprays applied	2123	700	1103		
Mean number per farmer	3.35	1.56	1.76		
Standard deviation	1.75	1.20	1.35		
Mode	4	1	1		
Median	4	1	1		
Range	0-11	0-8	0-9		
Percentage of farmers not using insecticides	1.1	20.2	31.7		

***Relationship Between Insecticide Use, Belief and Media Exposure***

In all three surveys, farmers' insecticide use frequencies were significantly correlated with the belief index values (pretest 1994, Pearson  $r = 0.109$ ,  $p < 0.05$ ; posttest 1996,  $r = 0.414$ ,  $p < 0.01$ ; posttest 1997,  $r = 0.285$ ,  $p < 0.01$ ). These findings implied that farmers with high belief indices have higher tendencies to spray insecticides (Table 6).

Farmers' media exposure index values were negatively correlated with belief indices in the two posttests (1996 Pearson  $r = -0.28$ ,  $p < 0.01$  and 1997,  $r = -0.21$ ,  $p < 0.01$ ). These findings implied that farmers' beliefs decrease with increase in media exposure. In the 1994 pretest, the relationship was not significant, as the campaign messages had not been introduced. Spray frequency was linearly related with media exposure in the 1997 posttest but was not significant in the 1996 posttest. This seems to suggest that perhaps the "sleeper effect" (Schramm 1973) was at work which was the case in the weed management campaign in Malaysia (Adhikarya, 1994; Ho, 1996).



<b>Table 5</b> Main Pest Targets of Farmers' Insecticide Sprays in Study Sites, Tan Tru and Tan Thanh			
Targets	Pre-test	Post-tests	
	August 1994	February 1996	March 1997
Rice leaf folders	33.4	37.0	43.8
Other leaf feeding insects	10.2	14.7	9.0
Stem borers	10.1	25.9	8.0
Thrips	14.0	6.1	8.5
Brown plant hoppers	28.0	7.6	12.4
Others	4.3	8.7	8.3

<b>Table 6</b> Regression Analyses of Relationships Between Spray Frequency, Belief Index and Media Exposure Index of Farmers in Long An Province, Vietnam					
<b>Regression Analyses</b>					
Year	Relationships	Coefficient (95% CL)	Intercept (95%CL)	F	p
1994	spray – belief	0.08 (±0.06)	3.02 (±0.63)	7.4	0.007
	belief – media	Regression not significant		0.05	0.800
1996	spray – belief	0.08 (±0.04)	0.12 (±0.31)	91.7	<0.001
	belief – media	-0.74 (±0.24)	8.67 (±0.29)	36.3	<0.001
	spray – media	Regression not significant		2.7	0.11
1997	spray – belief	0.13 (±0.03)	0.80 (±0.28)	54.4	<0.001
	belief – media	-0.74 (±0.27)	8.50 (±0.39)	29.1	<0.001
	spray – media	-0.22 (±0.27)	2.05 (±0.18)	12.8	<0.001

### *Farmer-to-Farmer Spread and Multiplier Effects*

After the campaign about 77% of the farmers who were aware of the heuristic (N=400) said that they discussed the information with members of their household and 67% took it up with other farmers. Persons with whom the information was discussed included

the spouses (57%), the sons and daughters (31%), children (19%), siblings (12%), and other relations (16%). Some farmers recalled communicating the information from the media to more than 10 persons (33%), while most said that they had spoken to 5 or less persons (44%). The most common situations where the information was discussed were in the field (36%), in the coffee shops (24%), and during dinner parties (24%).

The communication campaign in Long An Province stimulated other provincial governments in South Vietnam to launch their own programs using similar media materials. Between September 1994 and March 1997, 15 provincial governments initiated their own programs. The provinces spent about \$ 151,000 over this period, distributed 340,000 leaflets and 35,000 posters, organized 1,390 demonstration plots, and broadcast the radio drama about 1,550 times. In addition, 356,600 farmers were invited to participate in the experiment to “test” whether early season spraying for leaf folder control was necessary.

## **Discussion**

Rice farmers' insecticide use decisions are influenced more by perceived rather than actual benefits. Using Festinger's (1957) concept of cognitive dissonance, farmers in the Philippines were motivated in a face-to-face meeting to change perceptions by re-evaluating their beliefs (Heong & Escalada, 1997a). This study in Vietnam shows that carefully designed communication materials can similarly motivate farmers to change perceptions. After the campaign, farmers' beliefs, as indicated by the belief index, decreased from 11.3 to 7.6. Correspondingly, insecticide use declined from 3.35 sprays per farmer per season to 1.76 — a reduction of 47%. The main sprays that had been reduced seemed to be those applied in the early crop stages. Before the campaign 60%, 82%, and 84% of the farmers applied insecticides during the early and late tillering and booting stages, respectively. Eighteen months after the campaign, farmers spraying in these crop stages were 25%, 41%, and 55% and at 31 months after the campaign, these were further reduced to <1%, 19%, and 30%, respectively. This change corresponds directly to the message of the campaign materials motivating farmers to stop early season applications for leaf folder control. Initially, 66% of the farmers believed that leaf folders in the early crop stages could cause severe damages, yield loss (70%) and insecticides had to be sprayed in the early stages (77%). Eighteen months after the campaign, the

proportion of farmers who believed these statements declined to 27%, 26%, and 22%, respectively and at 31 months after, these were further changed to 24%, 25%, and 23%, respectively. It is evident that the campaign had affected farmers' judgement heuristic about leaf folders and insecticide use. Farmers with high media exposures had low beliefs, and beliefs and sprays applied were linearly related to a low extent. The main motivation for farmers to adopt the innovation appeared to be savings in insecticide and labour costs as cited by 89% of the respondents.

It is evident that when systematically planned and implemented, a media campaign can initiate and help sustain changes in farmers' pest management beliefs and practices. In Long An Province, media exposure was widespread, with remarkably high percentages of respondents reporting awareness and receipt of campaign materials. The relationships observed between pest management scientists (elite), information sources (media), farmers (public), and early season sprays for the leaf folder control (issue) in the campaign reinforce McLeod and Chaffee's (1973) co-orientation approach. Their model asserts that the public generally seeks information about an issue through personal experience, elite sources and the mass media, or a combination of these sources. Differences in perceptions of an issue can be a source of strain, which drives the public to seek more information from the media and other sources (McQuail & Windahl, 1981). In the Long An case, the issue that was communicated was clearly in conflict with the farmers' prevailing beliefs and the resulting dissonance motivated farmers to evaluate and resolve the heuristic presented by the media.

A number of campaign components might account for the adoption of the heuristic and behavioral change in Long An — simplicity of the message, benefits of the innovation, the media mix, the materials development process and delivery. In addition, emphasis was placed on motivating farmers to test the heuristic and materials were designed for that purpose such as highlighting the benefits of adoption. In other campaigns, the relative advantage expressed as reward appeals and promise of benefits has been shown to influence adoption rates (Manoff, 1985, Kotler & Roberto, 1989; Rogers, 1995).

Since the media approach is very familiar to the Provincial Extension Systems and is easy and inexpensive to implement, 15 provincial governments in the Mekong Delta established their own programs using provincial funds, thus extending the heuristic to

about 2 million farm households. In the innovation-decision process, mass media channels are important means to create knowledge and spread information rapidly to a large audience and can change some weakly held attitudes. The high adoption of the heuristic in Long An after the campaign also suggests that early season control of leaf folders, though common among farmers, is probably not a strongly held attitude. It is inevitable that negative messages about the innovation will continue, through mass media, pesticide sales agents and interpersonal networks. In order to avoid discontinuance, there is need to continue communicating the same heuristic or framing it differently and monitoring changes regularly.

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