Technology transfer to farmers: A study of the effectiveness of *A Farmer's Primer on Growing Rice* in two Philippine dialects

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ABSTRACT

The Tagalog and Hiligaynon editions of *A Farmer's Primer on Growing Rice*, published in 35 languages, were evaluated for effectiveness in transferring rice (*Oryza sativa* L.) technology information to 84 small-scale farmers in two regions of the Philippines. A 73-item test was used to measure initial knowledge level. The farmers were then given copies of the *Primer* in Tagalog (Cavite farmers) or Hiligaynon (Negros farmers). A posttest was given 45 d later to measure knowledge gain. Only 4% of the farmers had high knowledge in the pretest, but 46% had high scores after reading the book. The *t* test also showed that, although farmers who finished the book and those who did not differ significantly in initial rice knowledge, the difference in posttest scores was highly significant. The farmers' knowledge gain concerning fertilizer was highest. In the pretest, only 15% knew the meaning of "24-12-12" on a fertilizer bag, but half knew after the treatment. Of 14 independent variables tested, only 4 were significantly related to knowledge gain—previous participation in rice training courses, land tenure, number of years in rice farming, and exposure to newspapers. Farmers evaluated the *Primer's* design, packaging, and message content favorable but suggested improvements to increase its effectiveness, such as the deletion or substitution of abstractions and symbols they found confusing or hard to understand. The IRRI is using these findings to make forthcoming extension-level publications more effective.

LANGUAGE DIFFERENCES inhibit the flow of agricultural information among scientists—but even more so, from research institutions to farmers, the ultimate users of technology. To alleviate the language barrier in the transfer of agricultural technology, the IRRI developed its copublication program—cooperative ventures with national agencies and private publishers to translate, publish, and distribute IRRI books.

By late 1989, more than one million copies of 126 non-English editions of 29 IRRI books had been copublished in 45 languages in 29 countries.

The most popular IRRI publication is *A Farmer's Primer on Growing Rice*, an illustrated book describing improved techniques of lowland rice farming. It has minimal text and uses black and white illustrations with ample space on every page to allow for text translation.

The original English edition of the *Primer* was published in 1979 in the Philippines. The IRRI blocked off the text and printed sets of the illustrations. Copublishers translate and typeset the text, strip the translations onto the blank illustrations, and print their own editions on local presses. The *Primer* is the world's most widely published agricultural text. By late 1989, 44 editions had been published in 36 languages. For example, an Urdu edition of the book is available in Pakistan, Spanish editions in the Dominican Republic and Mexico, and Tamil edition in South India, Creole in Haiti, and Kiswahili in Tanzania. The *Primer* is also available in the following Philippine dialects: Bikol, Cebuano, Hiligaynon, Ilokano, Maguindanao, Pampango, Pangasinan, Tagalog, and Waray.

We previously surveyed 40 translators and copublishers of IRRI books in 12 Asian countries (Cabanilla and Hargrove, 1986) and found that success in copublication depends not only on cooperation among research centers, publishers, and translators, but on perceptions of the target audience. Translators and publishers considered farmers and extension agents as the main users of the *Primer*. We also found that a sense of altruism and the prestige of being the translator of a good book were primary motivating factors—only half of the translators were even paid for the jobs.

Huque et al. (1986) evaluated the effectiveness of English vs. Cebuano editions of the *Primer* among 88 extension workers in Southern Leyte, Philippines. The knowledge level of extension workers increased significantly after exposure to both editions. The knowledge increase of those who studied the Cebuano edition, however, was significantly higher than those who read the English edition.

Since its release, cooperators have asked: Is the *Farmer's Primer* really meant for farmers? Is the information too technical for effective transfer to those of low literacy? How could the *Primer* be improved? We initiated this research to find answers to those questions, and to improve communication in future extension-level publications.

MATERIALS AND METHODS

We tested the Tagalog edition in seven villages in Cavite, an area about 34 km south of Manila where rice farming is the main occupation and Tagalog the major dialect. The Hiligaynon edition was tested in five villages in Negros Occidental in the central Philippines. Rice farming is a new industry in much of Negros; 36% of our sample there was displaced sugarcane (*Saccharum officinarum* L.) workers who recently shifted to rice after

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the sugar industry collapsed. It was assumed that they had little or no knowledge of rice production. We pretested 102 farmers; 41 were in Cavite and 61 in Negros Occidental. However, we had only 84 farmers for the posttest.

We used the classic pretest and posttest experimental design. The test consisted of 73 items, from 10 to 14 items for each of six formats: simple recall, multiple choice, problem solving, matching, fill-in-the blank, and true- or false.

Farmers were individually pretested to determine their general level of technical knowledge in rice farming, then interviewed, in their dialect, on sociodemographic, educational, and communication variables. Each farmer was then given a copy of the *Primer* in Tagalog or Hiligaynon.

Forty-five days later, tests were administered as quickly as possible to avoid the "radiation effect" during the testing period. The same interviewers conducted the posttest, then had the farmers evaluate the *Primer's* design, packaging, and message content. Semantic differential was used to measure the farmers' attitudes. The instrument consisted of adjectival pairs of words such as "attractive-unattractive" or "appropriate-inappropriate" to which farmers reacted on a negative-positive scale of 5 points (Ebel, 1965).

Analysis was done by: simple frequency counts and percentages to measure observations on each test variable, chi-square tests to determine relationships among variables, and t test to determine the significance of means among variables. The level of significance was set at 0.10.

The independent variables were:

1. Sociodemographic: age, sex, marital status, and birthplace.
2. Education: highest formal education completed by the respondent, previous participation in rice production training courses, and membership in organizations.
3. Farming background: farming experience (no. of years) and land tenure.
4. Communication: exposure to print and broadcast media.

The dependent variables were:

1. Initial knowledge score,
2. Final knowledge score, and
3. Knowledge gain.

RESULTS

Farmer's Background

The respondents' ages ranged from 26 to 74; the average age was 44 (Table 1). Only 4 of the 84 respondents were female. Most respondents were married. Eight-one percent of the respondents were born in a farming village, and 94% still resided and farmed in the same village.

Only 61% of the farmers had any formal education. Elementary school (Grade 6) was the highest education level for half of the sample. Although about a third did not finish elementary school, 28% attended at least Grade 1. About half of those who had no formal schooling could read. The four illiterate farmers asked wives or children to read the book to them. Thirty-two percent of the farmers had participated in rice production training courses in the past 3 yr. Most farmers were members of farm, civic, or religious organizations; almost half had served as officers.

Table 1. Background of 84 rice farmers.

Background	Number	Percent
Age†		
<36	19	23
36-55	52	62
>55	13	15
Sex		
Male	80	95
Female	4	5
Civil status		
Single	5	6
Married	77	92
Widow	2	2
Birthplace		
Barrio	68	81
Town	14	17
City	2	2
Highest education		
None	9	11
< Grade 6	24	28
Elementary (Grade 6)	41	49
High school	9	11
College	1	1
Previous training		
Yes	27	32
No	57	68
Membership in organizations		
Yes	48	57
No	36	43
Position held in organications (n = 48)		
Officer	18	37
Member	30	63

† Mean age = 44.

Only 1 of the 84 farmers owned the land that they worked (Table 2). Seventy-six percent of the Cavite respondents were leaseholders (rented the land for a fixed fee). About 50% of the Negros farmers were tenants (paid a percentage of the crop to the landlord) and 14% were leaseholders. The remaining 36% were landless farmers who had previously worked on vast sugarcane plantations. For sustenance, these farmers had made temporary agreements with the landowners to plant rice on idle land. The landlords received no share of the rice, but could redivert the land if sugarcane becomes profitable again.

The respondents averaged 14 yr of farming experience. Seventy-one percent of the Cavite farmers had grown rice for more than 10 yr, but 62% of the Negros farmers had < 10 yr experience. Most had shifted from sugar to rice farming in the past 2 or 3 yr.

Print and Broadcast Media Exposure

Most farmers had never read an agricultural publication, and 41% never read newspapers (Table 3). The main reason cited for not reading was that printed materials were not available in the village. But the farmers showed great interest in highly illustrated materials in local dialects.

Table 2. Rice farming background of 84 Cavite and Negros farmers.

Farming variable	Cavite (n = 34)	Negros n = 50)	Both n = 84
	%		
Land tenure			
Owner	0	2	1
Leasehold	76	14	39
Tenant	24	48	38
Displaced sugar worker	0	36	21
Years in rice farming†			
10 or less	29	62	49
11-20	32	14	21
21-30	15	12	13
More than 31	24	12	17

† = 14.

Table 3. Exposure of 84 rice farmers to print and broadcast media.

Type of media	Frequency of exposure†				
	Very often	Often	Seldom	Very seldom	Never
	%				
Print					
Newspaper	0	1	14	44	41
Magazine	0	1	8	31	60
Agricultural publications	0	3	8	35	54
Comics	1	5	9	42	43
Broadcast					
Radio	12	28	43	11	6
Farm broadcast	2	14	53	17	14
Television	8	6	35	30	21

† For print media: very often = 6-7 d/wk, often = 4-5 d/wk, seldom = 1-3 d/wk, very seldom = <1 d/wk. For broadcast media: very often = three times/d, often = two times/d, seldom = once a day, very seldom = less than once a week.

Exposure to broadcast media was relatively high; 94% listened to the radio, with 83% listening at least once a day. Almost two-thirds of the farmers listened to farm broadcasts daily.

Effectiveness of the *Primer*

To test the effectiveness of the *Primer* among farmers, test scores were categorized as low (0-36) and high (37-73).

Although only 4% of the subjects had high knowledge or rice technology before the treatment, 46% had high knowledge in the posttest (Table 4). The difference between the mean score (26) of the 84 respondents before the treatment and the mean score (36) after exposure to the *Primer* was statistically significant.

Slightly more than half of the farmers read the entire book during the 45-d exposure period. Only 5% of the farmers who finished the book (Group A) had high knowledge of farming technology before reading it, but 70% had high knowledge afterward. Of those who did not finish the book (Group B), 3% had high knowledge before, and 20% after the treatment.

Although knowledge level increased significantly among the total sample of 84 farmers, the overall increase was only about 38% because of Group B's low knowledge gain. If respondents who did not finish reading the entire book were omitted, the average change in score would go up to 50%. We can conclude, therefore, that the *Primer* effectively transferred knowledge in rice technology.

Table 4. Knowledge levels in rice farming technology of 84 farmers before and after exposure to the *Primer*, by group (A = read the entire book, B = did not finish the book).

Classification of respondents	Knowledge level†					
	Low		High		Mean score	Range
	no.	%	no.	%		
	Before treatment (NS)					
Group A	42	95	2	5	26	15-41
Group B	39	97	1	3	25	17-39
All farmers	81	96	3	4	26	15-41
	After treatment‡					
Group A	13	30	31	70	39	23-55
Group B	32	80	8	20	32	22-39
All farmers	45	54	39	46	36	22-55

† Highly significant at a 0.10% probability level. NS = nonsignificant at a 0.10% probability level.
‡ Highly significant at a 0.10% probability level.

Table 5. Mean scores of 84 rice farmers by topic.

Topic	Mean scores			
	Highest possible score	Pretest	Posttest	Percent increase
Fertilizer	15	3.6	6.7	86
Carbohydrate production and water	9	4.4	6.0	36
Parts and life cycle of the rice plant	25	10.0	12.4	24
Seeds	17	6.0	8.4	40
Weeds	7	2.0	2.4	20

Table 6. Tests of relationship between independent variables and knowledge gain in rice technology after reading the *Primer*.

Independent variable	df	χ^2	Significance
Age	3	0.232	NS‡
Sex	1	0.953	NS
Membership in organization	1	1.001	NS
Education	3	3.720	NS
Training	1	5.858	*
Land tenure	3	7.285	†
Years in farming	3	12.910	*
Exposure to print media			
Newspapers	2	6.063	
Magazines	2	1.306	NS
Agricultural publications	2	3.357	NS
Comics	2	1.179	NS
Exposure to broadcast media			
Radio	4	4.244	NS
TV	4	3.180	NS
Farm broadcasts	4	2.724	NS

* Significant at a probability level of 0.05.
† Significant at a probability level of 0.10.
‡ NS indicates the effect is not significant at a 0.10 probability level.

The 73 questions were categorized into several topics. The initial mean knowledge scores for all topics were relatively low. The highest knowledge gain (86%) was on fertilizer (Table 5). Almost all farmers were aware of numbers such as 24-12-12 printed on fertilizer bags—but initially, only 15% knew that those numbers meant percentages of nitrogen, phosphorus, and potassium. After reading the book 50% of the 84 farmers understood

what the numbers mean. Knowledge gain was lowest in the life cycle of the rice plant and weeds.

Knowledge Gain and Farmers' Characteristics

The farmers' knowledge gain was measured by the difference between the pretest and posttest scores on the 73-item test. Four of the 14 variables were significantly associated with knowledge gain among the 84 farmers: prior participation in rice training courses, type of land tenure, number of years in rice farming, and exposure to newspapers (Table 6).

Of the 27 respondents who had previously participated in rice training courses, 70% had high knowledge gain in the posttest vs. 42% of those who had no training. In Negros, the relationship between knowledge gain and land tenure was highly significant. The knowledge gain of displaced sugar workers was 78%. In Cavite, no significant association was found between knowledge gain and land tenure. Farmers who read newspapers, including those who "seldom" read them, gained more knowledge from reading the *Primer* than those not exposed to newspapers.

The relationship between education and knowledge gain was highly significant in Cavite (0.05), but not among the displaced sugarcane farmers in Negros. The increase in test scores among less-educated Negros farmers was unexpectedly greater than among educated farmers. Their enthusiasm and eagerness to learn to grow rice better seemed more influential than education. This finding strengthens the conclusion of Brown's (1970) study that illiteracy does not impose impenetrable barriers to the flow of technical information, and that efforts to diffuse technical information via printed media need not await full literacy.

Primers' Design and Message Content

Design and book packaging refers to the *Primer's* illustrations, layout, and labeling. *Message content* refers to how the words and presentation of text were comprehended. Although the farmers considered the *Primer* highly appropriate, with legible letter size and proper illustration size, they were less enthusiastic about the cover, the labeling of illustrations, and size of the book. Some farmers said that the cover illustration was too abstract, and specifically mentioned the nonconventional depiction of a rice field. Farmers wanted the cover to be attractive, but as simple and natural as possible.

Half of the farmers who did not finish the *Primer* stopped at the section on carbohydrates and food production. Almost all respondents found the illustrations in the carbohydrate section hard to understand, and few considered the information relevant to their needs. Farmers found abstractions confusing and hard to understand, and preferred illustrations of real objects to which they could relate. This strengthens findings from several visual literacy studies that contend that the more realistic the presentation, the more effective the transmission of the desired message (Finn, 1953; Dale, 1946).

Some farmers suggested a smaller format for the *Primer,* so they could conveniently take it to the field. (The *Primer* is 15 by 33 cm.)

Farmers often misunderstood and were critical of Tagalog and Hiligaynon translations of technical terms in the *Primer;* many said that they differ from local terms and seem like English words.

Farmers considered the *Primer's* message highly interesting, credible, relevant, practical, and useful. But newness, adequateness, and practicality were rated less favorably. Cavite farmers rated "newness of information" in the *Primer* lower than did the less-experienced Negros farmers.

On adequateness, farmers felt that IRRI should introduce information on the following areas into the *Primer:*

- Types of varieties planted for specific seasons, locations, and cultural and management practices.
- Proper use of indigenous organic fertilizers.
- Prevention or control measures for specific insects and diseases.
- Alternate crops to grow with rice.
- Cultural and management practices for nonirrigated areas.
- Weed control measures.

The farmers evaluated some *Primer* messages as impractical, such as specifying water requirements in million liters. Farmers suggested that this information be presented in practical terms such as depth across 1 ha (i.e., knee-deep, or in feet or inches).

Farmers comprehended most of the general words used in the *Primer,* but some found familiar words hard to understand when used differently in the book. e.g. *arina* (starch or flour), *asukal* (sugar), and *taba* (fat).

Farmers also found symbols such as +, −, and > hard to comprehend. The plus sign was sometimes interpreted as something to avoid because it is like the danger sign (X). The farmers suggested using simple words such as "at" (Tagalog for "and") for the + sign. If symbols must be used, they should be supported with more text.

DISCUSSION

There are many lessons to be learned from extension workers and farmers who use *A Farmer's Primer on Growing Rice.* Some findings were hard to quantify statistically. Many farmers, particularly in Negros, walked 15 to 20 km to volunteer to be interviewed so they could get a free copy of the *Primer.* we gathered no data on their income, but we knew they are poor by almost any standard. Yet most of these low-literate farmers studied the *Primer* and learned from it.

The following are issues and problems that IRRI and national cooperators might consider when preparing future farm-level materials.

Distribution. Most farmers in our sample had never read an agricultural publication, and none had heard of the *Primer* before our research. No international agriculture research center or Third World agricultural agency can afford to distribute free copies of materials such as

the *Primer* to millions of farmers. Nonprofit sale seems to be the only way to reach farmers who want such information. Farmers said they would pay for publications to help them increase their rice production. We asked how much they would pay for the *Primer;* the mean price quoted was U.S. $1.50 (P31.00). The IRRI's current price is U.S. $1.30 (P26.00)/copy (minus a 40% bookseller's discount). The IRRI plans to print some editions on newsprint to cut production costs further.

There are few bookstores in the rural areas of Asia, Africa, and Latin America—and farmers do not go to bookstores. Farmers suggested agricultural supply stores as distribution outlets for the *Primer* and similar publications. By late 1986, IRRI had made distribution arrangements with 11 farm supply stores in the Philippines, plus 14 other nonconventional outlets such as church or women's organizations, agriculture professors or extension agents. By 1989, IRRI had 80 nonconventional distribution outlets across the Philippines.

The IRRI should also publish basic pamphlets that are shorter and cheaper. Such pamphlets should be highly illustrated so we can make copies of the artwork available to national programs, which can then add translated text and print local editions.

Translation. Accuracy of translation is difficult to control, particularly in the Philippines. A vast range of terms are used within, for example, a geographic area where Waray is the main language. In each region, one or two neighboring languages have crept into the dialect. The IRRI has a checker examine each translated manuscript—but if the checker and translator are from region 50 km apart, the checker invariably claims the translation is wrong and not pure.

Furthermore, there are no standard reference texts for proper use of most Philippine dialects. The claim that technical terms in the translations sound like English words is probably valid. Translators of IRRI publications often must create new terms because there are no appropriate words in the local dialect.

Design and Message Content. The IRRI used findings of this study to make four publications, designed on the *Primer* concept, more effective. These publications, all released in 1987 and 1988, include: *A Farmer's Primer on Growing Upland Rice, A Farmer's Primer on Growing Cowpea on Riceland, A Farmer's Primer on Growing Soybean on Riceland,* and *Helpful Insects, Spiders, and Pathogens—Friends of the Farmer.*

Women. Through informal discussion, we learned that the wives of many farmer respondents read the *Primer* at least as comprehensively as did their husbands. Wives often claimed to have subsequently discussed what they learned from the *Primer* with their husbands. More research should be done on the role of women in the diffusion of agricultural technology in developing countries.

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