

## CHAPTER 9

### FACTORS INFLUENCING INFORMATION FLOW

#### Introduction

What causes an extension specialist to use one source of information rather than another? This chapter examines influences on the amount of information specialists obtain from four sources: AIC publications, the agricultural press, AARD publications, and other specialists. Eight characteristics of the relationship between source and receiver (the FP SCORES variables) were hypothesized to affect such information flows: Familiarity, Proximity, Structure, Capacity, Openness, Reward, Energy and Synergy. Because the survey asked specialists at three institutions about four different sources, it is necessary also to investigate how source type and institution affected Information Flow and the FP SCORES variables, and to control for these when studying influences on Information Flow.

This chapter begins by describing the construction of the indices representing Information Flow and the FP SCORES variables. It then focuses on each index in turn, starting with Information Flow. For each index, I detail the index construction and differences in index values among the four source types (AIC publications, the agricultural press, AARD publications, and other specialists) and across respondents in the three institutions (province and district offices and Agricultural Information Centers). For the FP SCORES variables, I then discuss how the variable is related to Information Flow, examining the overall relationship as well as the differences among source types and institutions.

This chapter looks at each variable in turn. The next chapter examines how the FP SCORES relate to each other and, as a group, to Information Flow.

#### Index construction

Questions IS5 and 7.1 to 8.15 aimed to measure Information Flow and the FP SCORES variables thought to influence it. The *a priori* indices contained between one and three items (five for Information Flow) intended to tap each variable. Five criteria for index construction (face validity, correlations with other items in the index, item-total correlation, Cronbach's  $\alpha$ , and factor loadings) were used to determine which items to include in the indices. The Information Flow index was relatively simple to construct; the FP SCORES indices proved somewhat less straightforward. This was because of the lack of a standard set of questions to measure these concepts and the small number of items (due to space limitations) used to measure each one, and occurred despite the screening of questions in the pretest.

### Face validity

The *a priori* indices were constructed on the basis of face validity. However, preliminary analysis of the responses exposed the weak face validity of several items, especially in the Reward and Synergy indices (see the sections on these indices below). And in the case of Reward there appears to be strong face validity but poor actual correlation among items in the same *a priori* index.

**Table 9.1** Correlations among variables in the FP SCORES indices<sup>a</sup>.

Question	Know info type no.	Know well 8.11	8.14	Loca- tion 7.5	Easy to find 8.2	Dis- tance Map	Job to get 8.13	Cred- ible 8.4	Com- plete 8.10
Know info type <sup>b</sup>	8.11	1.00		Familiarity					
Know well	8.14	.25	1.00						
Location <sup>c</sup>	7.5	.10	.14	1.00			Proximity		
Easy to find <sup>c</sup>	8.2	.08	.28	.31	1.00				
Distance <sup>c</sup>	Map	-.01	.11	.24	.35	1.00	Structure		
Job to get	8.13	.10	.23	.01	-.11	-.09	1.00	Capacity	
Credible	8.4	.15	.13	-.10	-.19	-.18	.42	1.00	
Complete	8.10	.24	.04	-.06	-.18	-.13	.29	.48	1.00
Easy to use	8.5	.14	.12	.04	-.04	-.07	.21	.51	.43
Ready to use	8.9	.20	.09	-.04	-.02	-.21	.14	.34	.43
Easy understand	8.15	.18	.20	.03	.05	-.06	.21	.35	.36
Relevant <sup>c</sup>	8.3	-.04	.13	-.09	.33	-.01	.04	.12	.08
Area related <sup>b</sup>	8.8	.23	.13	-.07	-.03	-.11	.15	.34	.40
New <sup>c</sup>	8.12	-.16	.10	-.05	.03	-.06	.14	.19	.24
Try to get	8.7	.05	.05	-.12	-.36	-.15	.26	.44	.28
Agree <sup>bc</sup>	8.1	-.09	.08	.09	.16	-.01	.20	.17	.07
Timely	8.6	.13	.12	-.04	-.05	-.03	.18	.44	.42

(Continued)

**Table 9.1** (continued).

Question	Easy to use	Ready use	Easy understand	Relevant	Area related	New	Try to get	Agree	Timely
	no. 8.5	8.9	8.15	8.3	8.8	8.12	8.7	8.1	8.6
Easy to use	8.5	1.00							
Ready to use	8.9	.52	1.00						
Easy understand	8.15	.57	.43	1.00					
Relevant <sup>c</sup>	8.3	.18	.14	.13	1.00				
Area related <sup>b</sup>	8.8	.39	.54	.26	.21	1.00			
New <sup>c</sup>	8.12	.12	.01	.07	.31	.04	1.00		
Try to get	8.7	.16	.12	.09	-.06	.31	-.03	1.00	
Agree <sup>bc</sup>	8.1	.19	.08	.16	.42	.01	.29	-.00	1.00
Timely	8.6	.55	.42	.39	.21	.50	.18	.23	.13

<sup>a</sup> Data from questions IS7.5 to 8.15. Pairwise deletion of missing values (minimum  $n = 253$ ). Coefficients greater than  $\pm .14$  are significant at  $p < .05$ .<sup>b</sup> Deleted from revised version of index.<sup>c</sup> Coding has been reversed for negatively coded item.

### Inter-item correlations

All but two of the correlations between pairs of variables in the same original index (in the boxes along the diagonal of Table 9.1) were significant but generally low. The mean correlation among items along the diagonal was 0.32, compared to 0.53 for the revised form of the Information Flow index (Table 9.2). This leads us to suspect that the indices contain items that do not measure the same variable.

The two non-significant correlations were  $r = 0.04$  between two of the Reward measures and  $r = 0.13$  for the Synergy items. In both cases, the reason for the poor correlations is evident from the question wordings.

The off-diagonal cells of Table 9.1 show that some items were more closely related to components of other indices than to those in their own. For instance, questions IS8.6,

**Table 9.2** Number of variables, mean correlations, and Cronbach's *a* of original and revised forms of indices<sup>a</sup>.

Item	Variables		Mean <i>r</i> <sup>b</sup>		Cronbach <i>a</i> <sup>b</sup>		Questions	
	Orig	Rev	Orig	Rev	Orig	Rev	Retain	Drop
Info flow	5	4	.44	.53	.79	.81	5, 7.1- 7.3	7.4
Familiarity	2	1	.25	-	.39	-	8.14	8.11
Proximity	3	3	.30	.30	.56	.56	7.5, 8.2, Map	
Structure	1	1	-	-	-	-	8.13	
Capacity	2	2	.48	.48	.65	.65	8.4, 8.10	
Openness	3	3	.50	.50	.75	.75	8.5, 8.9, 8.15	
Reward	3	2	.19	.32	.42	.48	8.3, 8.12	8.8
Energy	1	1	-	-	-	-	8.7	
Synergy	2	1	.13	-	.23	-	8.6	8.1

<sup>a</sup> Data from questions IS5, 7 and 8.  $n = 262$  to  $271$ .<sup>b</sup> Correlation coefficient and Cronbach's *a* cannot be calculated for indices containing a single variable.

8.8 and 8.9, all in different *a priori* indices, have a mean mutual correlation of 0.49. This alerts us to the danger of multicollinearity in the multiple regression analysis planned. It also lends support to the suspicion that the questions tap underlying concepts other than FP SCORES. I address the first danger in the section on correlations among the FP SCORES variables in the next chapter. I discuss the second below.

### Item-total correlations

Low item-total correlations affected the Familiarity, Reward and Synergy scales. The two Familiarity items had item-total correlations of  $r = 0.25$ , while the equivalent figure for question IS8.8 (Reward) was 0.16 and for the two-item Synergy scale 0.13. All other item-total correlations exceeded the criterion level of 0.3.

### Cronbach's *a*

Cronbach's *a* for the indices ranged from an acceptable 0.75 for Openness to a poor 0.23 for Synergy (Table 9.2). Familiarity and Reward also had low *a* scores, while Proximity and Capacity had slightly higher, though still somewhat depressed, values.

The problem of poor index reliability arose partly due to the small number of items in each index -- a number constrained by the need to keep the questionnaire short. Cronbach's  $\alpha$  is sensitive to the number of items in a scale: a scale with many mutually correlated items will yield a higher  $\alpha$  than one with a few items. Except for the Information Flow index, all scales in this study contained only two or three items, so  $\alpha$  values were inevitably low. However, the low levels of  $\alpha$  are a further indication of problems with the unidimensionality of the indices.

### **Factor analysis**

Because of the relatively small correlations along the diagonal and large values among off-diagonal items in Table 9.1, several of the factors did not reveal loading patterns closely consistent with the original indices. Only five instead of the expected eight factors were identified, and several items that had been expected to tap a common underlying variable loaded heavily onto different factors. Table 9.3 presents the factor loadings of the 17 variables; Table 9.4 lists the questions in the *a priori* indices and those retained in their revised forms.

**Table 9.3** Factor loadings of variables intended to measure the FP SCORES concepts.<sup>a</sup>

Quest. no.	Concept intended to measure	Factor				
		1	2	3	4	5
8.5	Openness	<b>.81</b>	.12	.15	.13	-.07
8.9	Openness	<b>.77</b>	-.03	-.06	-.18	.13
8.6	Synergy	<b>.72</b>	.15	.13	-.05	.04
8.15	Openness	<b>.69</b>	.09	.11	.20	.04
8.8	Reward	<b>.64</b>	-.03	.03	-.31	.33
8.10	Capacity	<b>.60</b>	.05	.37	-.12	.03
8.3	Reward	.18	<b>.73</b>	-.26	-.19	.25
8.1	Synergy	.10	<b>.72</b>	.10	.14	-.04
8.12	Reward	.06	<b>.69</b>	.17	-.06	-.11
8.13	Structure	.10	.22	<b>.72</b>	.09	.20
8.7	Energy	.16	-.12	<b>.65</b>	-.27	.05
8.4	Capacity	<b>.50</b>	.17	<b>.60</b>	-.10	.05
8.2	Proximity	-.02	.31	<b>-.49</b>	<b>.44</b>	<b>.45</b>
7.5	Proximity	.03	-.06	-.01	<b>.76</b>	.08
Map	Proximity	-.09	-.01	-.16	<b>.63</b>	.08
8.14	Familiarity	.02	.17	.19	.20	<b>.74</b>
8.11	Familiarity	.24	-.32	.07	.01	<b>.66</b>
Percent of variance		24.7	12.5	9.6	7.5	6.0

<sup>a</sup> Data from questions IS7.5 to 8.15. Based on correlation matrix with pairwise deletion of missing values (minimum  $n = 253$ ). Factor analysis used varimax rotation and principal components extraction. Total variance accounted for = 60.3%.

<sup>b</sup> Factor loadings greater than .40 are in **boldface**.

The first factor, accounting for 24.7% of variance, had all the Openness items loading heavily onto it, plus items intended to measure Capacity, Synergy, and Reward. While Openness seems to be central to this factor, it is difficult to label such a diverse range of concepts. Possibly "Applicability" would be appropriate.

**Table 9.4** Loadings of items on factors identified through factor analysis<sup>a</sup>.

Question	Factor most heavily loaded	Original index	Revised index
8.5 S easy to use	1	Openness	Openness
8.9 S info ready to use	1	Openness	Openness
8.15 S easy to understand	1	Openness	Openness
8.6 S has timely info	1	Synergy	Synergy
8.8 S topics related to area	1	Reward	
8.10 S has complete info	1	Capacity	Capacity
8.1 S agrees with other sources <sup>c</sup>	2	Synergy	
8.3 S information relevant <sup>c</sup>	2	Reward	Reward
8.12 S info new <sup>c</sup>	2	Reward	Reward
8.13 Part of job to get info from S	3	Structure	Structure
8.7 Devote effort to get info from S	3	Energy	Energy
8.4 S is most credible	3	Capacity	Capacity
8.2 S easy to find <sup>c</sup>	-3 <sup>d</sup>	Proximity	Proximity
7.5 S's nearest usual location <sup>c</sup>	4	Proximity	Proximity
Map Distance to known source location	4	Proximity	Proximity
8.14 Know S well	5	Familiarity	Familiarity
8.11 Know type of information S has	5	Familiarity	

<sup>a</sup> Data from questions IS7.5 to 8.15. Based on correlation matrix with pairwise deletion of missing values (minimum  $n = 253$ ).<sup>b</sup> S = Source.<sup>c</sup> Coding has been reversed so high score corresponds with high expected information flows.<sup>d</sup> Negative loading on factor.

The remaining two Reward items loaded heavily on the second factor, which accounted for 12.5% of variance. Agreement with other sources (Synergy) also loaded on this factor. The source's relevance seems to be at the core of this factor. A peculiarity is that all items loading heavily on this factor were worded negatively: "Information from the source often disagrees with information from other sources," its "information is not relevant to problems farmers in your area face," and it often provides information "that isn't new." (Only one other item loading on another factor ["The source is difficult to obtain"] had similar negative wording.) Perhaps the wording somehow influenced responses similarly across all three items.

The third factor accounted for 9.6% of variance. This was a hodge-podge of items from four original indices: Proximity (loading negatively on the factor), Structure, Capacity, and Energy. Again, a possible underlying dimension here is the sense of duty the respondent may have to seek the source. This idea is most closely reflected in the statement, "It is an important part of your job to obtain information from the source," but people agreeing with this would also tend to agree that they "devote much effort to obtain information from the source." At the same time, the nature of the four source types is such that the hardest to get (AARD publications) is the one many specialists might see as one they should use most if they did their jobs well -- and the easiest to get (agricultural press) has the lowest status on such a measure. A source that is hard to get would therefore correspond to one they should use while fulfilling their duties -- hence the negative loading on the factor.

The fourth factor accounted for 7.5% of variance. It corresponded to the two remaining Proximity measures: "Nearest place source is usually located" (question IS7.5) and map distance to the nearest known source location. The third Proximity measure, "Source is difficult to find (question IS 8.2) had a high loading on this factor also but was more closely related to the third (see above).

The fifth factor accounted for 6.0% of variance. It was composed of the two Familiarity items on the questionnaire. Nevertheless, the correlation between these two variables was relatively low ( $r = 0.25$ , Table 9.1).

### **Causes of poor index reliability**

What caused the *a priori* indices to perform so poorly in the above correlation and factor analyses? Several possibilities are evident:

- **Poor conceptualization.** The FP SCORES concepts the indices are designed to measure are not unidimensional. As mentioned in Chapter 5, this appears to be true of Synergy, which is composed of at least two separate concepts (timing and repetition). It may also be true of Capacity (completeness and credibility) and Proximity (physical distance and accessibility).

- **Poor operationalization.** The items used did not adequately measure the FP SCORES concepts. Some of the items have poor face validity. For instance, some apply better to personal than non-personal sources. An example is question IS8.14, "You know [source] well," which *can* apply to non-personal sources (particularly with its wording in Indonesian), but better fits individuals. Question IS8.2, "[Source] is difficult to find," may not adequately measure Proximity. And IS8.12, "[Source] often provides information that is not new to you," has low face correspondence with the concept of Reward.
- **Inadequate pretesting.** The above problems should have become evident during the questionnaire pretest. Several problems did emerge during pretesting, and I adjusted the questionnaire to deal with them. For instance, the Openness items in the pretest had a mean  $\alpha$  (mean of the four source types tested) of .17. In response, I changed the wording of one item and added another in the final version of the questionnaire. This appears to have been successful: the Openness index in the full survey had an  $\alpha$  of .75 (Table 9.2). The pretest Synergy items had a mean  $\alpha$  of .20; I dropped the poorest one in the final version. This was not enough to improve reliability (full survey  $\alpha = .23$ ).

However, other problems did not become evident until the full survey was complete. Values of  $\alpha$  for Familiarity and Capacity were higher in the pretest than in the full survey:  $\alpha$  for Familiarity was .84 in the pretest but only .39 in the full survey; equivalent figures for Capacity were .80 (pretest) and .65 (full survey). Inter-item correlations were also correspondingly higher.

For space reasons, the pretest included only one item each to measure Proximity and Reward. It could therefore not predict the reliability problems encountered with these indices. From hindsight, the pretest thus included too few questions from which to select "clean" items for the final instrument.

Whatever the cause, the poor reliability of the *a priori* indices presents a problem. Which set of variables should be used in subsequent analysis? Three possibilities present themselves:

- Using the *a priori* indices, amended as far as possible by deleting variables that are poorly related to other items in the index.
- Using the groupings suggested by the factor analysis.
- Selecting the single most appropriate variable to represent each of the FP SCORES variables, thereby eliminating the problem of poor reliability.

Each of these options entails disadvantages. The first raises questions of index validity and reliability. The second means abandoning an attempt to test the FP SCORES model, and difficulties in interpreting some of the factor analysis groupings. The third risks the possibility that the selected measures have poor validity.

I chose the first option because of the validity problems associated with the third option and the wish to test the FP SCORES model. I included the factor analysis groupings

along with the other criteria rather than using them as the sole basis for developing indices.

### **Final form of FP SCORES indices**

The five criteria for index construction were occasionally in conflict. For instance, an item loaded onto a different factor from others in its *a priori* scale, but deleting it would significantly decrease the Cronbach's  $\alpha$  of the scale as a whole. Judgements in such cases were based primarily on the face validity and item-total correlation of the scale.

Applying the criteria yielded the indices listed in the last column of Table 9.4. Table 9.2 gives characteristics of the original indices and their revised forms after deleting items that failed to satisfy the criteria. Deleting variables made it possible to raise the mean correlation among items and the Cronbach's  $\alpha$  of one index (Reward). Four of the indices (Familiarity, Structure, Energy, and Synergy) were reduced to single variables. The mean correlation of items in the revised FP SCORES indices was 0.40, compared to 0.32 for the original indices and 0.53 for the Information Flow score. These are still low, but are the highest possible given the shortcomings outlined above.

Further details on the makeup of each index are given below.

## **Information Flow**

### **Constructing the index**

Five questions aimed to measure the level of Information Flow from source to respondent. Four of these were items in question IS7:

- IS7.1 Frequency you read [source].
- IS7.2 Frequency you obtain information useful for extension from [source].
- IS7.3 Frequency you use information originating from [source] in your extension activities.
- IS7.4 Usefulness of [source] as a source of extension information for you.

The fifth component of the index was drawn from question IS5:

IS5                    For extension purposes, how much information do you obtain from [source]?

This question asked about 24 sources. I used responses about one of the four sources germane to the questionnaire version each respondent was sent:

- For respondents asked about AIC publications (version 1 of the instrument), responses to item IS5.4 ("AIC publications such as booklets, *Buletin Informasi Pertanian, Liptan*") were used.
- For version 2 (agricultural press), item 5.1 was selected ("Agricultural newspapers/magazines [e.g., *Sinar Tani, Trubus*]")
- For version 3 (AARD publications), item 5.7 was used ("Books published by AARD [e.g., research summaries, symposium proceedings]")
- For version 4 (other specialists), item 5.13 was used ("Discussions with other SMSs").

These five items tap different dimensions of Information Flow. Question IS5 measures the total *quantity* of information. IS7.1 measures the *frequency of exposure*, while IS7.2 and IS7.3 measure the *frequency of obtaining and using* useful information. Question IS7.4 measures the *usefulness* of the information supplied by the course.

Including responses to all five questions in an index yielded a Cronbach's  $\alpha$  of 0.79 (an acceptably high value), and a mean inter-item correlation of  $r = 0.44$ . But excluding question IS7.4 improved the scale reliability still further (to  $\alpha = 0.81$ ) and the correlation to  $r = 0.53$  (Table 9.2). This was because of the relatively low correlations between responses to this question and the other items in the index (Table 9.5). Question IS7.4, reflecting the source's *usefulness*, also may differ conceptually from the *quantity* of information flow from that source. Furthermore, a reliable measure for the dependent variable is crucial to this study. I therefore deleted question IS7.4 from the index on both pragmatic and conceptual grounds, leaving a scale composed of four items.

### Differences among source types

Both source type and institution significantly affected Information Flow (Table 9.6). The agricultural press provided significantly more information than did the other three sources, and did so for all three groups of specialists. Second, also consistently across institutions, was "other specialists," with AIC publications and AARD publications providing least information to all groups.

One of the five component items in the Information Flow index was question IS5, which measured information obtained from 24 sources, including the four used in this part of the study. Despite this broader range of sources, Question IS5 yielded the same ranking as the Information Flow index (Table 8.1). There was one exception to this: the agricultural press had significantly higher Information Flow scores than did other specialists, while on question IS5 the reverse was the case. We can trace this to higher scores for the agricultural press on questions IS7.1 to 7.3 -- all items measuring frequencies rather than the "information obtained" measured by question IS5.

Both AIC and AARD publications scored poorly on the Information Flow measure, despite the high score by the AIC materials on question IS5. The AIC publications failed to

score any higher than AARD publications on questions IS7.1 to 7.3, indicating some discrepancy among the measures used.

The level of Information Flow is probably in part a function of how often respondents are exposed to the source -- for instance, how often a newspaper is published. While the density of useful information is probably lower in the agricultural press than in the other sources, the press's higher frequency (tapped by question IS7.1) seems to compensate for this.

### Differences among institutions

Overall, AIC specialists reported receiving more information than both province and district specialists. This is consistent with the findings for all 24 sources measured in question IS5 (Table 8.1). (This table and Table 9.6 are based in part on the same data, since responses to question IS5 are one of four items in the Information Flow index.)

While the interaction between source type and institution in the analysis of variance was not significant, two other features are of note. The highest Information Flow score of all was for the agricultural press among province specialists. And AIC specialists reported receiving much more information from AARD publications than did their province and district counterparts.

**Table 9.5** Simple Pearson's correlation coefficients between items in the Information Flow index<sup>a</sup>.

	Ques- tion	Qty of info obtained	Freq read/ talk to	Freq get useful info	Freq use info	Useful- ness
Quantity of info. obtained	5	1.00				
Freq. read/talk	7.1	.39	1.00			
Freq. get useful info.	7.2	.43	.71	1.00		
Freq. use info.	7.3	.40	.59	.64	1.00	
Usefulness <sup>b</sup>	7.4	.34	.30	.25	.40	1.00

<sup>a</sup> Data from questions IS5 and 7.  $n = 272$ .

<sup>b</sup> Variable deleted from revised version of index.

**Table 9.6** Information Flow scores by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	3.56 a	3.98 b	-	3.84 a
Agricultural press	<b>5.22</b> c	<b>4.80</b> c	<b>5.09</b> b	<b>4.97</b> c
AARD publications	3.42 a x	3.41 a x	4.26 a y	3.65 a
Other specialists	4.60 b	4.23 b	4.63 ab	4.43 b
Overall	4.21 x	4.12 x	4.65 y	4.26

$n = 273$ .

Overall analysis of variance:  $F$  for Source: 26.55\*\*

Institution: 4.57\*      Interaction: 1.97<sup>ns</sup>

<sup>a</sup> Data from questions IS5 and 7.1 to 7.3. Score range = 1 (low Information Flow) to 7. Common letters a-c in a column and x-z in a row indicate no significant difference at  $p = 0.05$  by Student-Newman-Keul's multiple range test. Highest scores in each column are in **boldface**; lowest scores are *italicized*.

## Familiarity

### Constructing the index

The Familiarity index aimed to reflect how *familiar* respondents were with the source. The questionnaire contained two items tapping this concept:

IS8.11 You know the type of information [source] has.

IS8.14 You know [source] well.

These two items both appear to have good face validity. Both loaded on the same factor (Table 9.4), but their low mutual correlation ( $r = 0.25$ ) gave the resulting index low reliability ( $\alpha = 0.39$ , Table 9.2). The reasons for this are unclear. IS8.11 appears to relate better to publications, and IS8.14 to people (though this is at least in part due to the translation into English; the original Indonesian wordings relate to both).

The poor index reliability led me to drop one of the items. I retained Question IS8.14 for two reasons: it had slightly better face validity than question 8.11, and respondents appeared to have difficulty answering question 8.11 -- 15 of them failed to provide any response and 25 answered "don't know" to this question (see Appendix 5).

**Table 9.7** Familiarity scores by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	<i>4.94</i> a	5.34 a		5.21 a
Agricultural press	5.50 a	5.39 a	<i>6.18</i>	5.63 a
AARD publications	5.75 a xy	5.26 a x	6.19 y	5.63 a
Other specialists	<b>6.65</b> b	<b>6.53</b> b	<b>6.53</b>	<b>6.56</b> b
Overall	5.71 x	5.61 x	6.29 y	5.79

$n = 276$ . Overall analysis of variance:  $F$  for Source: 11.28\*\*Institution: 3.89\*

Interaction: 1.35<sup>nsa</sup> Data from question IS8.14. Score range = 1 (low Familiarity) to 7. Common letters a-c in a column and x-z in a row indicate no significant difference at  $p = 0.05$  by Student-Newman-Keul's multiple range test. Highest scores in each column are in **boldface**; lowest scores are *italicized*.

### Differences among source types and institutions

Both source type and institution significantly influenced Familiarity scores (Table 9.7). Other specialists consistently scored highest on this measure. No significant differences occurred among the other three sources.

The relatively high Familiarity scores for other specialists may result merely from a different interpretation of the question for individuals as opposed to publications (the other three source types). On the other hand, they may also reflect a real difference between interpersonal and mediated channels. The high Familiarity scores with other specialists indicates an opportunity for networking and information exchange among extension personnel -- though Familiarity guarantees neither that specialists see it as their job to seek information from each other, nor that they expend much effort to do so. And hence it may not result in information exchange among specialists (see the sections below on Structure and Energy and the results of the multiple regression analysis).

The low Familiarity scores for AARD publications are understandable given that most specialists are not sent them. But the similarly low scores for the agricultural press and AIC publications are puzzling because the respondents supposedly receive both routinely -- the agricultural press more often than the AIC publications. Responses to the Publications questionnaire (Table 8.5 and Appendix 3) show that 79% of specialists read the newspaper *Sinar Tani* at least once a week, compared to 19% for the AIC magazine *Buletin Informasi Pertanian* and 31% for the AIC *Liptan* fact sheets. By contrast, only 10% claimed to read the AARD newsletter *Warta Litbang*, 8% scientific journals, and 8%

AARD books at least once a week.

**Table 9.8** Standardized simple regression coefficients (beta) for Information Flow against Familiarity, by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	.40	.48 **		.48 **
Agricultural press	.22	.25	.23	.25 *
AARD publications	.29	.44 **	-.03	.39 **
Other specialists	.03	.22	.18	.17
Overall	.28 *	.33 **	.12	.31 **

<sup>a</sup> Data from question IS8.14. For sample *ns* see Table 9.9. Significance of beta (one-tailed): \*  $p < 0.05$ ; \*\*  $p < 0.01$ . No significant differences among beta values at  $p = 0.05$  by *z*-test.

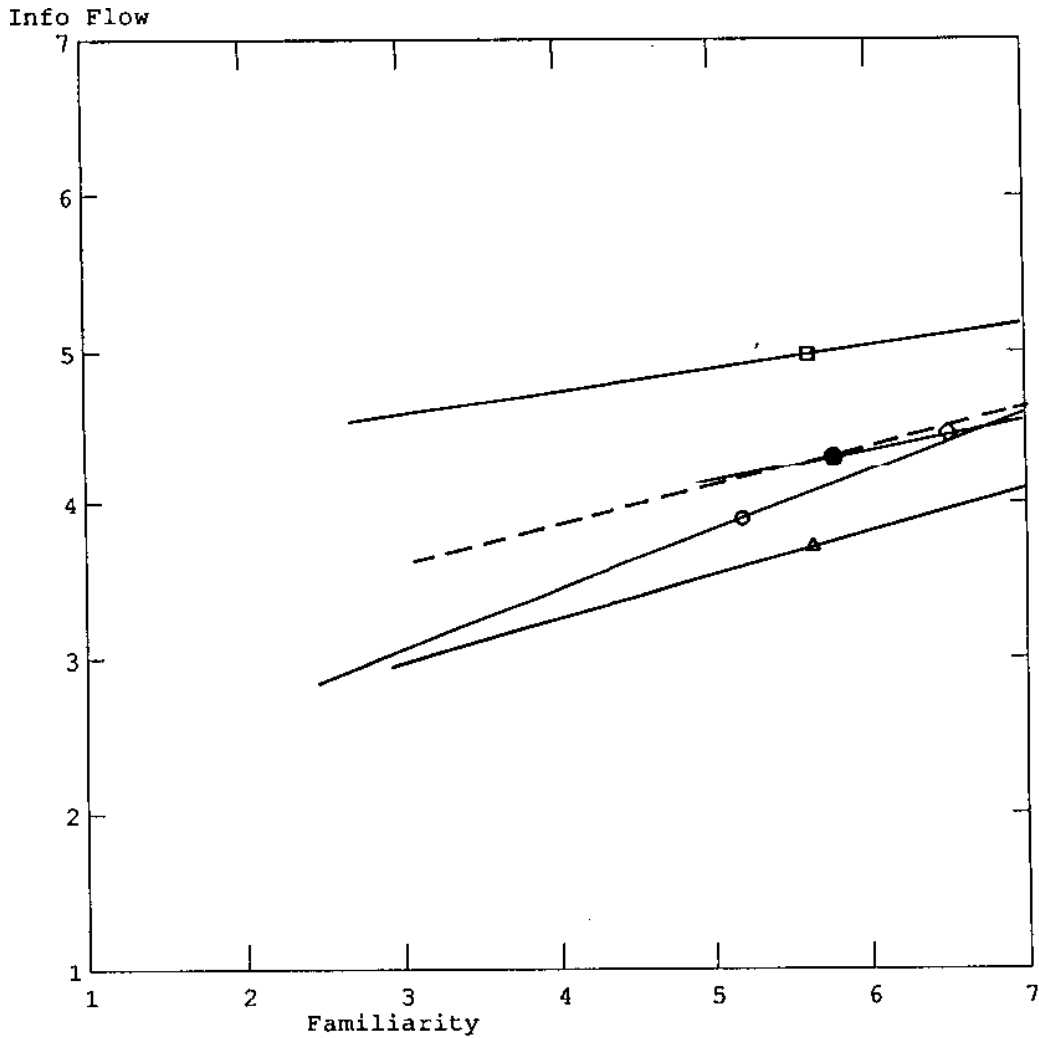
A reason for the low Familiarity with the agricultural press despite the frequency specialists receive it may be the low opinion some specialists have of *Sinar Tani*. Several interviewees said that they pay little attention to the paper as they saw it as of low quality -- large parts are written by field agents with little credibility for specialists, and attitudes about the paper may be colored its being seen as a government outlet rather than an independent organ. AIC publications' low Familiarity score is hard to explain, since respondents are supposedly among the main users of these publications. Admittedly, the score is reduced because AIC specialists were not questioned about AIC publications, which they themselves author; presumably these specialists are very familiar with them. But non-AIC specialists seem to lack familiarity with these publications: district specialists were only as familiar with AIC materials (Familiarity = 5.34) as with AARD publications (Familiarity = 5.26), and province specialists were somewhat (though not significantly) less so (Familiarity = 4.94 compared to 5.75).

If substantiated, this lack of familiarity with AIC publications among extension specialists should be a cause for some concern for AIC administrators. Specialists who are unfamiliar with AIC publications may be unaware of technologies thought suitable for their province. Strategies to raise the level of Familiarity are suggested in Chapter 11

AIC specialists reported significantly higher overall Familiarity scores than did their counterparts, primarily because of their greater Familiarity with AARD publications. They also scored somewhat (though not significantly) higher than their colleagues on the agricultural press; indeed, their Familiarity with these two publication types approaches their interpersonal Familiarity scores with other specialists.

**Presentation of FP SCORES -by-Information Flow relations**

Table 9.8 plots the relationship between Familiarity and Information Flow overall and for the four sources separately. It also shows mean scores of Familiarity (horizontally) and Information Flow (vertically), corresponding to the rightmost columns of Table 9.6 and Table 9.7).



	Familiarity		Inter -cept	Slope	n	Beta (=r)	R <sup>2</sup>	
	Mean	Std dev						
○ AIC publications	5.21	1.36	1.89	.38	52	.48	.229	**
□ Agricultural press	5.63	1.48	4.09	.15	77	.25	.064	*
△ AARD publications	5.63	1.37	2.11	.28	74	.39	.153	**
◇ Other specialists	6.56	.79	3.05	.21	67	.17	.030	ns
● Overall	5.79	1.36	2.81	.25	270	.31	.097	**

**Figure 9.1** Regression of Information Flow against Familiarity for four source types.

**Table 9.9** Maximum and minimum *ns* for regression coefficients for Information Flow against FP SCORES variables.<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	16-17	34-35		50-52
Agricultural press	16-17	40-41	19-20	76-78
AARD publications	15-16	35-38	20-21	72-74
Other specialists	16	30-33	14-19	61-67
Overall	63-66	141-146	54-59	261-271

<sup>a</sup> Regression coefficients are presented in Table 9.8 and similar tables in this chapter.

Table 9.8 compares standardized simple regression coefficients for Familiarity as a predictor of Information Flow for the various combinations of source type and institution. The slopes in Figure 9.1 correspond to the rightmost column in Table 9.8.

Each of the sections below on the individual FP SCORES variables contains similar plots and tables. To avoid cluttering these tables, I provide in Table 9.9 the maximum and minimum sample sizes used in calculating each of these regressions. The small numbers in the province and AIC columns mean that it is difficult to obtain significance for betas representing these source-institution combinations.

The figures show the mean values for each of the FP SCORES indices overall and for the four source types individually. They also show the regression between each index and Information Flow. The height of the mean-point symbols thus corresponds to the value of Information Flow for that source (rightmost column in Table 9.6). The horizontal position of the mean-point symbol reflects the value of the FP SCORES variable in question (in the case of Familiarity, the rightmost column in Table 9.7). The slope of the regression lines reflects the relationship between the FP SCORES variable and Information Flow (rightmost column in Table 9.8). The length of the regression line gives an idea of the range along the horizontal axis: it equals two standard deviations either side of the mean of the FP SCORES variable measured. These data are summarized in the table below the figure.

### **Influence on Information Flow**

The respondents' Familiarity with a source was relatively strongly related to the amount of information obtained from the source (overall beta = 0.31\*\*), accounting for 10% of variance in Information Flow.

Table 9.8 shows that the relationship between Familiarity and Information Flow was closest for AIC publications (beta = 0.48\*\*) and for AARD publications (beta = 0.39\*\*), and less so, though still significantly, for the agricultural press (beta = 0.25\*). For other specialists as sources, the relationship was not significant, possibly because of the limited range in Familiarity scores for this source: all respondents except one gave scores of at least five (on a seven-point scale) for their Familiarity with other specialists.

The overall beta for Familiarity was .31\*\* (see above). The strong relationship between Familiarity and Information Flow held even when controlling for source type using dummy variables in a multiple regression: its beta value was again .31\*\*, with Familiarity accounting for 8% of Information Flow.

Among the three institutions surveyed, district specialists had the closest relationship between Familiarity and Information Flows (beta = 0.33\*\*). Province specialists had a virtually identical regression slope ( $b = 0.24$ ) but a slightly lower standardized regression score (beta = 0.28\*). The beta value for AIC specialists (0.12) was low, probably because of the same reason as for other specialists.

Despite the apparent variations in beta values among subsamples in Table 9.8, there were no significant differences either between sources within an institution (among values within a column in the table), or between institutions within a source (across a row). This lack of significant differences among sources and institutions means it is legitimate to group all responses together and use the overall beta value of 0.31 as a measure of the effect of Familiarity on Information Flow.

Familiarity appears to be most important as a determinant of Information Flow for district specialists in using AIC and AARD publications. These are the sources district specialists are the least likely to receive (see discussion of Proximity below) or be familiar with. But if these specialists are familiar with them, they tend to use them more heavily.

Familiarity has the least effect on the use of other specialists as sources, and on the amount of information obtained by AIC specialists. This is probably because Familiarity scores for these two subsamples are already high (Table 9.7); increasing them further will therefore have little effect.

It is plausible that Familiarity is the result of Information Flow rather than the other way round, or that causation is circular. In other words, when we use a source we become more familiar with it, and this leads us to use it more. Similar relationships between the other FP SCORES variables and Information Flow may also exist. I discuss this further in Chapter 11.

## Proximity

### Constructing the index

Proximity means the physical distance between the source and the receiver, or the availability of the source to the receiver. I used three measures to tap this concept. Two were questionnaire items, and the third was measured from a map:

IS7.5 Nearest usual location of [source].

IS8.2 [Source] is difficult to find.

Map Distance to nearest known location of [source].

The map measure was generated not from the survey responses but by measuring distances on a map from the respondents' addresses to the nearest known likely location of each source (see Chapter 6). Such a measure inevitably entails some error. For instance, not all AICs regularly receive AARD publications (as was evident from personal observation during my field visits). And some individual specialists are sent some publications, as shown by the AARD mailing lists I was given (Balitnak 1991, Balitvet 1991). And counter to my assumption, some specialists undoubtedly do not receive *Sinar Tani*. However, time and the amount of space available in the questionnaire made it impossible to collect all of the information necessary to create a "cleaner" measure.

While all these are weaknesses of the map measurement approach, this item does not necessarily contain more error than any of the others. The questionnaire items, for instance, could be criticized for over-reliance on perception and memory. The map measure was fairly well correlated with the two other measures in the Proximity index, even though it was taken from an independent source. I therefore retained it in the index.

Question IS7.5 and the map measure tap the physical distance dimension, while question IS8.2 measures source availability. While these are perhaps conceptually different, correlations between IS8.2 and the other two variables (.31 and .35, Table 9.1) were higher than the mutual correlation of IS7.5 and the map measure (.24). Availability and physical distance thus seem to be highly related, so I have included both in the index.

The Proximity index was an instance where the five criteria for index construction (chapter 6) did not agree. The three-item Proximity index had a somewhat low mean inter-item correlation of  $r = 0.30$  and a Cronbach's  $\alpha$  of 0.56 (Table 9.2). In factor analysis, question IS8.2 loaded onto a different factor from the other two items (Table 9.4). However, its loading on this factor (3) was negative, and it also loaded heavily on factors 4 and 5. Deleting it would have lowered Cronbach's  $\alpha$  from 0.56 to 0.50. In addition, all three items had item-total correlations of more than 0.35. I therefore retained all in the Proximity index.

The Proximity index could also be criticized for being less relevant for human than

for non-personal sources. Humans, it could be argued, move around more often than publications, and they can use the telephone to overcome the friction of distance. However, Table 7.14 shows that specialists do not travel very much to seek information (only about once every 3 months), and few have regular access to a telephone, especially for long-distance calls. Any differences between the effect of Proximity between personal and non-personal sources should be revealed in the regression analysis reported below.

An argument could also be made for the opposite: that the Proximity measures are more applicable to personal than non-personal sources. It is relatively easy to say where a person is usually located (question IS7.5) (though this leaves unanswered the question of *which* person, or persons -- some of whom may be close by and others distant). But multiple locations may be applicable to a publication, on the other hand: is its usual location at the publisher's, in the library (where the copy is normally kept), or my office (when I want to read it)? (The second alternative was the one I intended to measure.) This difficulty is further compounded when we ask about a class of publications, some of which may be close by and others distant.

Respondents may have interpreted questions IS7.5 and 8.2 differently. This and the inevitable error in the map measure (see above) increase the amount of error in the Proximity index. In the absence of strong evidence to the contrary, I assume in the analysis below that this error is randomly distributed about the mean.

### **Differences among source types and institutions**

Both institution and source type significantly influenced Proximity (Table 9.10). While the sources did not vary in Proximity for the AIC specialists, province and district specialists reported that the agricultural press and other specialists were significantly closer than the other two sources.

**Table 9.10** Proximity scores by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	5.82 ab y	4.12 ab x		4.65 a
Agricultural press	6.10 b	<b>5.93</b> b	<b>6.53</b>	<b>6.14</b> b
AARD publications	5.31 a y	3.92 a x	6.44 z	4.95 a
Other specialists	<b>6.34</b> b y	5.53 b x	6.38 y	5.96 b
Overall	5.91 y	4.90 x	6.45 z	5.49

$n = 271$ . Overall analysis of variance:  $F$  for Source: 26.21\*\*Institution: 46.32\*\*

Interaction: 7.36\*\*<sup>a</sup> Data from questions IS7.5 and 8.2 and map distances.

Score range = 1 (low Proximity) to 7. Common letters a-c in a column and x-z in a row indicate no significant difference at  $p = 0.05$  by Student-Newman-Keul's multiple range test. Highest scores in each column are in **boldface**; lowest scores are *italicized*.

This was in part because of the way one of the three components of Proximity was calculated: the distance to the source was set to 0 km for the agricultural press but for the other three sources depended on the number of kilometers measured on a map to the nearest known source. According to the address list of 1560 specialists, most respondents were in the same institution or town as another specialist in their own field. But both the agricultural press and other specialists also scored high on the other measures in the Proximity index (questions IS7.5 and IS8.2). The results from these two questions support information from question P5 (Table 8.5), personal interviews and observations that the agricultural newspaper *Sinar Tani* is distributed to and is received by extension offices throughout the country, and justifies the somewhat arbitrary calculation of the distance component in the index.

The overall Proximity value for AIC publications (4.65, Table 9.10) would have been higher had AIC specialists been questioned about them. Its low score is thus misleading, especially when compared to AARD publications, which had lower Proximity for both district and province specialists.

AIC specialists enjoyed the highest degree of Proximity to all sources and reported no significant differences among them. AIC libraries appear to fulfil their function as a repository of AARD publications and hold a reasonably wide range of agricultural periodicals. Personal interviews indicated that these libraries were frequently used by AIC staff. The AICs and province offices also are home to several extension specialists, resulting in high Proximity scores for other specialists.

In contrast, district specialists were far more isolated. Most AARD publications are not sent to the district level -- this is clearly reflected in the low Proximity scores for this

source type. Of concern also is the low Proximity score for AIC publications at the district level, possibly indicating that district respondents receive few of these publications also (see the comments on Familiarity above). These low Proximity values are not merely an artifact of the distance component in the index: district specialists gave low scores to AIC and AARD publications on the other two components: 4.06 for AIC publications on question IS7.5 (compared to 5.19 for province specialists), and 3.31 to AARD publications on question IS8.2 (compared to 5.13 for province specialists) (see Appendix 5).

Interviews and personal observations indicate that district offices lack libraries and formal methods of circulating incoming publications to relevant personnel. Both AARD and AIC publications may thus be difficult to find at district offices, even if copies are received. And while the newspaper *Sinar Tani* is distributed to most extension specialists nationwide, few agricultural magazines reach the district level.

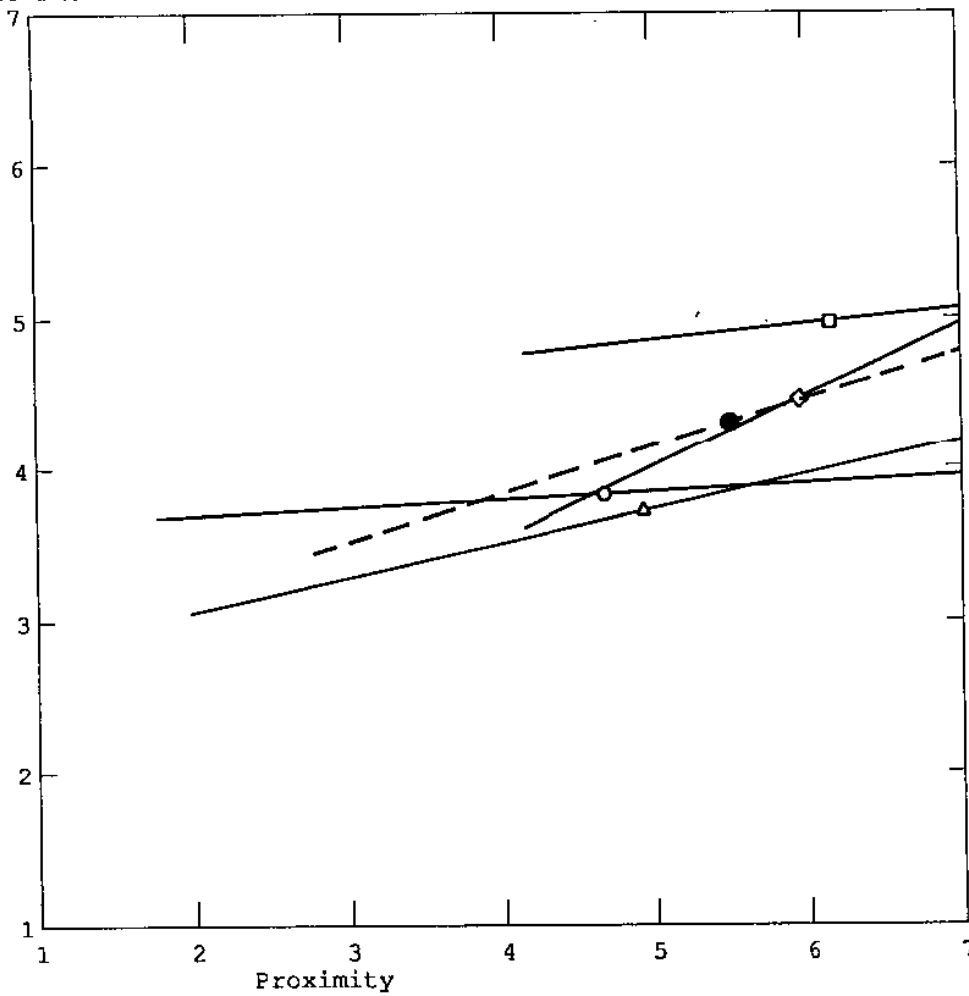
The interaction between source type and institution was significant, presumably because of the high Proximity between AIC specialists and AARD publications.

### **Influence on Information Flow**

The amount of information a specialist obtained from a source was closely tied to the source's Proximity. These two variables had a simple correlation of  $r = 0.38$ , higher even than Familiarity, indicating that physical closeness or access was more important overall than how well the specialist knew the source. Proximity alone accounted for almost 15% of the variance in Information Flow.

Figure 9.2 shows that there was considerable apparent variation among sources in the effect of Proximity on Information Flow. For other specialists and AARD publications, the slopes are relatively steep and beta values high (beta = 0.45\*\* for other specialists, 0.33\*\* for AARD publications). For the other two sources, however, the slopes are almost flat (beta = 0.07<sup>ns</sup> for AIC publications, 0.12<sup>ns</sup> for the agricultural press).

Info Flow



	Proximity		Inter -cept	Slope	n	Beta (=r)	R <sup>2</sup>
	Mean	Std dev					
○ AIC publications	4.65	1.47	3.61	.05	51	.07	.005 ns
□ Agricultural press	6.13	1.02	4.36	.10	76	.12	.013 ns
△ AARD publications	4.95	1.49	2.61	.22	72	.33	.110 **
◇ Other specialists	5.95	0.93	1.64	.47	67	.45	.202 **
● Overall	5.49	1.38	2.60	.31	266	.38	.147 **

**Figure 9.2** Regression of Information Flow against Proximity for four source types.

Figure 9.2 shows that the more Proximate sources also had higher Information

**Table 9.11** Standardized simple regression coefficients (beta) for Information Flow against Proximity, by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	.26	.20		.07
Agricultural press	-.14	.04	.48 *	.12
AARD publications	.10	.16	.44 *	.33 **
Other specialists	.34	.40 *	.57 **	.45 **
Overall	.29 **	.37 **	.49 **	.38 **

<sup>a</sup> Data from question IS7.5 and 8.2 and map measurement. For sample *ns* see Table 9.9.

Significance of beta (one-tailed test): \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

No significant differences among beta values at  $p = 0.05$  by *z*-test.

Flow. This would tend to reinforce the apparent effect of Proximity in a simple regression of all respondents. Controlling for institution showed this indeed to be the case: the beta value fell from .38\*\* to .23\*\* when source-type dummy variables were included in the equation. Proximity accounted for about 4% of variance in Information Flow in this equation.

Table 9.11 shows the beta values from regressions of Proximity against Information Flow for each combination of source type and institution. The rightmost column gives the overall beta values for each source type, represented by the regression lines in Figure 9.2. This table shows that while other specialists and AARD publications had slopes significantly greater than zero, they were not significantly different from the beta values of AIC publications and the agricultural press.

There was less apparent variation among institutions (the bottom line of Table 9.11) than among source types. All three institutions show a strong relationship between Proximity and Information Flow, though this was highest for AIC specialists (beta = 0.49\*\*) and lowest for province staff (beta = 0.29\*\*). However, the differences among beta scores were not significant.

The body of Table 9.11 shows that the relationship between Proximity and Information Flow was strong for AIC specialists using all sources, and less evident for specialists at the other institutions. Again, despite the apparent variation in beta values, there were no significant differences among betas either among institutions (across rows in the table) or among sources (across columns). We can thus use the overall beta value of 0.38 as an estimate of the effect of Proximity on Information Flow from sources overall.

Proximity would thus seem to be a major influence on Information Flow for all specialists, especially when using AARD publications and for other specialists as sources. The high beta values for AIC specialists is surprising given that they are closer to all sources than are province and district personnel (Table 9.10). We might thus expect Proximity to have less effect on them than on their counterparts.

Examining Figure 9.2 gives a clue as to the cause of this. Proximity seems especially important for both respondents at AICs as receivers, and other specialists as a source. Both of these samples have high overall Proximity (Table 9.10), indicated by the position of the latter's mean values near the right side of Figure 9.2. This suggests that the higher a source's Proximity, the more important Proximity becomes -- a curvilinear relationship. In other words, when a source is close by, small distances may be critical in determining whether it is used. For instance, a specialist is far more likely to use a publication in his or her own room rather than one in the library in the building next door. As the distance between source and receiver increases, such differences become less critical: if one has to travel to reach a source, it makes little difference whether the source is 15 kilometers away or 50.

Two of the three components of Proximity, question IS7.5 ("Nearest usual location of source") and the map distance are already curvilinear in nature. The map distance used a log scale, and the scale used in question IS7.5 is gives equal weight to the difference between "own office" and "other room in same building" as to the difference between "less than 50 km away" and "less than 150 km away." These two components thus already take into account this differential friction of distance. But this is not enough to account for the strength of the curvilinearity in the relationship.

## **Structure**

### **Constructing the index**

Structure refers to the organizational relationship between the source and receiver. The questionnaire contained a single item to measure this:

IS8.13 Obtaining information from [source] is an important part of your job.

Structure and Energy (also measured by a single variable, see below) loaded onto the same factor (Table 9.4), but their mutual correlation was not large enough ( $r = 0.26$ ) to justify grouping them into a single index. I therefore kept them separate.

**Table 9.12** Structure scores by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	4.24 a	4.94 a		4.71 a
Agricultural press	5.18 ab	4.76 a	5.23 ab	4.97 a
AARD publications	<b>6.00</b> b	<b>6.16</b> b	<b>6.05</b> b	<b>6.09</b> b
Other specialists	5.00 ab	4.44 a	4.65 a	4.63 a
Overall	5.09	5.09	5.31	5.14

$n = 277$ . Overall analysis of variance:  $F$  for Source: 11.85\*\* Institution: 0.11<sup>ns</sup>  
Interaction: 0.97<sup>nsa</sup> Data from question IS8.13.

Score range = 1 (low Structure) to 7. Common letters a-c in a column and x-z in a row indicate no significant difference at  $p = 0.05$  by Student-Newman-Keul's multiple range test. Highest scores in each column are in **boldface**; lowest scores are *italicized*.

### Differences among source types and institutions

Only source type significantly affected the Structure scores (Table 9.12). Respondents at all three institutions gave the highest priority to obtaining information from AARD publications. They may have done this merely because they saw this as the desired response; however, such an effect may have been mitigated because each respondent was asked about only one source, so was presented with no explicit comparison.

Province personnel gave low priority to AIC publications, though not significantly less than to the other two source types. While these publications scored somewhat better among district personnel, their relatively low score indicates that specialists do not generally see it as their job to seek information from them. This may be because of the range of materials included under "AIC publications," which range from magazines and booklets with four-color covers and inserts to cheaply produced, two-color *Liptan* fact sheets. Specialists may see themselves as an audience for the former but not the latter. Indeed, one interviewee remarked with disdain that *Liptans* looked like the used paper that "street vendors wrap peanuts in."

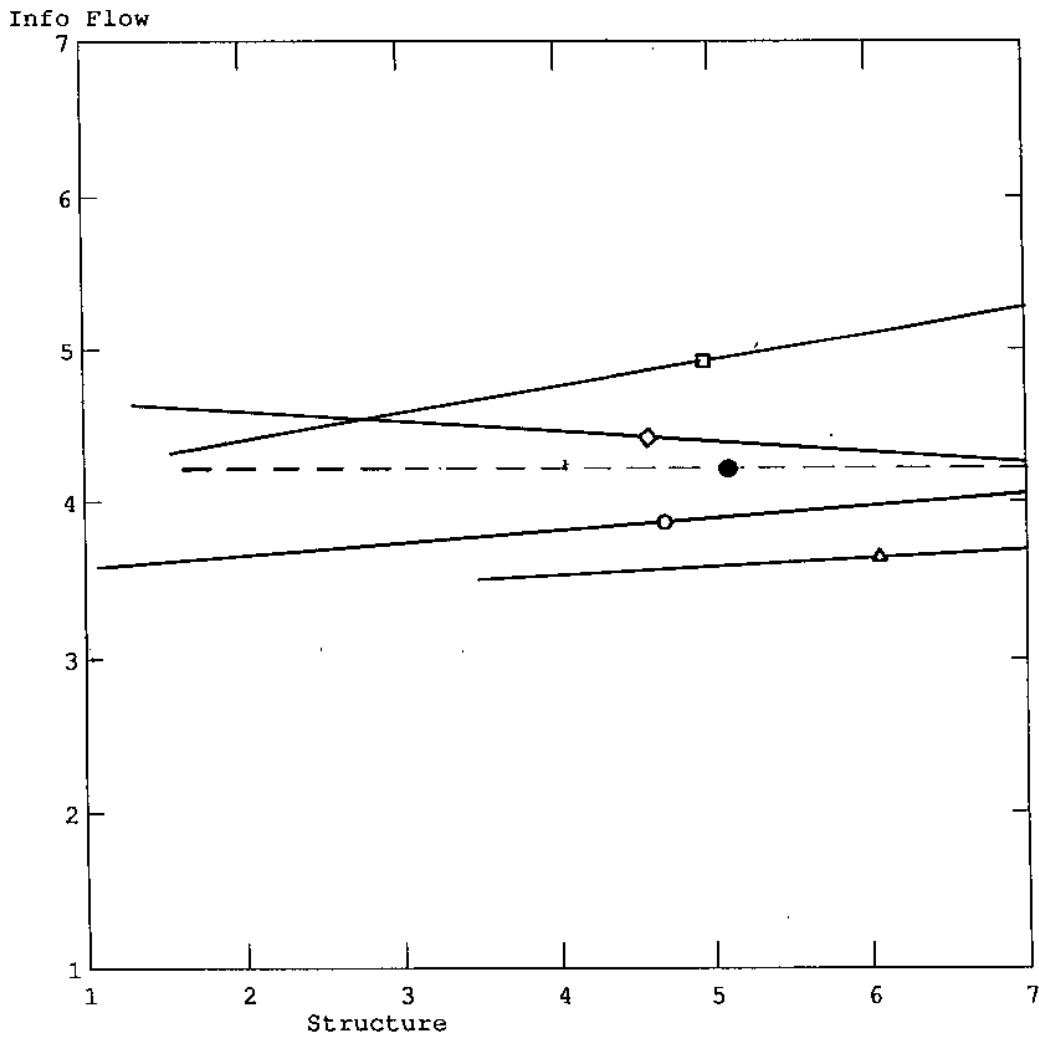
AIC staff say that extension specialists are not the main target audience for AIC publications, which are aimed primarily at field agents and farmers. But AIC staff interviewed clearly saw specialists as a secondary audience for their materials. Perhaps AIC and AARD administrators should review the types of material produced in order to target specialists more specifically.

Most respondents saw other specialists as a low priority source of information.

Nevertheless, their counterparts were major sources for many (Table 9.6). This suggests that Structure -- at least as measured here -- has little influence on actual Information Flows.

### **Influence on Information Flow**

The plot of Information Flow against Structure (Figure 9.3) shows that the slope for all respondents was flat ( $\beta = 0.02^{ns}$ ). Structure was thus not related to Information Flow: whether specialists saw it as their job to use a source had little influence on the amount of information they obtained from the source.



	Structure		Inter -cept	Slope	n	beta (=r)	R <sup>2</sup>	
	Mean	Std dev						
○ AIC publications	4.71	1.85	3.44	.09	52	.15	.022	ns
□ Agricultural press	4.98	1.74	4.04	.18	78	.35	.123	**
△ AARD publications	6.09	1.34	3.23	.07	73	.10	.010	ns
◇ Other specialists	4.63	1.63	4.73	-.06	68	-.11	.01	ns
● Overall	5.14	1.73	4.20	.01	271	.02	.000	ns

**Figure 9.3** Regression of Information Flow against Structure for four source types.

**Table 9.13** Standardized simple regression coefficients (beta) for Information Flow against Structure, by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	-.02	.18 ab		.15 ab
Agricultural press	.07	.44 ** b	.29	.35 ** b
AARD publications	.35	.16 ab	-.26	.10 ab
Other specialists	.38	-.20 a	-.35	-.11 a
Overall	.11	.00	-.13	.02

<sup>a</sup> Data from question IS8.13. For sample *ns* see Table 9.9.

Significance of beta (two-tailed test): \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

Common letters a-b in a column indicate no significant differences in beta at  $p = 0.05$  by *z*-test.

This was true for all source type and institution subsamples except one: the agricultural press. For this source the relationship was strongly positive (beta = 0.35\*\*), with Structure accounting for 12% of variance in Information Flow. Table 9.13 shows that this was due to the strong relationship between Structure and Information Flow for this source among district specialists (beta = 0.44\*\*). The beta for the press was significantly larger than that for other specialists both for district specialists and overall.

Figure 9.3 shows that the mean for AARD publications is below and to the right of those for the other three source types. This would tend to dilute any positive effect of Structure on Information Flow in a simple regression using all respondents. Controlling for source type using dummy variables shows this is indeed the case: doing so raised the beta from .02<sup>ns</sup> to .13\*. Structure accounted for a small amount (1.5%) of the overall variance in Information Flow when source type was controlled for.

Two of the subsamples, other specialists as a source and AIC specialists, had negative slopes, indicating that respondents obtained *less* information from a source, the more important they thought using it to be in their job. However, neither of these slopes were significant; the negative relationship they reflect appears to be an aberration.

Why the strong relationship between Structure and Information Flow for the agricultural press but not for the other sources? The mean respondent did not regard it as part of his or her job to use the press as a source (Table 9.12): indeed, there appears to be some stigma attached to using the newspaper *Sinar Tani* (though none for the more specialized magazines such as *Poultry Indonesia* or *Trubus*. Several interviewees admitted almost with embarrassment that they used *Sinar Tani* as a serious source. And during the study design an AARD communication official queried question wordings that implied that the press was a legitimate or desirable source for extension specialists.

Yet specialists clearly *do* use the agricultural press, *Sinar Tani* included, often because it is one of the few non-local sources available (Table 9.10). And if they see it as their job to do so, they tend to use it even more.

Some specialists may see *Sinar Tani* as a feedback mechanism that informs them about farmers' problems and concerns. I did not collect data on this, and as far as I am aware, no content analysis of *Sinar Tani* or *Trubus* has been performed. *Trubus* and other magazines contain information about particular techniques or solutions to problems. *Sinar Tani* does contain articles about pest outbreaks and other problems, and stories by and about farmers as well as extension personnel. However, these seldom air problems or voice criticisms. *Sinar Tani's* ties with the Ministry of Agriculture would seem to make it even less likely than other, privately owned newspapers to perform the role of a local advocate. It seems more likely that *Sinar Tani* fulfills the important role providing extension personnel with news about government programs and farming successes outside their own areas.

A second possible cause for the peculiar relationships displayed in Table 9.13 is suggested in the above discussion. It concerns the identity of the source. "Agricultural press" is shorthand for the words actually used in the questionnaire: translated as "agricultural newspapers/magazines (e.g., *Sinar Tani*, *Trubus*)." While *Sinar Tani's* reputation among extension specialists leaves something to be desired, that of *Trubus* and other agricultural magazines is high. Specialists may have given rather different responses if asked about *Sinar Tani* and agricultural magazines separately.

In light of this, lumping these media together in the questionnaire may have been inappropriate. It may have caused two problems, one serious, and one less so. First, a respondent may have been thinking of different publications while completing each question. In such a case, responses to one question may not have any relationship to responses to another, and we are left with large random errors.

Second, and less seriously, one respondent may have thought consistently about *Sinar Tani* in answering questions, while another may have based her responses on *Trubus*. This would have increased to variance within each source type, making significant differences among the four source types harder to obtain. But this is less serious a problem since the relationships due to the FP SCORES variables should still hold true for that individual.

The same two problems are present for Information Flow and all the FP SCORES variables and all four source types. Both AARD and the AICs produce various publications, and respondents may view each differently. For instance, the AARD newsletter *Warta Litbang* would probably be seen as more Open and of lower Capacity, and possibly as providing more Information Flow, than say, a symposium proceedings on maize. And the AIC *Liptan* fact sheets would probably fare similarly when compared with the AIC magazine *Buletin Informasi Pertanian*.

For other specialists, the problem lies in asking about the combined characteristics of several individuals, one of whom may be a close friend and office-mate, while another may be a casual acquaintance working in the provincial capital hundreds of kilometers away.

The same problem would have arisen even if I had asked specialists to respond to questions about a single publication, such as *Liptan*. Which issue? On what topic? Individual *Liptans* may vary as much along the FP SCORES dimensions as do any other source. And no single source serves all Indonesia's (or even a single province's) extension specialists. This problem could have been reduced by asking about the distinct kinds of publications separately, or avoided completely by using an experimental approach -- though this would have obviated the wish to measure the effect of all FP SCORES dimensions together.

## **Capacity**

### **Constructing the index**

Capacity refers to the amount of information a source has and to its credibility. Two questions measured this:

IS8.4 [Source] is the most credible source.

IS8.10 [Source] has more complete information than do other sources.

Based on their face validity, these two questions would seem to tap different concepts: credibility and quantity. In factor analysis these two items loaded onto separate factors: question IS8.10 onto factor 1 and IS8.4 onto factor 3 (Table 9.4). However, their mutual correlation was high ( $r = 0.48$ ), making the Cronbach's  $\alpha$  value 0.65, relatively high for an index containing only two items (Table 9.2). In addition, question IS8.4 loaded almost as heavily onto factor 1 (loading = .50, Table 9.3) as on factor 3 (loading = .60). I therefore retained both in the index.

### **Differences among source types and institutions**

Both institution and source type also significantly affected Capacity scores, though the influence of institution was too diffuse to cause any significant multiple range tests (Table 9.14). AARD publications consistently enjoyed the highest Capacity, while other specialists had the lowest.

**Table 9.14** Capacity scores by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	3.15 a	3.78 a		3.57 b
Agricultural press	3.68 ab	3.61 a	3.39 ab	3.56 b
AARD publications	<b>4.47</b> b	<b>4.82</b> b	<b>4.05</b> b	<b>4.53</b> c
Other specialists	2.79 a	3.15 a	2.72 a	2.94 a
Overall	3.51	3.87	3.42	3.68

$n = 271$ . Overall analysis of variance:  $F$  for Source: 17.90\*\*Institution: 3.42\*  
Interaction: 0.52<sup>nsa</sup> Data from question IS8.4 and 8.10. Score range = 1 (low Capacity) to 7. Common letters a-c in a column and x-z in a row indicate no significant difference at  $p = 0.05$  by Student-Newman-Keul's multiple range test. Highest scores in each column are in **boldface**; lowest scores are *italicized*.

AARD publications' high Capacity scores are not surprising, given the perceived role of science in providing complete and authoritative information on many topics. The low Capacity of the agricultural press and AIC publications may be related to the generally poor opinions many specialists appear to hold about these sources, discussed in the section on Structure above. Indeed, Structure and Capacity are highly correlated with each other (Table 10.1 below).

The poor Capacity attributed to other specialists may be because publications are generally seen as having more information than do individuals. It may also reflect the possibility that specialists estimate their colleagues' skills (and by extension, their own abilities) as low. The surveys collected other data tangentially pertaining to this possibility. While extensionists' lack of technical and extension skills were not among the most important problems listed in question P4, specialists still thought these problems were on average more than "important" (Table 7.15). The lack of training opportunities was named as the most serious problem facing specialists in obtaining information (question P5, Table 7.16). And such opportunities are indeed rare (questions IS10.3 and 11.1, Table 7.14). Such problems compound the fact that half of Indonesia's extension specialists have no farm background (Table 7.7 and Table 7.8), most have less than six years of experience as a subject-matter specialist, and fewer than one in ten have an advanced degree (Table 7.5).

While the overall analysis of variance presented in Table 9.14 indicates a significant effect of institution on Capacity, this was too weak to produce any significant differences among institutions. However, district specialists generally placed most credence in the sources, while AIC specialists had the least.

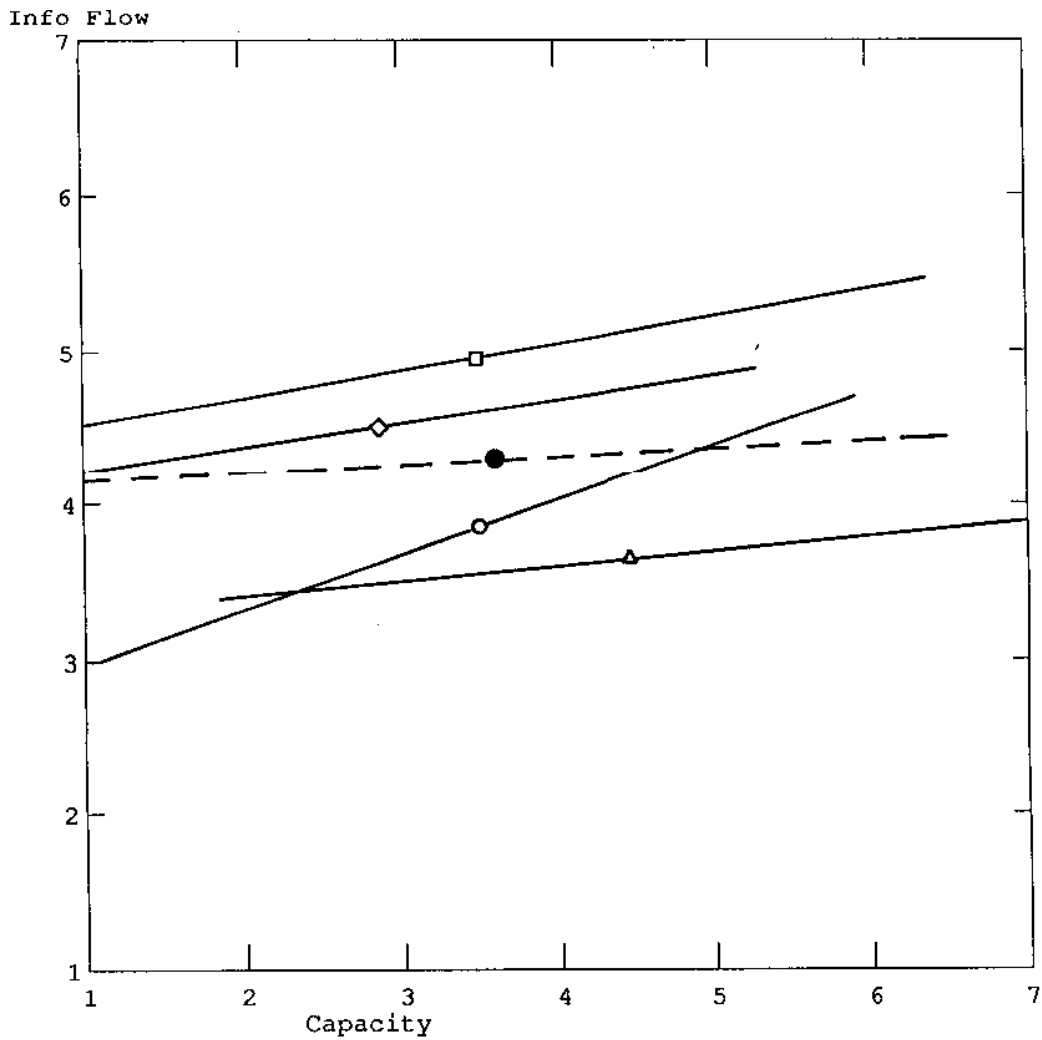
The reasons for this are not clear. Being more familiar with a wide variety of

sources, AIC respondents may be more realistic about the completeness or credibility of any one source. On the other hand, we might expect district specialists to invest less credence in sources they see as having little relevance to local field problems. The data tend to support the former view. Having said that, other explanations are possible: unraveling the role of Capacity is particularly difficult because this index is significantly correlated with six of the other seven FP SCORES variables (Table 10.1).

### **Influence on Information Flow**

In general, respondents' opinions of a source's Capacity did not significantly affect the amount of information they obtained from it ( $\beta = 0.07^{ns}$ ).

But as Figure 9.4 shows, the slope for all respondents was considerably flatter than that for each of the four sources considered individually. The slopes for AIC publications ( $\beta = 0.40^{**}$ ) and the agricultural press ( $\beta = 0.28^{**}$ ) were steep, while that for other specialists was only marginally non-significant ( $p = 0.051$ ). The slope for AARD publications was weaker but still larger than the overall value (Table 9.15).



	Capacity		Inter- cept	Slope	n	beta (=r)	R <sup>2</sup>	
	Mean	Std dev						
◇ AIC publications	3.57	1.21	2.62	.35	51	.40	.156	**
□ Agricultural press	3.56	1.44	4.33	.18	77	.28	.079	*
△ AARD publications	4.53	1.34	3.22	.10	74	.14	.02	ns
○ Other specialists	2.94	1.19	4.03	.16	63	.21	.04	ns
● Overall	3.67	1.43	4.08	.06	265	.07	.006	ns

**Figure 9.4** Regression of Information Flow against Capacity for four source types.

**Table 9.15** Standardized simple regression coefficients (beta) for Information Flow against Capacity, by source type and institution<sup>a</sup>.

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	.09	.44 **		.40 **
Agricultural press	.14	.33 *	.33	.28 *
AARD publications	.25	.28 *	.18	.14
Other specialists	.24	.40 *	-.02	.21
Overall	.01	.14	.06	.07

<sup>a</sup> Data from question IS8.4 and 8.10. For sample *ns* see Table 9.9.  
Significance of beta: \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

No significant differences among beta values at  $p = 0.05$  by *z*-test.

Among the three institutions, only district specialists had a significant relationship between Capacity and Information Flow. As with the sample overall, this relationship was stronger for the individual sources than for district specialists as a whole, all four of which were significant.

Despite the variations among the slopes of the various subsamples in the table, there were no significant differences in beta within sources or institutions.

The lack of an overall relationship between Capacity and Information Flow despite the significant relationships within sources was because of differences between the four source types. The high Capacity AARD publications were associated with low Information Flow, while the other three sources, with their lower Capacity scores, generated higher flows. This appeared to be related to factors other than Capacity. Within each source, however, respondents who felt a source had high Capacity used it more than others who saw it as lower in Capacity.

This can be seen from Figure 9.4: the higher Capacity sources generally have lower Information Flow scores than the lower Capacity sources. Controlling for source type by including dummy variables in the regression equation revealed a fairly strong underlying relationship between Capacity and Information Flow: its beta value was .23\*\* (compared to .07<sup>ns</sup> without controlling for source type), and it accounted for 4% of variance in Information Flow. Thus, despite Capacity's overall apparent lack of significance, respondents do tend to use sources they think have higher Capacity.

AARD administrators clearly do not have to worry about whether their publications are perceived as complete or credible: most specialists think they are both. And the flat regression for AARD publications suggests that improving the perceived Capacity will not have any effect on specialists' use of AARD publications as information sources.

The story is different for the other sources, however. Their low mean Capacity

scores indicate that they have generally low credibility and are seen as providing less than sufficient amounts of information. At the same time, increasing the Capacity of these sources raises the amount of information specialists obtain from them.

## **Openness**

### **Constructing the index**

Openness is the ease of understanding and using the source's information. Three questions measured this concept:

IS8.5 Compared with other sources, [source] is easy to use for extension purposes.

IS8.9 [Source] provides information in a ready-to-use form.

IS8.15 Compared with other sources of information about agricultural technology, [source] is easy to understand.

The three measures all loaded onto factor 1 (Table 9.4) and were highly mutually correlated. With an  $\alpha$  of 0.75 and mean inter-item correlation of 0.5 (Table 9.1 and Table 9.2), Openness was the most reliable of all the FP SCORES indices. This is despite the conceptual distinction that could be drawn between the ease of understanding a source and the ease of using it.

### **Differences among source types and institutions**

Source type and the source-institution interaction were both significant influences on Openness scores. Since AIC publications are designed for use by extension workers, it is not surprising that they were seen overall as the easiest sources to understand and use. The agricultural press, written in a journalistic style, was also seen as easy to understand.

Somewhat surprisingly, other specialists were seen as the least Open source. One interviewee hinted that other SMSs were reluctant to share information. Another reason may be that relatively few specialists share offices with others in the same field: a livestock extensionist may indeed have little information of use to a crops specialist. In any case, the reported lack of Openness among specialists is disturbing given the importance of the oral transmission of information within the extension system.

AARD publications also had relatively low Openness scores (Table 9.16). Most AARD publications are aimed at scientists rather than practitioners. They describe the results of research rather than contain technology recommendations, so are difficult for extension personnel to interpret and use. The Openness scores reflect this.

**Table 9.16** Openness scores by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	4.59	<b>5.19</b> b		<b>4.99</b> c
Agricultural press	<b>4.81</b>	4.57 ab	<b>5.03</b> b	4.75 bc
AARD publications	4.40 y	4.78 b y	3.52 a x	4.35 ab
Other specialists	4.22	3.98 a	3.79 a	3.98 a
Overall	4.50 xy	4.65 y	4.14 x	4.50

$n = 270$ . Overall analysis of variance:  $F$  for Source: 6.69\*\* Institution: 1.84<sup>ns</sup>

Interaction: 3.22\*\*<sup>a</sup> Data from questions IS8.5, 8.9 and 8.15. Score range = 1 (low Openness) to 7. Common letters a-c in a column and x-z in a row indicate no significant difference at  $p = 0.05$  by Student- Newman-Keul's multiple range test. Highest scores in each column are in **boldface**; lowest scores are *italicized*.

Overall, district specialists thought that sources were more Open than did their AIC counterparts. This was particularly the case with AARD publications: unlike AIC specialists, district (and province) respondents saw them as being relatively easy to use. This must be tempered by the knowledge that AIC specialists were significantly both closer to AARD publications (Table 9.10) and more familiar with them (Table 9.7). The only AARD publication district specialists have regular access to is the newsletter *Warta Litbang*, which is written in a semi-popular rather than a scientific style. District specialists may have based their responses on this, while province and AIC respondents may have considered also AARD's more technical materials and hence given them lower Openness scores.

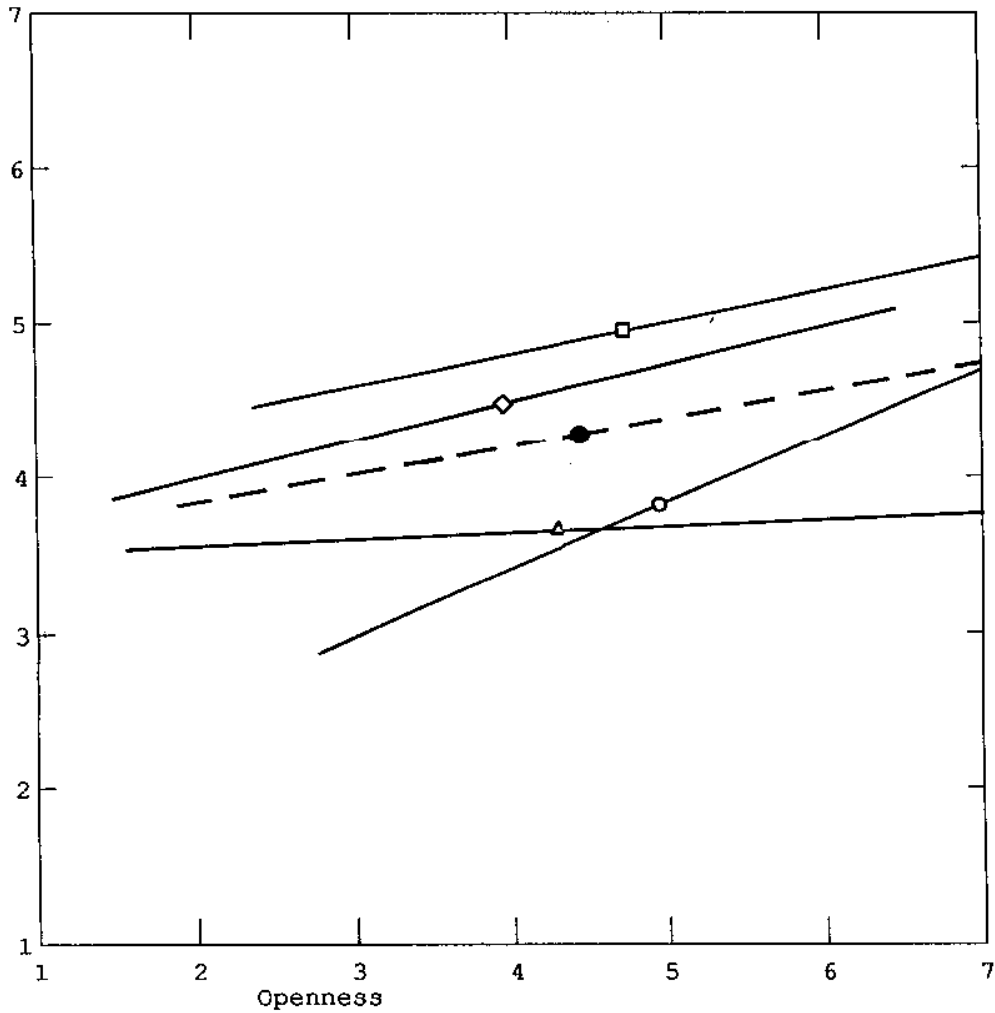
Nevertheless, district and provincial specialists appear to view AARD publications as potential information sources -- if they can gain access to them. They may also have a higher tolerance for relatively hard-to-use sources. A district specialist with relatively few alternative sources of information may regard all as being Open, while a specialist at an AIC, with far greater information resources at hand, may be more critical of sources that are difficult to use. However, this speculation cannot be confirmed through the data available.

### **Influence on Information Flow**

Openness was significantly related to Information Flow (beta = 0.24\*\* overall), explaining about 6% of variance in the dependent variable. This means that if respondents saw a source as easy to understand and use in extension activities, they would draw on it for information.

This relationship held true for respondents at all three institutions (bottom line of Table 9.17) and all the source types except AARD publications (Figure 9.5). The strongest relationship among the source types was for AIC publications (beta = 0.46\*\*), seen as the most Open source of the four (Table 9.16). High correlations between Openness and Information Flow were also evident for other specialists (beta = 0.37\*\*) and the agricultural press (beta = 0.30\*\*).

Info Flow



	Openness		Inter -cept	slope	n	beta (= r)	R <sup>2</sup>	
	Mean	Std dev						
○ AIC publications	4.99	1.12	1.65	.44	51	.46	.207	**
□ Agricultural press	4.75	1.23	3.93	.22	76	.30	.090	**
△ AARD publications	4.35	1.39	3.46	.05	74	.08	.006	ns
◇ Other specialists	3.98	1.27	3.45	.26	64	.37	.13	**
● Overall	4.50	1.31	3.40	.20	265	.24	.055	**

**Figure 9.5** Regression of Information Flow against Openness for four source types.

AARD publications were the exception to this. Overall, specialists who found AARD publications easy to use and understand obtained no more information from them than did their colleagues who saw them as less Open (beta = 0.08<sup>ns</sup>). Looking along the AARD publications row in Table 9.17, we see that this was true for province and AIC respondents but not district personnel, for whom Openness was consistently an important determinant of Information Flow. The reasons for this inconsistency are unclear.

Controlling for source type has no effect on the influence of Openness on Information Flow. Without such a control, the beta value was .24\*\* and the amount of variance explained, 5%. When dummy variables for source type are included in the regression equation, both values remain unchanged.

Beta values did not vary among themselves among either source types or institutions. The overall value of 0.24\*\* can thus be used as an estimate of the effect of Openness on Information Flow. The ease of understanding and using a source thus appears to be a major influence on how much information specialists obtain from it.

## Reward

### Constructing the index

Reward refers to the relevance of the source's information to the receiver. It was measured by three questions:

IS8.3 Much information from [source] is not relevant to problems faced by farmers in your area.

IS8.8 [Source] often discusses topics that are closely related to conditions in your area.

IS8.12 [Source] often provides information that is not new to you.

**Table 9.17** Standardized simple regression coefficients (beta) for Information Flow against Openness, by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	.50 *	.42 **		.46 **
Agricultural press	.10	.30 *	.37	.30 **
AARD publications	.11	.41 **	.05	.08
Other specialists	.35	.38 *	.48 *	.37 **
Overall	.23 *	.25 **	.38 **	.24 **

<sup>a</sup> Data from question IS8.5, 8.9 and 8.15. For sample *ns* see Table 9.9. Significance of beta: \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

No significant differences among beta values at  $p = 0.05$  by *z*-test.

**Table 9.18** Reward scores by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	<i>3.71</i> a	4.43 ab		4.19 a
Agricultural press	4.29 a	<i>4.03</i> a	4.29	4.15 a
AARD publications	5.09 b y	4.33 abxy	4.33 x	4.50 a
Other specialists	<b>5.29</b> b	<b>5.13</b> b	<b>4.87</b>	<b>5.11</b> b
Overall	4.59	4.45	4.46	4.49

$n = 267$ . Overall analysis of variance:  $F$  for Source: 4.26\*\*Institution: 0.74<sup>ns</sup>  
 Interaction: 0.15<sup>nsa</sup> Data from questions IS8.3 and 8.12. Score range = 1 (low Reward) to 7. Common letters a-c in a column and x-z in a row indicate no significant difference at  $p = 0.05$  by Student- Newman-Keul's multiple range test. Highest scores in each column are in **boldface**; lowest scores are *italicized*.

Codes for responses to questions IS8.3 and IS8.12 were reversed because these items were worded negatively.

The first two questions appear to tap the Reward concept better than the last. And their similar wordings lead us to expect a strong correlation between them, and weaker relationships between these and question IS8.12. This was not the case: question IS8.3 was more closely associated with question IS8.12 ( $r = .31$ ) than with 8.8 ( $r = .21$ ), and the correlation between questions IS8.8 and IS8.12 was negligible ( $r = .04$ ) (Table 9.1). In addition, question IS8.8 loaded heavily onto factor 1 in factor analysis, while the other two Reward measures loaded onto factor 2 (Table 9.4). This may have been because both questions IS8.3 and IS8.12 were worded negatively.

I therefore dropped question 8.8, leaving a Reward index composed of two items and raising the mean inter-item correlation from  $r = 0.19$  to 0.32 and the Cronbach's  $\alpha$  from 0.42 to 0.48 (Table 9.2).

### Differences among source types and institutions

Source type significantly affected overall Reward scores, with other specialists scoring consistently higher than the remaining three sources (Table 9.18). Most "other specialists" work in the same locality as the survey respondents, so have information that is more locally relevant than do the nationally or provincially oriented publications.

We might expect provincially produced AIC publications to score higher on Reward than do the national AARD materials and press. That they do not is because of their low score among province specialists -- a finding difficult to explain. Province

specialists gave AIC publications low scores on several other measures also: Familiarity, Structure, Capacity, Energy and Synergy. Low scores on each of these variables may be interrelated.

The effects of institution and the source-institution interaction were not significant overall. However, AARD publications were significantly more Rewarding for province personnel than for their AIC colleagues, and the difference between province and district specialists falls just short of significance.

It is easy to speculate why province specialists obtained more Reward from AARD publications than did their district colleagues. They are closer to and somewhat more familiar with the AARD publications than are district personnel (Table 9.7 and Table 9.10). Because of their larger territories, they also deal with a greater range of commodities and agro-ecosystems, making a greater proportion of AARD publications relevant to their needs.

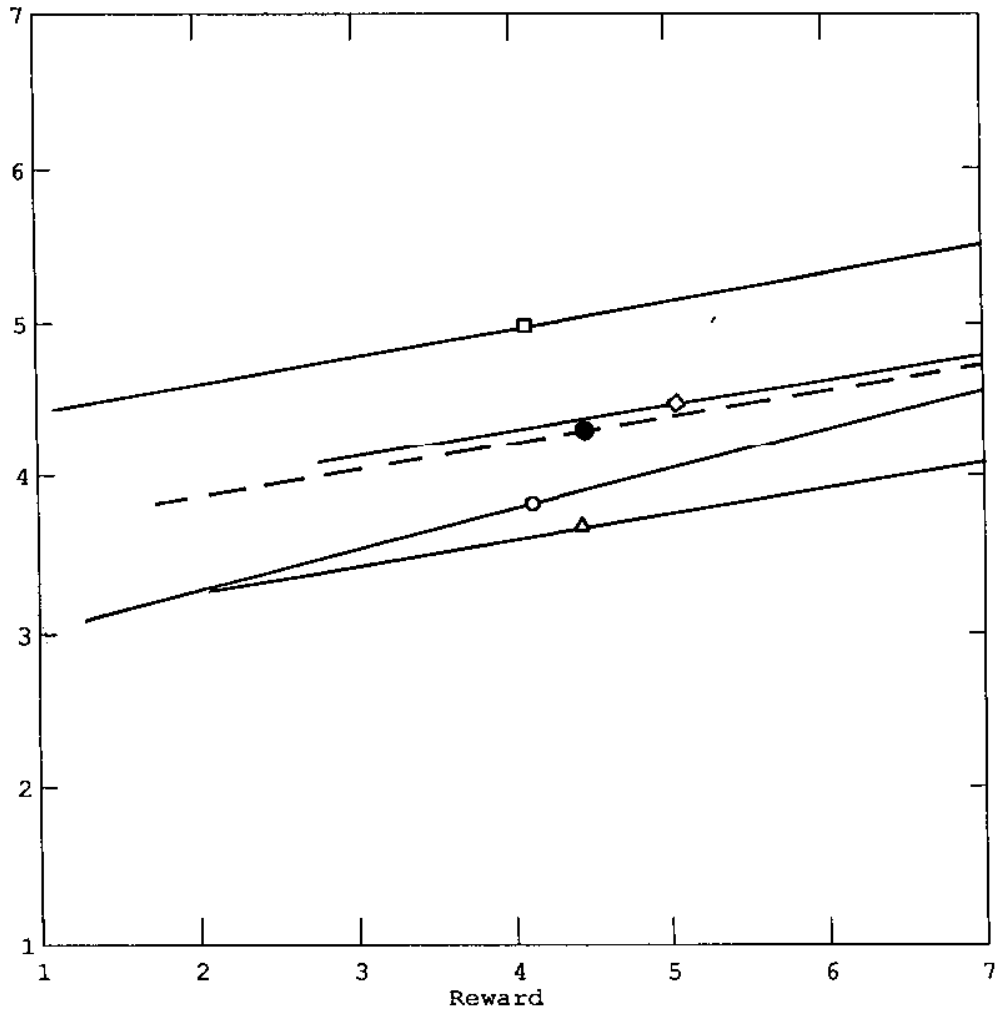
It is less easy to see why province specialists should get more Reward from AARD publications than do AIC staff. The two groups are similar in the frequency of their contacts with researchers (Table 7.14). Perhaps AIC staff are familiar with a wider range of AARD publications than are province personnel (Table 9.7) but find a smaller proportion relevant to their needs.

### **Influence on Information Flow**

The Reward level of a source was significantly related to the amount of information specialists obtained from it ( $\beta = 0.23^{**}$ ). This means that a source's relevance to local conditions helped determine how much specialists used that source.

The relationship between Reward and Information Flow held for all the four source types (Figure 9.6). The strongest relationships were for AIC publications and the agricultural press. It held also when source type was controlled using dummy variables: in this regression equation, the beta value was  $.26^{**}$  and the proportion of variance explained, 6%.

Info Flow



	Reward		Inter -cept	Slope	n	beta (= r)	R <sup>2</sup>	
	Mean	Std dev						
○ AIC publications	4.19	1.43	2.75	.26	52	.35	.121	**
□ Agricultural press	4.15	1.55	4.20	.19	76	.32	.104	**
△ AARD publications	4.50	1.24	2.90	.17	72	.22	.051	ns
◇ Other specialists	5.11	1.18	3.62	.17	61	.23	.050	ns
● Overall	4.49	1.40	3.50	.18	261	.23	.051	**

**Figure 9.6** Regression of Information Flow against Reward for four source types.

It is possible that some respondents saw the agricultural press as providing Reward because it informed them of agricultural problems rather than how to solve them. I discuss this possibility above in the section on Structure.

The relationship between Reward and Information Flow did not hold across respondents at all institutions, however: only district personnel had a significant beta score (0.30\*\*, bottom line of Table 9.19). The body of the table shows that this was because Reward consistently affected Information Flow for district specialists across all source types, unlike the case for province and AIC personnel. The lack of significance for several of the source-institution combinations is undoubtedly due to the small *ns* involved (Table 9.9). But the small values and even negative sign of other combinations are difficult to explain, as are the small betas for province and AIC specialists.

Despite these apparent variations, there were no significant differences in magnitude among beta scores either within columns or across rows. We can therefore use the overall figure of  $\beta = 0.23^{**}$  as representing the effect of Reward on Information Flow.

## Energy

### Constructing the index

The amount of effort a specialist expended to obtain information from the source was reflected by the source's Energy. The questionnaire contained only one item to measure this:

IS8.7 You devote a lot of effort to obtain information from [source].

In factor analysis, this question loaded most heavily on factor 3, along with a measure of credibility (Capacity) and ease with which the source could be found (Proximity)

**Table 9.19** Standardized simple regression coefficients (beta) for Information Flow against Reward, by source type and institution<sup>a</sup>.

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	.35	.31 *		.35 **
Agricultural press	.06	.35 *	.41 *	.32 **
AARD publications	-.04	.43 **	.22	.22
Other specialists	.22	.48 **	-.11	.23
Overall	.11	.30 **	.16	.23 **

<sup>a</sup> Data from question IS8.3 and 8.12. For sample *ns* see Table 9.9.

Significance of beta: \*  $p < 0.05$ ; \*\*  $p < 0.01$ . No significant differences among beta values at  $p = 0.05$  by *z*-test.

**Table 9.20** Energy scores by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	<i>2.56</i>	3.53 a		3.22 a
Agricultural press	3.25	3.32 a	3.82 b	3.44 a
AARD publications	<b>3.33</b>	<b>4.56</b> b	<b>3.95</b> ab	<b>4.15</b> b
Other specialists	<i>2.76</i>	<i>3.00</i> a	<i>2.78</i> a	<i>2.88</i> a
Overall	<i>2.97</i>	<i>3.62</i>	<i>3.56</i>	<i>3.45</i>

$n = 273$ . Overall analysis of variance:  $F$  for Source: 5.90\*\*Institution: 2.55<sup>ns</sup>

Interaction: 0.99<sup>nsa</sup> Data from question IS8.7. Score range = 1 (low Energy) to 7. Common letters a-c in a column and x-z in a row indicate no significant difference at  $p = 0.05$  by Student-Newman-Keul's multiple range test. Highest scores in each column are in **boldface**; lowest scores are *italicized*.

(Table 9.4). The relationship with credibility seems to reflect a causal relationship (we devote much effort to obtain a source we perceive as credible) rather than a unitary concept. And the relationship with ease of finding the source is negative: we must devote effort to obtaining a source that is difficult to find. Despite its common factor loading with the Energy item, the ease of finding the source seemed to fit better with the other Proximity measures (see the section on Proximity above). I therefore treated the Energy item as a separate index as originally planned.

### Differences among source types and institutions

Respondents at all three institutions consistently said they devoted the most effort to obtaining information from AARD publications (Table 9.20). This was especially true for district specialists, possibly because these found such publications most difficult to find (Table 9.10). Of course, this may have been the socially acceptable response (see the discussion on Structure above), though the questionnaire item (question IS8.7) invited no specific comparison with other sources.

Seeking information from other specialists was generally allocated the least effort. This supports the argument made above (see the sections on Familiarity and Structure) that while many specialists may have the opportunity to exchange information, they do not necessarily do so.

While the differences are not significant, it seems that province specialists expend least effort to seek information. That they nevertheless report obtaining about the same amount as district specialists indicates that Energy may not be a major factor in determining Information Flows.

**Influence on Information Flow**

The amount of Energy respondents put in to seeking information from a source was not significantly related to the amount of information they actually obtained. In fact, the overall relationship between Energy and Information Flow was marginally negative (beta =  $-.06^{ns}$ , Table 9.21).

This lack of relationship held true for all source types and institutions (Figure 9.7),

**Table 9.21** Standardized simple regression coefficients (beta) for Information Flow against Energy, by source type and institution<sup>a</sup>.

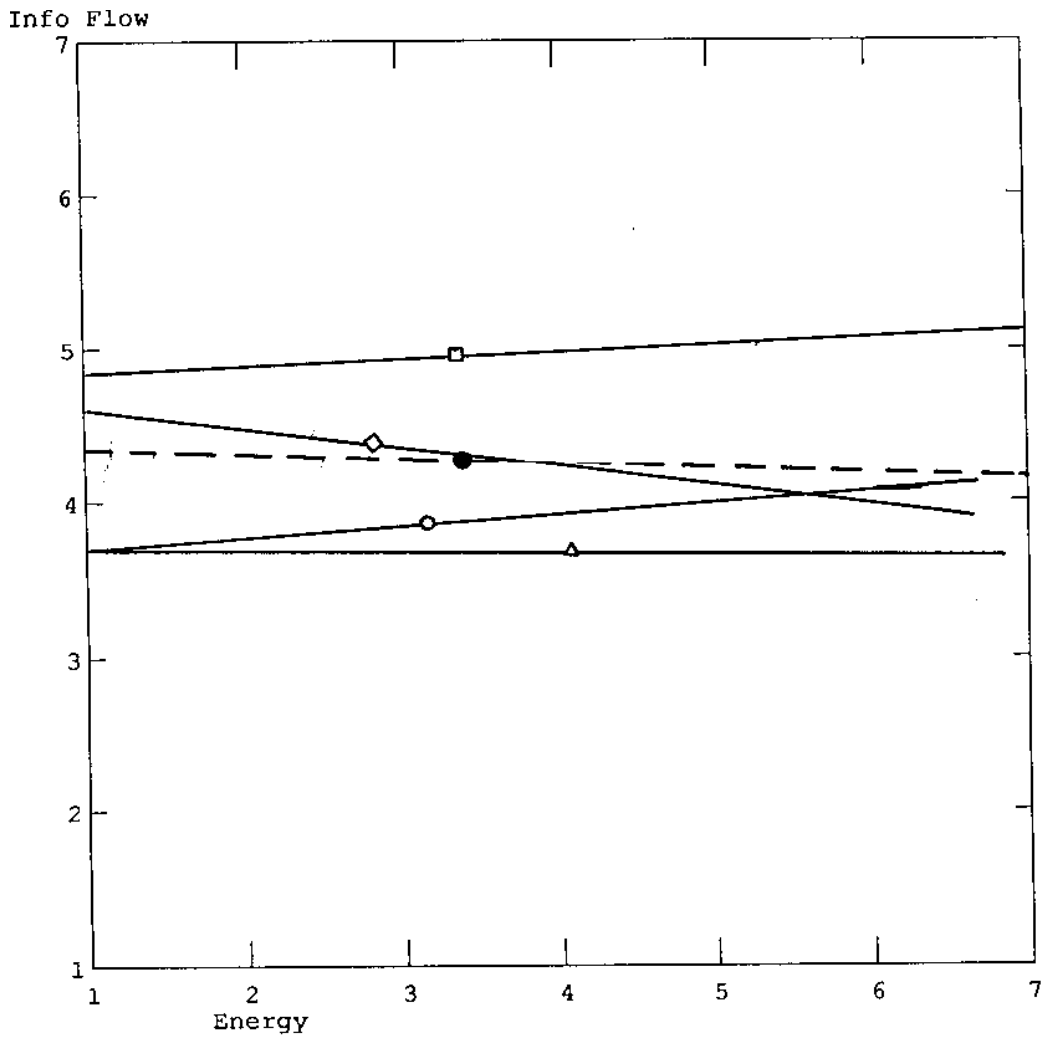
Source type	Institution			Overall
	Province	District	AIC	
AIC publications	-.12	.14		.13
Agricultural press	.12	.02	.24	.10
AARD publications	.46 *	-.16	.24	-.02
Other specialists	.10	-.27	-.30	-.22 *
Overall	.15	-.16 *	.08	-.06

<sup>a</sup> Data from question IS8.7. For sample *ns* see Table 9.9.

Significance of beta: \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

No significant differences among beta values at  $p = 0.05$  by *z*-test.

and when source type was controlled for using dummy variables (beta = .00<sup>ns</sup>). Only one beta value was significantly positive: that for AARD publications among province specialists, indicating that the more effort these respondents put into using this source, the more information they obtained. This is what we would expect.



	Energy		Inter- -cept	Slope	n	beta (=r)	R <sup>2</sup>	
	Mean	Std dev						
○ AIC publications	2.88	1.76	3.61	.08	50	.13	.017	ns
□ Agricultural press	4.14	1.94	4.78	.05	77	.10	.011	ns
△ AARD publications	3.44	1.74	3.70	-.01	74	-.02	.000	ns
◇ Other specialists	3.22	1.84	4.72	-.12	66	-.22	.047	ns
● Overall	3.45	1.87	4.37	-.03	267	-.06	.003	ns

**Figure 9.7** Regression of Information Flow against Energy for four source types.

However, two subsamples had significant *negative* relationships between Energy and Information Flow: other specialists as sources (beta = -0.22\*), and specialists at district offices (beta = -0.16\*). This strange result implies that putting more effort into using a source actually reduces the amount of information that source yields.

A possible reason for this is the distinction between information search and receptivity (Atkin 1973:238; see also Chapter 5). Some information comes to us without needing to look for it (information *receptivity*). In the context of this study, such information is likely to arrive on specialists' desks via the agricultural press and AIC publications without any effort on their part, and through conversations with colleagues. The total amount of information obtained from these sources is larger than from AARD publications, but the quality of a particular item is not as great. This phenomenon is akin to the strength-of-weak-ties theory (see Chapter 5).

AARD publications, on the other hand, are not widely distributed because of their short print runs and limited funding for distribution (Chapter 4). They thus are not sent to most specialists, as reflected by their low Proximity scores relative to other sources (Table 9.10). Nevertheless, specialists think they are useful (Table 9.18 and Table 9.14) and expend effort to obtain information from them (Table 9.20). This is information *search*.

Why, then, is Energy not significant for AARD publications? Surely, if these are hard to find, specialists should devote Energy to getting them, and this should pay off? This appears to indeed be the case for specialists at province offices (beta = .46\*) and AICs (beta = .24<sup>ns</sup>). Small numbers of AARD publications are indeed sent to province *Dinas* offices and AICs, though not directly to SMSs at these institutions -- hence the Energy required to search for them. But this effort pays off through higher Information Flow.

District specialists have a harder time finding AARD publications, however. Only the AARD newsletter *Warta Litbang* is sent regularly to district *Dinas* offices, and this has experienced lapses in publication due to funding shortages. The district specialists thus must try hard to find these publications, as shown by the high mean Energy score of 4.56 in Table 9.20. That the difficulties in doing so frustrate their efforts is shown by the negative regression slope (beta = -.16) in Table 9.21.

## **Synergy/Timeliness**

### **Constructing the index**

Synergy refers to the timing and mutual reinforcement of information from different sources. I tried to measure this concept using two questions:

- IS8.1 Information from [source] often does not agree with information from other sources.
- IS8.6 [Source] usually has information that is currently needed (timely).

**Table 9.22** Timeliness scores by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	3.88	4.49		4.29
Agricultural press	<b>4.88</b>	<b>4.78</b>	<b>4.86</b> b	<b>4.83</b>
AARD publications	4.56 xy	4.68 y	3.67 a x	4.37
Other specialists	4.59	<i>4.13</i>	3.95 ab	<i>4.18</i>
Overall	4.48	4.54	4.18	4.45

$n = 274$ .

Overall analysis of variance:  $F$  for Source: 2.87\*

Institution: 1.76<sup>ns</sup>      Interaction: 1.34<sup>ns</sup>

<sup>a</sup> Data from question IS8.6. Score range = 1 (low Timeliness) to 7. Common letters a-c in a column and x-z in a row indicate no significant difference at  $p = 0.05$  by Student-Newman-Keul's multiple range test. Highest scores in each column are in **boldface**; lowest scores are *italicized*.

Synergy is perhaps conceptually the weakest of Havelock and Lingwood's original HELP SCORES variables. This is shown by the poor correlations between the two measures used ( $r = 0.13$ ), the *a priori* index's low Cronbach's  $\alpha$  of 0.23 (Table 9.2), and the items' loading onto different factors (Table 9.4). Synergy is thus clearly not a concept adequately measured by this study, if indeed it is a unitary concept at all.

I chose to retain question IS8.6, measuring timeliness, as being the more likely to affect Information Flow. Since the term Synergy is not appropriate to refer to this measure, I refer to it as *Timeliness* in the following discussion. I dropped question IS8.1 from the analysis altogether.

### Differences among source types and institutions

The agricultural press scored highest on Timeliness with respondents at all three institutions (Table 9.22). This was as expected as a biweekly newspaper like *Sinar Tani* or a monthly magazine like *Trubus* can provide more timely information than the other sources.

The content of most AARD publications in particular depends more on research projects planned and executed up to several years beforehand, rather than on rapidly changing field conditions. And because they depend on the AICs' financial planning procedures and are based largely on other information sources, AIC publications also have long lead times. Other specialists have infrequent opportunities for visiting researchers and training, so may also lack up-to-date information.

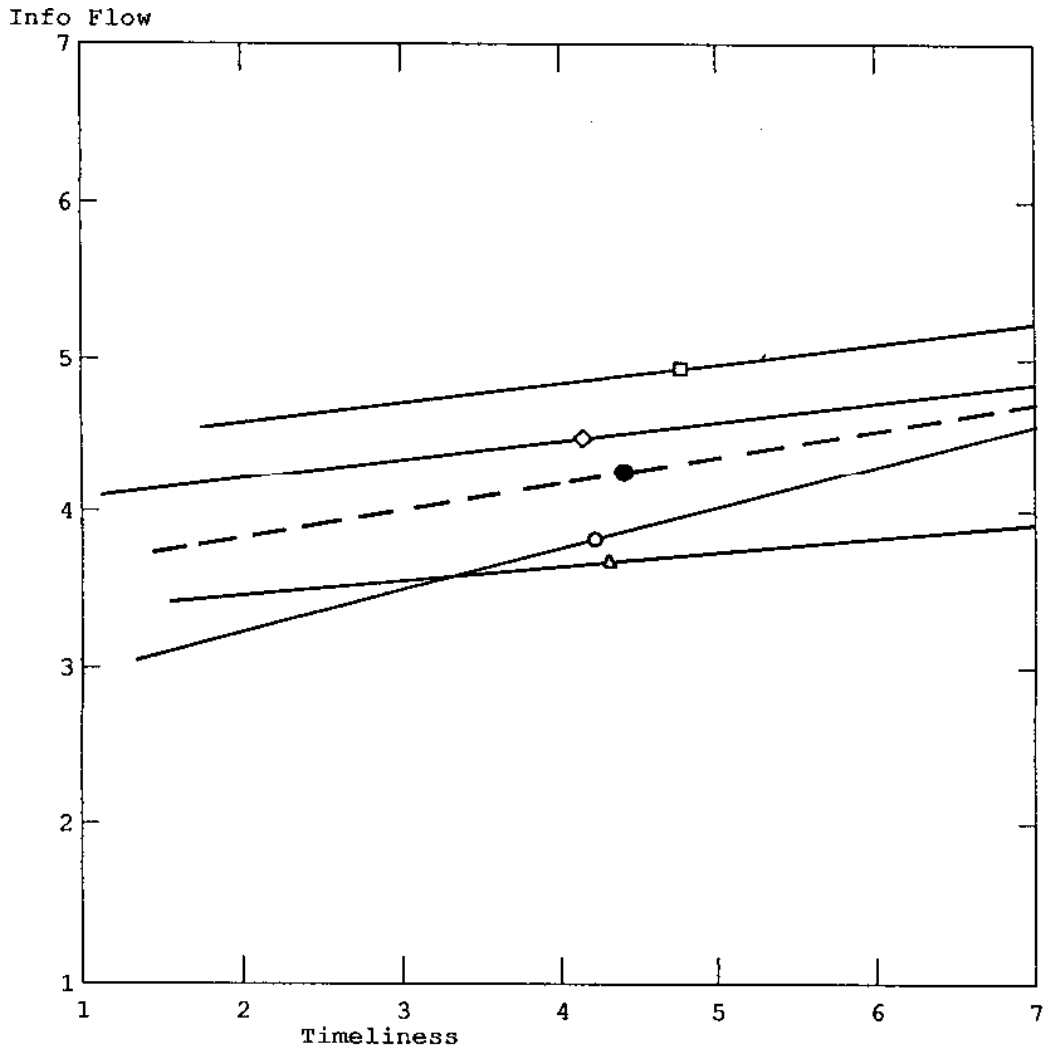
Nevertheless, these differences among sources were significant only for AIC specialists. District respondents were rather more optimistic than their colleagues about the published sources, while province specialists saw AIC publications as least timely.

Institution had no significant effect on Timeliness levels -- except for AARD publications, which district specialists saw as being timelier than did AIC respondents. This is difficult to understand, given that district personnel are not sent most AARD publications. Perhaps AIC specialists, more tied into information networks generally, see AARD publications as relatively less timely than other sources they are familiar with, whereas district personnel have few other sources to compare them with.

Another possibility is that specialists have different views of what constitutes "timeliness." AIC specialists, and to a lesser extent those at province offices, tend to package information and pass it on to others. District specialists, on the other hand, tend to use information more directly. District personnel may thus see a publication as "timely" if it concerns problems they are currently trying to solve (as was indeed the intent of the question wording). AIC personnel may look more at how soon they received the publication after it was written (or when the research was performed, or when a symposium reported in the publication was held). Indeed, several interviewees mentioned that they had not recently received a copy of the AARD newsletter *Warta Litbang* (which had not been published because of funding shortages).

### **Influence on Information Flow**

With an overall beta value of .25\*\*, Timeliness was relatively closely related with Information Flow (Table 9.8). This means that the timeliness of a source is an important factor in determining whether SMSs use it.



	Timeliness		Inter-cept	Slope	n	beta (=r)	R <sup>2</sup>	
	Mean	Std dev						
○ AIC publications	4.29	1.47	2.69	.27	52	.37	.138	**
□ Agricultural press	4.82	1.57	4.33	.13	78	.22	.050	*
△ AARD publications	4.37	1.43	3.29	.09	74	.13	.018	ns
◇ Other specialists	4.19	1.55	3.95	.13	65	.21	.043	ns
● Overall	4.45	1.52	3.46	.18	269	.25	.065	**

**Figure 9.8** Regression of Information Flow against Timeliness for four source types.

This relationship held generally for the various sources and institution types (Table

**Table 9.23** Standardized simple regression coefficients (beta) for Information Flow against Timeliness, by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	.34	.36 *		.37 **
Agricultural press	.22	.10	.52 **	.22 *
AARD publications	.20	.38 *	.17	.13
Other specialists	-.22	.36 *	.21	.21
Overall	.24 *	.25 **	.39 **	.25 **

<sup>a</sup> Data from question IS8.6. For sample *ns* see Table 9.9.

Significance of beta: \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

No significant differences among beta values at  $p = 0.05$  by *z*-test.

9.23). There was some variation in the magnitude of the betas among the subsets of respondents, with province specialists even returning a (non-significant) negative value for information flows from their colleagues. This appears to be an aberration due to a small *n*. The overall beta for AARD publications was non-significant but positive, while that for AARD publications among district respondents was reasonably strong. The relationship with Information Flow held also when using dummy variables to control for source type: the beta value for this regression was .21\*\*, and the amount of variance explained, 4%.

**Table 9.24** Standardized simple regression coefficients (beta) for amount of information obtained against Timeliness, by source type and institution<sup>a</sup>

Source type	Institution			Overall
	Province	District	AIC	
AIC publications	.45	.33 *		.36 **
Agricultural press	.09	.04	.48 *	-.09
AARD publications	.02	.10	.07	.17
Other specialists	-.19	.29	-.18	.09
Overall	.15	.11	.11	.10

<sup>a</sup> Data from questions IS5 and IS8.6. For sample *ns* see Table 9.9.

Significance of beta: \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

That Timeliness is related to Information Flow may be merely because the two variables measure the same thing. The Information Flow index contains two variables that measure the frequency-of-receiving information (IS7.1 and IS7.2), plus another that is closely related (IS7.3).

To test this, I regressed the remaining variable in the Information Flow index (IS5, measuring amount of information) alone against Timeliness (Table 9.24). Several of the beta values significant in Table 9.23 failed to attain significance in this table, indicating a weaker relationship between the stripped-down Information Flow indicator and Timeliness. Three betas retained their significance, however, confirming that the relationship between Timeliness and the Information Flow measure was not dependent only on the frequency information was received.