

CHAPTER 8

SPECIALISTS' INFORMATION SOURCES AND NEEDS

Introduction

This chapter describes the technical information sources of subject-matter specialists and their information needs. I first discuss responses to question IS5, which listed 24 possible sources of information for extension purposes, ranging from the mass media to farmers, and from research publications to training courses. I discuss the ranking of these sources and differences among the respondents at the three institutions surveyed (province and district offices, and Agricultural Information Centers). I then compare the total amount of information obtained by respondents at the three institutions.

Question IS6 measured source desirability: it asked respondents to name the top five sources they would use in ideal conditions. I compare responses across institutions and then discuss the relationship between source desirability and the actual amounts of information respondents reported obtaining from each source.

The Publications questionnaire contained several questions that paralleled those just described. I discuss these next. Questions P5 and P6 asked respondents how often they read several agricultural publications and how useful they found them. Questions P7 and P8 focussed on the major sources for six food crops and six livestock technologies released by AARD in the previous decade. I use responses to the latter questions to discover how fast and by what media AARD technologies diffuse through the SMS population.

Finally, I turn to SMSs' information needs. Question P9 listed 62 topics and asked respondents to check those on which they felt they needed most information.

Information sources

Respondents obtained most information from field extension workers, followed by other extension specialists, farmers, and their superiors. This is shown in the last column of Table 8.1, which summarizes data from question IS5. The top six sources were all persons whom the specialists meet frequently or the respondents' own experience. Testing and research by respondents themselves ranked somewhat lower (11th), possibly because specialists seldom conduct such tests.

Table 8.1 Amount of information respondents received from 24 sources, by institutional affiliation.^a

Source ^b	Province	District	AIC	Weighted mean ^c
1 Field extension workers	4.95 a	5.58 b	4.65 a	5.3
2 <u>Extension specialists</u>	5.18	4.86	5.05	5.0
4 Farmers	4.58 a	5.18 b	4.62 a	5.0
5 Superiors	4.85	4.89	4.95	4.9
5 Own experience/observation	4.86	4.86	4.48	4.8
Other colleagues	4.56 a	4.87 ab	5.10 b	4.8
7 <u>Ag newspapers/magazines</u>	4.52	4.43	4.47	4.5
8 <u>AIC publications</u>	4.00 a	4.23 a	5.21 b	4.3
9 Univ courses/notes	4.20 ab	4.31 b	3.49 a	4.2
Other mass media	4.03	4.20	4.18	4.2
11 Own testing and research	3.78 b	3.91 b	3.11 a	3.8
12 Dir Gen recommendations	3.91 ab	3.53 a	4.47 b	3.7
Training	4.06 b	3.42 a	4.03 ab	3.7
14 <i>Warta/Jurnal Litbang</i>	3.61 a	3.15 a	5.17 b	3.5
15 AARD technical guides	3.39 a	3.01 a	4.44 b	3.3
17 Seminars etc. at res. inst	3.45 ab	2.90 a	3.63 b	3.1
<u>AARD books</u>	3.31 a	2.79 a	4.46 b	3.1
Scientific journals	3.25 a	2.78 a	4.30 b	3.1
19 Field research projects	2.92	3.02	2.85	3.0
20 University textbooks	2.73	2.89	3.18	2.9
Researchers	3.09 ab	2.69 a	3.37 b	2.9
22 Private technical guides	2.12	2.40	2.70	2.4
23 Agribusinesses	2.31	2.00	2.13	2.1
24 Correspondence	2.13 ab	1.94 a	2.40 b	2.0
Total information obtained ^d	3.69 ab	3.61 a	4.04 b	

Data from questions IS5.1-5.24. Scale: 1 = very little, 2 = little, 3 = somewhat little, 4 = medium, 5 = somewhat much, 6 = much, 7 = very much. *n* for each item = 262 to 278. Figures in a row followed by the same letter are not significantly different at *p* = 0.05 by Scheffé's test.

Underlined sources are discussed in detail elsewhere in this study.

Weighted for proportions of total specialist population in each group. Sources are listed in rank order of the weighted mean response.

For specialists responding to all 24 items (*n* = 227).

Easily understood and accessible non-personal sources (agricultural press, extension publications, general mass media, and ministry recommendations) ranked between 7th and 12th. Training courses and notes ranked 9th (university courses) and 13th (training at extension institutions), the extension training being less important presumably because of its infrequency.

The respondents said they obtained relatively little information from research sources, both printed and personal. The most-used of such sources, the serials *Warta Litbang* and *Jurnal Litbang*, ranked 14th, followed by AARD technical guides, books, scientific journals, and university textbooks. Personal contacts with researchers also fared badly, with seminars and other formal contacts (workshops, exhibitions, and training at research institutes) ranking 16th, field research projects 19th, contacts with individual researchers 21st, and correspondence with researchers a dismal 24th.

Somewhat surprisingly, commercially published technical guides were rated low (22nd), even though these are relatively widely available locally through bookstores. Perhaps specialists are unable or reluctant to purchase copies. Agribusiness employees were also unimportant as a source.

Comparison among institutions

The overall ranking described above disguises important differences among specialists in the various institutions surveyed. Significant differences among the institutions are denoted by letters following the first three columns of figures in Table 8.1.

In general, AIC specialists got more information than did their provincial and district colleagues from nearly all types of research and extension publications and from most forms of contact with scientists. But they got less information from their own research than did the others. Their two top sources were both publications: AIC publications and the AARD series *Warta Litbang* and *Jurnal Litbang* (Table 8.2).

District specialists' top two sources were field extension agents (by quite a wide

Table 8.2 Top five information sources of respondents at provincial and district offices and Agricultural Information Centers.^a

Source ^b	Province		District		AIC	
	score	rank	score	rank	score	rank
Field extension workers	4.95	2	5.58	1	4.65	6
Extension specialists	5.18	1	4.86	5	5.05	4
Farmers	4.58	5	5.18	2	4.62	7
Superiors	4.85	4	4.89	3	4.95	5
Own experience & observations	4.86	3	4.86	6	4.48	8
Other colleagues	4.56	6	4.87	4	5.10	3
AIC publications	4.00	11	4.23	9	5.21	1
<i>Warta/Jurnal Litbang</i>	3.61	14	3.15	14	5.17	2

Data from questions IS5.1-5.24. *n* for each item = 275 to 278.^b Only those sources ranking in the top 5 of 24 sources for one of the groups are shown. Sources are listed in rank order of the weighted mean response.

margin) and farmers. They receive significantly more information from these sources than do other specialists. They also rely significantly more on their university course work.

Provincial specialists' most important sources were extension specialists and field agents. They also received more information through extension training courses.

The three groups did not differ significantly in the amount of information they receive from the mass media, their superiors and peers, field research projects, textbooks and commercial technical guides, their own experience, or agribusiness employees.

Differences seemed to be heavily influenced by specialists' institutional setting. District specialists are more field-oriented than those at the central institutions, so have more contact with and obtain more information from field agents and farmers. They are also more isolated, often being the only specialist in their subject area in their district, and are rarely able to travel to the provincial capital or local research institution. They must therefore rely on whatever materials are available, such as their university notes.

That field agents and farmers are important sources is encouraging given the need for extension institutions to respond to local conditions. It may indicate that specialists are ready to take advantage of and promote locally developed technologies, or indigenous knowledge. Unfortunately the surveys did not include further questions about the role of extension clients as information sources.

Agricultural Information Center personnel have less contact with the field but greater

access to the extension and scientific literature. All AICs have a library, and many are fairly well stocked, maintained and used. Indeed, the AIC libraries attract users from outside, especially students at local universities seeking information for term papers and theses.

Provincial personnel are often intermediate between the district and AIC specialists. They visit the field less than do district staff, but have less easy access to agricultural publications since many of their institutions have no library. On the other hand, they work with and meet other extension specialists frequently, and probably travel more widely, if less frequently, than do district specialists.

Notwithstanding the differences noted above, there was remarkable agreement among the specialists as to which were major sources and which were not. Interpersonal, easily accessed sources ranked high, while research sources and those associated with the private sector scored low. The mass media, extension publications and training were intermediate. The challenge for AARD and the extension agencies is to raise the flow of research-based information--through whatever channels--to supply the needs of extension personnel at all types of institution.

Total information flows

We can use the sum of scores on all 24 items in question IS5 (shown as "Total information obtained" in Table 8.1) to indicate the total amount of information a respondent obtains. On this crude measure, Agricultural Information Center specialists received significantly more information than their colleagues at district offices, and somewhat (but not significantly) more than those at the provincial level.

I used one-way analysis of variance and simple regressions to test whether the total amount of information obtained was affected by any other criteria. The following characteristics (based on the respondents' address or the Information Sources questionnaire) were tested: Inner vs. Outer Island location, development stage of province, respondent's specialization (question IS2.2), education (2.3), number of years as an extension specialist (2.4), sex (2.5), rural background (2.6 and 2.7), engagement in outside work (2.8), wealth (2.9), hours spent seeking information (3.1), and time spent solving field problems (4.1).

Of these characteristics, only wealth was significantly related to the total amount of information obtained ($F = 7.18^{**}$). The reasons for this are not clear: province specialists were significantly wealthier than their district counterparts (Chapter 7), but did not obtain significantly more information (Table 8.1). AIC specialists obtained the most information, but were not significantly wealthier than their district colleagues.

Hypothesis 1 proposes that food crops specialists will obtain a larger total amount of information than their livestock counterparts. This was not the case, as shown by the lack of a significant effect of specialization (question IS2.2) on either total information flow (the sum of responses to questions IS5.1 to 5.24) or flow from AARD publications (IS5.5 to 5.7 and 5.9).

This may be because of the lack of a direct comparison in the questionnaires

between food crops and livestock. Because each specialist responded to questions about his or her own topic, he or she had no outside referent with which to make comparisons. Thus a livestock specialist might have answered "Very much" to an item in question IS5 ("How much information do you obtain from [source]?"), whereas a food crops specialist, faced with a larger total amount of information, might have compared the source in question with the larger total and answered only "Somewhat much." Measures of the amount of information flow may thus be consistent within a respondent, but less so among respondents. This would tend to reduce any difference between food crops and livestock respondents.

A second reason for this finding may be that the amount of information available on food crops and livestock does not in fact differ a great deal. AARD's six food crops institutes have considerably more research staff than do the two livestock institutes (Figure 4.1) and the output of research publications reflects this, but the numbers of extension publications are not greatly different: 1164 food crops items in the period 1984-90, compared to 830 for livestock (Table 3.3). The lack of difference appears to be a result of a deliberate attempt by provincial authorities to maintain a balance among the various commodity groupings in terms of media materials the AICs produce.

Desirability of sources

Respondents were asked to name the five sources or channels from the list of 24 that they would most like to use under ideal conditions. One point was given to a source if it appeared as one of a respondent's five choices. Giving choices different weights (5 points for a respondent's first choice, 4 for the second, and so on) yielded essentially the same ranking as the simpler method.

Table 8.3 Number of respondents naming sources among their five preferred information sources, by respondents' institutional affiliation^a.

Source	Province		District		AIC		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	% ^b
Warta/Jurnal Litbang	37	55.2	81	55.6	33	54.1	151	55.4
Dir Gen recommendations	43	64.2	64	44.0	31	50.8	138	50.4
AARD books	33	49.3	71	48.8	33	54.1	137	49.5
AARD technical guides	31	46.3	68	46.7	• ^c 43	70.5	142	49.1
AIC publications	25	37.3	55	37.8	18	29.5	98	36.8
Training	17	25.4	62	42.6	* ^d 15	24.6	94	35.8
Scientific journals	23	34.3	40	27.5	13	21.3	76	28.7
Seminars at res. insts.	16	23.9	39	26.8	21	34.4	76	26.8
Ag newspapers/magazines	18	26.9	36	24.7	16	26.2	70	25.5
Own testing & research	13	19.4	30	20.6	10	16.4	53	19.8
Field research projects	8	11.9	28	19.2	12	19.7	48	17.2
Farmers	11	16.4	23	15.8	14	23.0	48	16.7
Own experience/observ.	8	11.9	19	13.0	10	16.4	37	13.1
Researchers	11	16.4	14	9.6	9	14.8	34	12.1
Extension specialists	9	13.4	17	11.7	5	8.2	31	11.8
University textbooks	8	11.9	17	11.7	2	3.3	27	10.9
Field extension workers	5	7.5	14	9.6	2	3.3	21	8.3
Other mass media	5	7.5	9	6.2	6	9.8	20	6.9
Agribusinesses	3	4.5	10	6.9	1	1.6	14	5.6
Private tech. guides	3	4.5	6	4.1	7	11.5	16	5.0
Correspondence	3	4.5	7	4.8	1	1.6	11	4.4
Superiors	1	1.5	9	6.2	• ^c 0	0	10	4.2
Other colleagues	2	3.0	6	4.1	3	4.9	11	3.9
Univ. courses/notes	2	3.0	3	2.1	0	0	5	2.1
Total respondents^f	67		145.6		61		273.6	

Data from question IS6. Sources are ordered according to their weighted means of desirability (final column). "Other sources" (named by 6 respondents) are ignored.

Weighted for proportions of total specialist population in each institution.

Chi square = 5.23 (significant at $p = 0.10$). Chi squares calculated using the proportion of respondents in each group of the total (e.g., 67/273.6 for provincial specialists) multiplied by the total respondents naming that source (e.g., 151 for *Warta/Jurnal Litbang*) as the expected value.

Chi square = 6.13 (significant at $p = 0.05$).

Chi square = 5.63 (significant at $p = 0.10$).

Number of specialists responding to questions. Calculated as the sum of the preceding column divided by 5 (because respondents named 5 sources). Some figures are non-integers because some respondents named less than five desired sources.

The last column of Table 8.3 shows the percentage of respondents (weighted according to their relative numbers in the general population of SMSs) who listed each source as one of the five they desired most. The most desired source was AARD's quarterly newsletter and semi- technical journal, *Warta Litbang* and *Jurnal Litbang*. These were named as the most desired source by 56 specialists (20% of respondents), and among the top five by 151 (55%). The AARD serials were followed by other technical publications: Directorate General recommendations, AARD books, and AARD technical guides were all among the top five most desired sources of about half the respondents. Two other types of publications (AIC publications and scientific journals) were named by fewer respondents but also ranked high (5th and 7th).

All these sources share several features. They are obviously all publications, so can be stored and accessed at will and without disturbing another person. They also are likely to be invested with high credibility -- they are produced by government sources and contain official recommendations, or represent careful scientific research. This suggests that under ideal conditions (i.e., if publications are available at each extension office), credibility and ease of reference may be key in determining which sources are used.

The remaining non-mass media publication types were less popular: university textbooks were mentioned by about 10% of respondents, and commercially published guides by only 5%. This is possibly because of the cost and non-official nature of these two publications.

Specialists also favored training at extension institutions, making this the highest ranked non-publication source (6th overall). But this seemed to apply to training in the future rather than courses they had attended at university, which ranked last in desirability. They preferred the agricultural press (9th overall) over other mass media (18th).

Research, and direct contact with researchers, scored in the middle range of desirability as sources. Seminars and other meetings was 8th in terms of desirability, field research projects 11th, and personal contacts with researchers 14th. Specialists appeared reluctant to rely on correspondence, though, which ranked 21st. The wish to rely on research included the specialists' own testing and research (ranking 10th), and possibly the specialists' own observations and experience (13th).

Personal contacts scored low on desirability. The most desired personal contacts were farmers, ranking 12th in terms of desirability. These were listed by only 17% of respondents among their five most desired sources. Other extension specialists ranked 15th overall, followed by field agents at 17th. Agribusiness employees and projects ranked 19th. Superiors and other colleagues weighed in near the bottom.

Comparison among institutions

Specialists at the three types of institutions had remarkably similar lists of desired sources (six leftmost columns of figures in Table 8.3). This can be seen from the similar percentages of respondents in each group that named a particular source as desirable. The three groups had nine of the ten most desired sources in common, with minor differences in the rankings among sources.

Only three sources deviated significantly (or nearly so) from the common ordering. These were training, AARD technical guides, and superiors. Two-fifths of district specialists named training as a desired source, compared to only about one-quarter of provincial and AIC respondents. District specialists indeed received fewer training opportunities than AIC personnel, though not fewer than provincial specialists (see Table 7.14).

Agricultural Information Center specialists' most desired source by a wide margin was AARD technical guides. This source was named as one of the five most desired sources by over 70% of AIC respondents, but by less than half of the specialists in the other two groups.

Superiors were named as desirable sources by rather more district specialists and fewer AIC staff than might be expected, but the very small numbers involved induce us to disregard this result.

Various other sources appeared to attract different groups. For instance, nearly two-thirds of provincial specialists named Directorate-General recommendations among their desired sources, while half or less of the other specialists did so. But chi-square tests revealed that this and other differences did not attain statistical significance.

Relation between information flow and source desirability

One might expect specialists to tend to use those sources that they see as most desirable -- those that they would use in ideal conditions. That this was not the case can be seen from Table 8.4, which lists the sources according to the difference in their ranks on information flow and desirability (final columns of Table 8.1 and Table 8.3). Information flow (as represented by its weighted mean) is correlated with neither desirability ($r = -0.11^{ns}$) nor its natural logarithm ($r = -0.07^{ns}$). Of the 11 most desired sources, only two ranked among the top ten actual sources.

Table 8.4 Comparison of desirability of 24 sources and actual information flows to respondents from those sources^a.

Source	Desirability		Info flow		Difference ^d
	Weighted mean ^b	Rank	Weighted mean ^c	Rank	
AARD books	49.5	3	3.1	17	+14
<i>Warta/Jurnal Litbang</i>	55.4	1	3.5	14	+13
AARD technical guides	49.1	4	3.3	15	+11
Scientific journals	28.7	7	3.1	18	+11
Dir Gen recommendations	50.4	2	3.7	12	+10
Seminars at res. insts.	26.8	8	3.1	16	+8
Field research projects	17.2	11	3.0	19	+8
Training	35.8	6	3.7	13	+7
Researchers	12.1	14	2.9	21	+7
University textbooks	10.9	16	2.9	20	+4
Agribusinesses	5.6	19	2.1	23	+4
AIC publications	36.8	5	4.3	8	+3
Correspondence	4.4	21	2.0	24	+3
Private tech guides	5.0	20	2.4	22	+2
Own testing & research	19.8	10	3.8	11	+1
Ag newspapers/magazines	25.5	9	4.5	7	-2
Own experience & observ	13.1	13	4.8	5	-8
Other mass media	6.9	18	4.2	10	-8
Farmers	16.7	12	5.0	3	-9
Extension specialists	11.8	15	5.0	2	-13
Univ courses/notes	2.1	24	4.2	9	-15
Field extension workers	8.3	17	5.3	1	-16
Other colleagues	3.9	23	4.8	6	-17
Superiors	4.2	22	4.9	4	-18

Data from questions IS5 and 6. $n = 276$. "Other sources" (named by 6 respondents) are ignored.^b

Percent of population of all specialists, estimated by weighting the scores of provincial, district and AIC respondents by their proportions in the total population.^c Weighted mean information flow score for all specialists, estimated in the same way as in footnote 2.^d A positive score indicates respondents wish to receive relatively more information from that source. A negative score denotes the opposite.

The final column in Table 8.4 gives the difference in ranks between desirability and actual information flow scores. As we are using ranks, all figures are relative: a negative score does not necessarily mean that respondents wish to get less *total* information from that source, but merely *relatively* less than from other sources.

Sources in the top one-third of the table ("AARD books" to "Training") are ranked high in terms of desirability and low in actual flows. The reverse is true of the final eight sources ("Own experience" to "Superiors"). Sources listed in the middle of the table are of two types: those high in both desirability and actual flows (e.g., "AIC publications" and "Agricultural newspapers and magazines"), and those scoring low on both counts (e.g., "University textbooks," "Agribusinesses," "Correspondence," and "Private technical guides").

Table 8.4 reflects a remarkably clear distinction among types of sources in terms of desirability and actual information flows. Publications were much more desired as sources than their low scores for information flow might suggest. The five sources with highest differences between actual and desired flows were all technical publications. Indeed, all technical publications, including university textbooks and commercial guides, ranked higher on desired than on actual information flows. The only publications with lower desired than actual flows were mass media, both agricultural and general.

Research and contacts with researchers were somewhat more desired as sources than we might expect from their information flow scores. For instance, seminars and other meetings were 8th in terms of desirability but 16th in information flow (difference in ranks of +8). This was mirrored by field research projects (difference also of +8), direct contacts with researchers (+7) and even correspondence (+3).

Respondents also appeared to want more training at extension institutions (difference score of +7) than they at present receive. But they wanted to rely less on their university course work (difference of -15). We can speculate on the reasons for this: it may indicate that their course work did not prepare them adequately for their extension work, or that they hoped for improved opportunities to obtain information in the future rather than depending on past course work.

Respondents wished to rely relatively less than at present on their own experience and observations (5th in information flow, compared to 13th in desirability, a difference of -8). They also seemed to set little store by research they conduct themselves (score of only +1), despite the very limited amount of research most specialists currently engage in. Perhaps this is because of a lack of familiarity with or skills in research, or a realistic view of funding limitations for it.

The general mass media at present seem to be rather more important information sources than many respondents would like (difference score of -8). They currently used the specialist agricultural press about as much as they would wish (difference score of -2). They still saw the agricultural press as a desirable source, though, as reflected by its rank of 9th in desirability scores.

With the exception of contacts with researchers, personal contacts were much less desirable than we might expect from their actual roles. The top four information sources

(field agents, other extension specialists, farmers and superiors) ranked 17th, 15th, 12th and 22nd in terms of desirability. Five personal sources, including these, were among the bottom six sources in terms of difference scores.

Discussion

The data suggest that the same channels could be used to reach specialists at all three institutions. Specialists currently rely primarily on personal contacts for information but obviously would prefer to use technical publications -- though they seldom do so at present.

Research is prominent among their preferred sources. Other channels they would like to use more include seminars and other meetings with scientists, and training at both research and extension institutes. They also like to use the specialist agricultural press.

Some of the differences between the desirability of sources and the actual amount of information obtained from them, as shown in Table 8.4, are consistent with the strength-of-weak-ties theory (Granovetter 1973, Rogers 1983). This predicts that the highest quality (and therefore most desirable) sources are often those with which we have limited contact. Thus, research sources ranked low on information flow because they are published infrequently, and SMSs seldom came into contact with them (Table 7.14). However, they ranked high on desirability. Workmates such as colleagues and superiors were the reverse. They are located close to SMSs and come into frequent contact with them, so ranked high on information flow, but low in terms of desirability as sources.

The strength-of-weak-ties has been explained as being due to *homophily/heterophily* and *communication proximity* (Rogers 1989:296). I already know what my close friend knows because we are homophilous -- we are alike, so we tend to know the same things and exchange information frequently. We also know the same people and have the same set of sources -- in other words, we have high communication proximity, as defined as the degree to which two individuals have overlapping personal communication networks. On the other hand, I may gain valuable information from a slight acquaintance because we are heterophilous, have low communication proximity, and exchange information seldom.

The concept of homophily cannot be applied to non-personal sources. For instance, a newspaper is not analogous to my friend, even though I see both every day. But the concept of communication proximity still applies: the newspaper draws on a wide range of sources -- sources my friend and I do not have. It therefore has the potential to provide me with new information every day.

Frequent contact does not necessarily imply low desirability. For instance, if you were to ask me where I would most like to obtain news, I would answer "the newspaper." Thus, some sources both supply large amounts of information and are desirable. In Table 8.4 such sources are represented by AIC publications (5th on desirability and 8th on information flow) and agricultural newspapers and magazines (9th and 7th).

On the other hand, infrequent contact need not imply high desirability. SMSs correspond with researchers rarely (Table 7.14) and get little information from

Table 8.5 Frequency respondents read selected agricultural publications, and ratings for publication usefulness.^a

Publication type	Mean frequency read ^b	Rank	Mean usefulness ^c	Rank
<i>Sinar Tani</i> (biweekly agricultural newspaper)	4.16	1	4.91	7
<i>Liptan</i> (AIC fact sheets)	3.01	2	5.42	6
AIC booklets	2.96	3	5.48	5
<i>Buletin Informasi Pertanian</i> (AIC magazine)	2.66	4	5.55	4
<i>Warta Litbang</i> (AARD newsletter)	2.19	5	5.77	3
AARD books	2.06	6	5.91	1
AARD scientific journals	2.04	7	5.87	2

Data from questions P5 and 6, Publications questionnaire. $n = 160-164$.

Scale: 1 = not once, 2 = once in 3 months; 3 = once a month; 4 = once a week; 5 = every 3 days; 6 = every day

Scale: 1 = not useful, 3 = somewhat useful, 5 = rather useful, 7 = very useful

agribusinesses or privately published technical guides. And they indicated little willingness to use these sources (Table 8.4).

Actual information flow from a source and that source's desirability appear to be affected by different things. Information flow is at least in part dependent on proximity and the frequency of contact (this is discussed further below and in the next chapter). The desirability of a source, on the other hand, is not dependent on these characteristics, but would seem more likely to be affected by such factors as the source's relevance, ease of use, and credibility.

Publication readership and usefulness

Readership

Questions P5 and P6 asked respondents how often they read several agricultural publications, and how useful they found these same publications. Table 8.5 summarizes responses to these questions.

The most frequently read source by a wide margin was the agricultural newspaper *Sinar Tani*. Some 79% of respondents indicated that they read the newspaper at least once a week. Only seven (4%) read it less than once a month.

AIC publications ranked second, third and fourth in terms of frequency read, both averaging about once a month. Thirty-one percent of respondents read a copy of *Liptan* at least once a week, 28% read an AIC booklet, and 18% read the AIC magazine *Buletin Informasi Pertanian*. Percentages reading these publications less than once a month ranged from about 40% for *Liptans* and AIC booklets to 54% for *Buletin Informasi Pertanian*.

Readership of AARD publications was less frequent. Ten percent read the AARD newsletter *Warta Litbang* at least once a week. Eight percent read a scientific journal at least once a week, and seven percent an AARD book -- even though AARD mailing lists indicate most are not sent these publications. (This may be because of the "halo effect" -- over-reporting of a desirable activity.) About 70% read all three publication types less than once a month.

This ranking is at least in part due to the frequency the various publications are issued. *Sinar Tani* appears twice a week, while most of the AIC and AARD publications appear irregularly at longer intervals. Nevertheless, increasing the frequency of readership is a challenge facing AIC and AARD publication managers alike.

Usefulness

Respondents' opinions of the usefulness of the various publication types stand in marked contrast to the frequency they read them (Table 8.5). The relationship is almost perfectly inverse: the more frequently a publication is read, the less useful SMSs think it is. AARD publications were thus seen as the most useful, and *Sinar Tani* as the least useful, publication type. This echoes the findings in Table 8.4.

This inverse relationship provides two opportunities for increasing information flows from research to extension. First, the research content of *Sinar Tani* could be increased. Since the majority of SMSs read the newspaper frequently, they would be exposed to any research-based information in it.

Various models could be used:

- A regular column containing research information, possibly rotated among the various commodities or subsectors.
- Articles contributed by AARD scientists or communication personnel.
- Inserts for readers to remove and save, for instance integrated pest management techniques, the characteristics of newly released crop varieties, or a list of research sites and information sources.

Sinar Tani has direct links with the Ministry of Agriculture, and ministry and AARD

communication personnel sit on the paper's editorial board. Adapting the newspaper's content to carry more research findings should thus not prove difficult. All the suggestions above could also be implemented with other newspapers, especially those in the "Newspapers Enter the Village" (*Koran Masuk Desa*) program. Studies of the readership of these newspapers would be necessary in order to target audiences effectively.

Second, Table 8.5 indicates that SMSs regard AARD publications highly and would read them if they had access to them. The frequency and print runs of AARD publications should therefore be increased, and publications should be sent directly to SMSs at both provincial and district levels. This could also be done at relatively little expense and with some coordination -- for instance in the provision of updated, computerized mailing lists.

Information diffusion rates

Question P7 asked food crops SMSs whether they had obtained information on six specific food crops technologies recently developed by AARD, and if so, where they had obtained *most* information on those technologies. Question P8 posed an equivalent set of questions relating to livestock. Table 8.6 and Table 8.7 present the results of these two sets of questions. Some respondents indicated more than one main source per item; such multiple responses are reflected in the tables.

Table 8.6 Percentages of respondents specializing in food crops who obtained most information from various sources.^a

Topic	Year ^b	Main source					Total ^d
		AAR D publ	AIC publ	Mass media	Coll- eagues	Other ^c	
Stemborer enemies	- ^e	29	18	18	18	21	79
Ash in soybean storage	'89	21	16	15	13	20	71
<i>Sesbania</i> green manure	'89	20	9	27	10	13	67
P dosage on rice	'89	27	5	9	16	14	64
Rama maize variety	'89	12	4	8	4	4	31
Barumun rice variety	'91	10	3	7	5	3	26
Mean	'89	20	9	14	11	13	56

Data from question P7. $n = 99-100$.

Approximate year technology was first reported by AARD.

Includes "training," "other," and "don't know."

Received from at least one source. Rows sum to more than "total" value because of multiple responses.

Data unavailable.

Knowledge of technologies

The percentages of respondents who claimed to have received information about each of the technologies ranged from 95% for conical nests and the use of *Glyricidia* as small ruminant feed, to 26% for the newly released rice variety Barumun (last columns in Table 8.6 and Table 8.7).

A greater proportion of livestock specialists knew of the livestock technologies than did food crops SMSs for innovations in their field. This was merely because the livestock technologies were generally older (mean of 6 years) than were those relating to food crops

Table 8.7 Percentages of respondents specializing in livestock who obtained most information from various sources.^a

Topic	Year ^b	Main source					Total ^d
		AARD publ	AIC publ	Mass media	Coll- eagues	Other ^c	
Conical nests	'85	28	30	18	10	24	95
<i>Glyricidia</i> as feed	'81	38	48	20	3	10	95
Ducks without ponds	'81	20	30	25	8	21	83
Urea molas- ses block	'88	31	15	15	21	23	82
Newcastle vaccine	'88	20	10	43	8	16	80
Prolific sheep	'90	13	5	13	8	16	48
Mean	'85	25	23	22	9	17	80
Overall mean ^e		21	13	16	11	14	63
Mean items per respondent ^{ef}		1.27	0.75	1.00	0.65	0.86	3.80

Data from question P8. $n = 39-40$.

Approximate year technology was first reported by AARD.

Includes "training," "other," and "don't know."

Received from at least one source. Rows sum to more than the "total" value because of multiple responses.

Combined from food crops (Table 8.6) and livestock personnel (this table).

Mean number of items that respondent had obtained information on. Maximum possible score = 6.

(mean of 2 years). The greater length of time allowed information about the older technologies to have spread to more specialists than had the more recent innovations (see below).

Sources of information

AARD publications with few exceptions provided the most information on each technology. These publications were the major source for between one-quarter and two-fifths of respondents who had heard of an innovation. Overall, they were the main source for one-third of respondents who had obtained information on the twelve technologies (21 of 63%, second-from-last line in Table 8.7).

The mass media were the second most named source overall, though not consistently so. They were the main information source on the Newcastle disease vaccine for more than half of the respondents who had heard of this innovation, but were the most important source for only one in seven respondents for phosphorus fertilization of rice.

AIC publications were the main source for about one-fifth of respondents who had heard of the innovations. They were the main information supplier for the *Glyricidia*, conical nests, and ducks-without-ponds technologies, but were relatively unimportant for several other topics. The reasons for this are discussed below.

Colleagues were relatively unimportant overall as a source. They were the main source for about one in six respondents who had heard of an innovation, and accounted for the most respondents for none of the twelve topics.

About one in five respondents who had heard of the new technology had obtained most information through "other" sources. Slightly less than one-half of these named training courses as their prime source. About the same number named other sources (e.g., seminars). A small proportion indicated they did not know where they had obtained most information.

At first glance, the percentage of specialists obtaining information through official sources (AARD and AIC publications, training and seminars) appears low. But questions P7 and P8 asked respondents to mark only their *main* source of information. Table 8.6 and Table 8.7 thus do not indicate how many obtained information from sources other than their main one.

Number of topics

The last line in Table 8.7 shows the mean numbers of topics respondents had obtained information on. Respondents had heard of a mean of 3.8 of the six technologies in their commodity area. Of these, AARD publications were the most important sources for a mean of 1.27 items, the mass media for one item, and the other source types for less than one item each.

Diffusion rates

Figure 8.1 regresses the percentage of respondents who had obtained information on the technologies listed in questions P7 and P8 against the number of years those

technologies had been released by AARD. This figure reveals several interesting features of the spread of AARD innovations.

First, the curves shown in the figure conform remarkably well to the expected shape: the upper part of an ogive. This shape is typical of innovation or information diffusion: the curve is relatively steep at first, but eventually plateaus out at a ceiling level (for this reason a logarithmic regression was selected). It is encouraging to note that the ceiling level for agricultural technologies in Indonesia approaches 100% of the SMS population -- in other words, eventually, all SMSs in relevant subject areas will obtain information about AARD technologies.

Second, and disturbingly, the figure reveals the slow rate of information spread among the SMS population. It takes about two years after a technology is released for half of the SMSs to hear about it (dashed line), and a total of six years before 80% of the SMSs have obtained the information (dotted line).

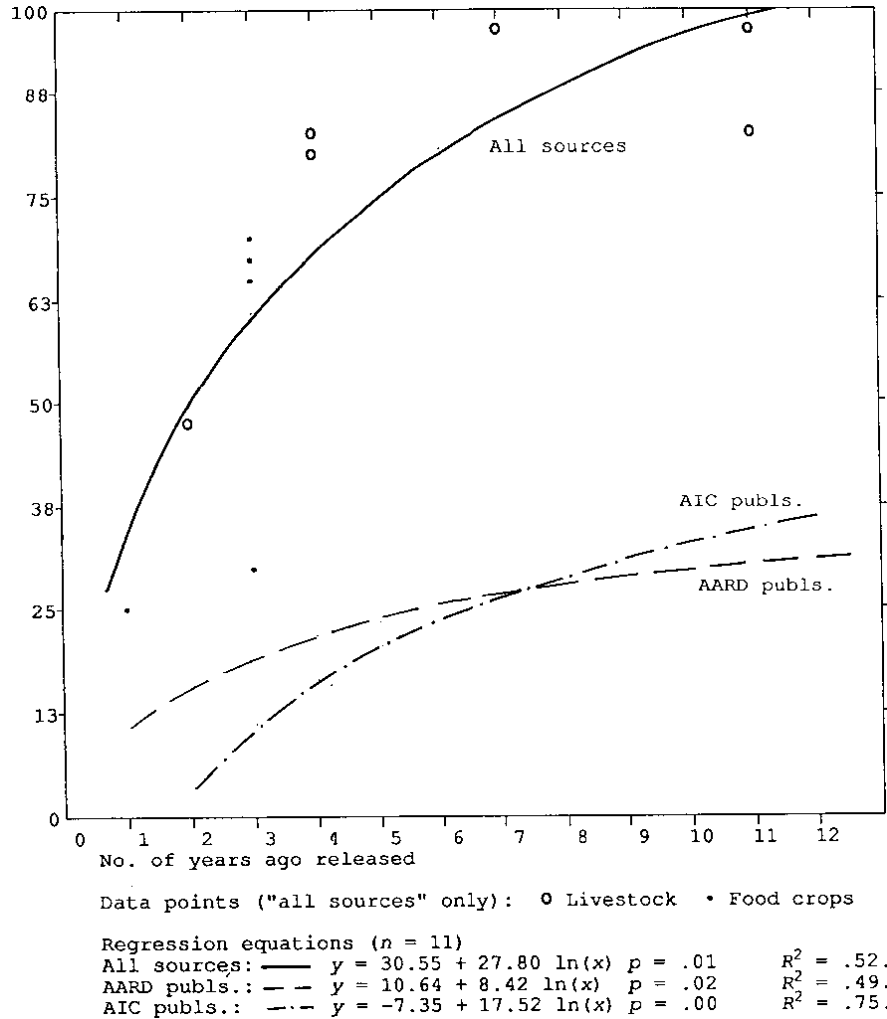
Third, AARD publications are the major source of information on AARD technologies until about eight years after the technology is released, when AIC publications take over. It is impossible to draw a meaningful trend line for the other sources as their regressions were not significant; however, they were less important overall than AARD publications but more important than AIC publications.

The relationship between the AARD and AIC lines reflects two things. It takes time for AARD technologies to become incorporated in AIC publications -- hence the lower height of this curve in the first few years. But once AIC publications begin to carry the technology, their wider availability means they grow more rapidly in importance than do AARD publications.

Possible data shortcomings

The data in Table 8.6, Table 8.7 and Figure 8.1 suffer from several shortcomings that mean the results presented above should be treated as a coarse approximation.

- Figure 8.1 is based on a small number of technologies only (11). A larger n might reveal different results.
- Some of the technologies (e.g., the new crop varieties) passed through the centralized recommendation procedure at the relevant directorate-general (Figure 4.2). I do not know about the others. A comparison of technologies that undergo the recommendation process and those that are disseminated horizontally might reveal different patterns.



Curves for other sources (mass media, colleagues, and others) were lower than for AARD publications and not significant.

Percentages based on responses from 140 respondents (100 food crops and 40 livestock SMSs).

Figure 8.1 Percentage of respondents obtaining information on selected technologies, by year^a.

- Because of space limitations, the questions used to measure information on the twelve technologies were crude. For instance, they did not seek to measure flows from any sources other than the major one.
- The release dates vary in accuracy. For some of the technologies -- such as crop varieties -- the date can be determined with some precision. For others, it is only approximate. For instance, some research findings are published as scientific articles well before they are officially accepted as a technology recommendation. Others, such as the use of conical bamboo nests for chickens, are derived from indigenous technologies, so SMSs in some areas may have heard of them well before the release date.
- The technologies chosen may not be directly comparable. The figure assumes that information on a minor technology such as chicken nest types is equivalent to that on a major breakthrough such as an oral vaccine or new crop variety.
- Because the livestock technologies were generally older than the food crops, there may be confounding between the commodity grouping and the year of release.

Discussion

Nevertheless, the picture painted by the responses to questions P7 and P8 is remarkably clear. Information on AARD technologies spreads among SMSs through multiple channels, with AARD publications being the most important of these. And while information does eventually reach nearly all the SMS population, it does so slowly.

AARD publications were most often named as a source for these technologies, yet were given low information flow scores in the Information Sources questionnaire (question IS5, Table 8.1). This seems to be because of a difference in question wording. Questions P7 and P8 ask respondents to identify a single main source for AARD-derived technologies. Questions IS5 and IS7 focus on total flows of information about *all topics* useful for extension purposes -- a much broader concept.

The data thus indicate that AARD publications are important sources of information about AARD technologies (the "strength-of-weak-ties" phenomenon), but that these technologies form a minor part of all information useful in extension.

The responses to questions P7 and P8 also reflect the slow overall flow of information from research to extension about AARD technologies. After an item of information reaches the SMSs, it must pass through at least three other hands before it can be widely known by rural people: field agents, contact farmers, and follower farmers (Figure 3.2). And this is still only *awareness*; it presumably takes longer still before a sizable number of farmers will *adopt* a technology.

Compared to farmers and the general public, SMSs are an unusually easy audience to reach: their work addresses and names are known, their numbers are limited, and it their official *duty* to obtain information from research.

The time taken for information on a technology to spread could be shortened dramatically by using the mass media (especially *Sinar Tani*) and the AARD newsletter *Warta Litbang* to carry more research findings, and by increasing print runs and mailing publications directly to SMSs instead of relying on the extension hierarchy to transmit messages.

AARD publications are relatively important conduits for information about AARD technologies. This is despite their relative inaccessibility for most SMSs. Direct mailings to SMSs would improve their importance further.

Notwithstanding the importance of AARD publications, a variety of other channels are useful for carrying research information. One channel may be useful for some technologies, but not for others. In such circumstances, a multiple-channel approach would seem advisable, with AARD institutes using all available methods to communicate messages to their audiences.

Information needs

The final question in the Publications questionnaire (P9) listed 62 agricultural and socio-economic topics and asked respondents to indicate the five they most needed information on. Despite these instructions, so many respondents marked more than five that I included all responses in the analysis.

The 62 topics were grouped into three categories: food crops, livestock, and "others" (some of which were possibly relevant to both food crops and livestock SMSs). The analysis below treats the food crops and livestock topics separately, since direct comparisons between them would merely reflect the larger numbers of food crops specialists in the sample. For food crops topics, responses from food crops SMSs only are therefore considered; likewise for livestock topics. For other topics, I consider all SMSs: food crops, livestock, and the small number (13) who fell into neither category.

Table 8.8 Percentages of respondents who needed information on food crops-related topics.^a

Crop type	Culti- vation	Seed & varieties	Pests & diseases	Post- harvest	Mean
Rice	14	55	35	36	35
Maize, sorghum, wheat	25	38	39	46	37
Roots & tubers	31	49	39	52	43
Legumes	24	49	53	51	44
Vegetables	37	50	55	60	51
Fruits	49	47	49	62	52
Mean	30	48	45	51	
Estate and industrial crops	30				
Machinery and equipment	40				
Irrigation	43				
Overall	43				

Food crops specialists only ($n = 108$). Numbers are the percentages of food crops respondents who checked the corresponding boxes in question P9.

Table 8.8, Table 8.9 and Table 8.10 present the percentages of respondents who felt they needed information on each topic.

The most needed food-crops related topic was post-harvest handling of fruits: nearly two-thirds of food-crops respondents indicated they needed information on this topic (Table 8.8). Post-harvest handling of vegetables, root crops and legumes also scored high, as did seed and variety questions for rice and vegetables, and pest and disease problems on legumes and vegetables.

The least needed topics were all in the area of cultivation: rice (named by only 14% of respondents), other cereals, legumes, and root crops. Relatively few respondents stated they needed information about estate and industrial crops; this is hardly surprising given the food crops emphasis of most of these SMSs.

Overall, respondents indicated they most needed information on post-harvest handling (on average named by 51% of respondents) and on fruits and vegetables. They

Table 8.9 Percentages of respondents who needed information on livestock-related topics.^a

Livestock type	Manage-ment	Repro-duction/ breeding	Feed	Health	Mean
Dairy cattle	45	45	58	39	47
Beef cattle, buffaloes	37	74	63	47	55
Goats, sheep	34	61	66	47	52
Improved chickens	24	47	45	45	40
Local chickens	32	58	66	42	50
Ducks	50	47	61	45	51
Mean	37	55	60	44	
Fodder plants	74				
Milk handling	63				
Livestock post- harvest	95				
Overall	52				

Livestock specialists only ($n = 38$). Numbers are the percentages of food crops respondents who checked the corresponding boxes in question P9.

needed least information about cultivation and about rice and other cereals.

Among livestock specialists, the most desired individual topic was post-harvest handling of animals (slaughtering, meat handling and processing, hide tanning, etc.) (Table

Table 8.10 Percentages of respondents who needed information on other topics.^a

Topic	Percent	Topic	Percent
Fisheries	16	Economics	43
Marketing	54	Farm systems analysis	67
Extension	50	Rural sociology	50
Regional planning	76	Other	18

All specialists ($n = 159$). Numbers are the percentages of all respondents who checked the corresponding boxes in question P9.

8.9). Almost all (95%) livestock specialists indicated they wanted information on this subject. Other popular topics were fodder crops (wanted by 74%), breeding of beef cattle and small ruminants, feed for several different species, and milk handling.

The least popular livestock topics were management of improved chickens (needed by only one-quarter of respondents), and management of other species.

Overall, respondents wanted most information about feedstuffs and about beef cattle and buffaloes (though there was very little overall difference among the various livestock species). They needed least information about management and about improved chickens.

Among general topics, the most needed were regional planning (named by three-quarters of all respondents) and farm systems analysis (named by two-thirds) (Table 8.10). Marketing and rural sociology also scored high. Fisheries scored low, except among SMSs who specialized in this topic (most fisheries and estate crops specialists had been deliberately excluded from the sample).

Livestock topics seemed to be in greater demand from livestock specialists than food crops topics were from SMSs in this commodity grouping. This is reflected in the generally higher scores in Table 8.9 than in Table 8.8. Overall, a mean of 52% of livestock SMSs indicated they needed information on a livestock topic, while only 43% of food crops specialists stated they desired information on a topic in their field. This may indicate a greater demand (or a smaller supply) of information on livestock than on food crops; or it might merely reflect a greater degree of specialization among food crops extensionists and hence their individual need for information on fewer topics. It is not possible from these data to distinguish between these two possibilities.

Some livestock SMSs indicated they also needed information on food crops, as did some food crops specialists for livestock topics. Presumably this is because a livestock SMS may occasionally be called on to answer questions related to other commodities: some interviewees said they faced such situations, while others denied doing so. However, the numbers of respondents indicating such needs were small, so they have been excluded from the analysis above.