

## **CHAPTER 11**

### **TOWARD IMPROVED LINKS**

#### **Introduction**

This chapter is divided into four sections. The first summarizes the major findings of the study as reported in Chapters 7 and 8. It covers the importance of research-extension links, contacts between researchers and extension specialists, extensionists' information sources, the rate of spread of research-based information among extension specialists, and specialists' unmet information needs.

The second section reviews the findings on why subject-matter specialists use the sources they do, reported in Chapters 9 and 10. It discusses in turn each of the hypotheses proposed in Chapter 5 (and subsequently amended), relating to prolificacy, Familiarity, Proximity, Structure, Capacity, Openness, Reward, Energy, and Timeliness. For each predictor variable, it then suggests ways of boosting information flows by increasing levels of the determinant. Some of these suggestions would simultaneously increase the levels of two or more determinants -- for instance, improving publication distribution would raise both the Proximity of the publications to the SMSs, and their Familiarity with them. The suggestions apply mainly to research-extension links, and to AARD publications. Suggestions for other media and institutions are also provided.

The third section focuses on specific methods that can be used to increase research-extension links. It discusses publications of the Agricultural Information Centers (AICs) and the Agency for Agricultural Research and Development (AARD), the agricultural press and mass media, and interpersonal communication.

The fourth section discusses some implications and shortcomings of the theoretical model used in this research for studying information flows.

#### **Summary of findings**

##### **Importance of research-extension linkages**

Lack of information was a major problem for Indonesia's agricultural extension specialists. It was not the most important problem -- which is poor mobility -- but it came a close second (Table 7.15). Respondents thought that lack of training opportunities, limited funding for extension activities, the infrequency of meetings with researchers, and the irregularity with which publications were received were the major problems in obtaining information (Table 7.16).

### **Contacts with research**

Direct contacts with research were infrequent among extension personnel at all three institutions surveyed (province and district offices and Agricultural Information Centers) (Table 7.14). Every three years, the median specialist attended one research exhibition or seminar, attended two technical meetings with researchers, exchanged one visit with researchers, and provided feedback to researchers once. He or she attended no training and collaborated in no research with AARD personnel during that period. Obviously there were extension personnel with much higher levels of interaction, but these were relatively rare. These findings generally support those of Hussein (1986:422).

Indirect contacts with research were greater: the median specialist reported reading four scientific journal articles and two AARD books within the previous three months.

### **Information sources**

Specialists' main information sources were field extension personnel, other extension specialists, farmers, the specialists' superiors and colleagues, and their own experience and observation. Agricultural newspapers and magazines ranked seventh, and AIC publications eighth. Research sources -- both personal and non-personal -- were unimportant relative to other sources. The most important research source was the AARD newsletter *Warta Litbang*, which ranked 14th of 24 sources. AARD books and journals ranked 17th (Table 8.1).

Most specialists read the agricultural newspaper *Sinar Tani* frequently, but found it to be of relatively little use as a source of extension information. They read AIC publications less frequently, and AARD publications still less so, but found the latter to be more useful in their extension work (Table 8.5).

### **Spread of research-derived technologies**

Information about AARD-developed technologies diffuses only slowly to extension specialists. It takes an average of about two years before half the specialists have heard of a newly released technology, and about six years before 80% of specialists have heard of it. These rates could be increased dramatically through improved communication strategies. AARD publications of various types are the major source of information about these technologies (Figure 8.1).

## Unmet information needs

Both livestock and food crops specialists felt that the topic they most needed information on was post-harvest processing and handling of their commodities. Food crops personnel felt they most required information on fruits and vegetables, and required least on rice and on crop cultivation (Table 8.8). Livestock personnel indicated that feed and fodder plants, and the breeding of beef cattle and buffaloes, were their top information needs. They least needed information on livestock management, especially of improved chickens (Table 8.9). Among general topics, the most needed were regional planning and farm systems analysis (Table 8.10).

## Determinants of information flow

### Prolificacy

#### Hypothesis test

#### **Hypothesis 1**

Receivers will receive more information from a prolific source than from a less prolific one.

Since Indonesia's food crops research institutes have been more prolific (in terms of numbers of publications), and government policies have focused on rice rather than other commodities, I expected that food crops extensionist would recognize a larger total information flow from research than would their livestock colleagues.

The evidence for this is mixed. Food crops and livestock respondents' did not differ significantly in the amount of total information they reported obtaining, or in the amount of information they got from research sources (Chapter 8). This may be because of the lack of a direct comparison in the questionnaires between food crops and livestock. However, livestock specialists appear to need information more than do food crops personnel.

Another finding lends support to the prolificacy hypothesis. The agricultural press is more prolific than the other sources: *Sinar Tani* is published twice a week, and *Trubus* and other magazines typically appear monthly. AARD publications appear less often (*Warta Litbang* is bimonthly); AIC publications, though published more frequently, are typically short. Although the density of relevant information is less in the press than in the other sources, it still provides more information overall.

It was not possible in this study to test the effects of prolificacy jointly with the FP SCORET variables because my measure of Information Flow contains items on how frequently a person receives information from a source -- a measure closely related to prolificacy. Including the latter as an independent variable in the model would mean basing

both dependent and independent variables on the same measures.

To summarize, the findings on prolificacy are equivocal. The measures I intended to test the hypothesis failed to show any effect of prolificacy on Information Flow, but other data tend to support the hypothesis. I am forced to conclude that the hypothesis has not been adequately tested in this study, and that no firm conclusion can be drawn.

## **Familiarity**

### Hypothesis test

#### **Hypothesis 2: Familiarity**

Information flow will be greatest from sources familiar to the receiver.

The evidence supporting the relationship between Familiarity and Information Flow is compelling. AIC respondents, the group most Familiar with the four sources, received more information than did their province and district counterparts (Table 10.3). Other specialists, far the most Familiar source overall, came second in the amount of information they provided (Table 10.2). Familiarity was an almost uniformly significant predictor of Information Flow in simple regression equations (Figure 9.1, Table 9.8). It continued to be important even when other variables were taken into account: with a beta value of .22, it was the most significant predictor in the overall multiple regression (Table 10.4), and was significant in four of the seven multiple regressions of subsets of respondents (Table 10.5 and Table 10.6).

A question remains, however, about the direction of causation of the relationship between Familiarity and Information Flow -- as pointed out toward the end of Chapter 5. Instead of using a source because we are familiar with it, the argument could be made that we become familiar with a source because we use it -- reversing the direction of causation hypothesized in this study. It is likely that causation is in fact circular, that Familiarity leads to use, which in turn leads to greater Familiarity.

Reverse or circular causation may occur with other variables also: for instance, if we want to use a publication, we may keep it in our office (making it Proximate) -- rather than using it because it happens to be nearby. While such arguments have merit, it is not possible to test them using these data.

**Increasing Familiarity** The evidence shows that improving SMSs' familiarity with print sources should increase the amount of information they obtain from those sources. Familiarity could be improved through a variety of means. These include:

- Improve publication distribution (see under Proximity below).

- Publicize publications more widely, for instance, by advertising books through *Warta Litbang* and the AIC magazines *Buletin Informasi Pertanian*.
- Produce catalogs of current titles and distribute these to extension personnel and others. All AARD institutes should publish a catalog of their materials. CALREC could produce a master catalog containing titles from all institutes.
- Increase the use of the agricultural press to promote research findings.
- Involve scientists more in extension training courses.
- Use research publications in extension training courses, and encourage collaboration between researchers and AAET trainers in developing course materials.
- Publish indexes or computerized databases to improve access to information already available at AIC libraries.
- Increase the interpersonal interactions between researchers and extension personnel through meetings, exhibitions, seminars, training courses, joint projects, field surveys, and the involvement of extension personnel in field research.
- Explore ways of bringing extension personnel to work at research institutes on a longer term basis. Options include the secondment or exchange of staff between AARD and the extension agencies, joint appointments, AARD's hiring of people with degrees in extension and development communication, or simply providing a desk and office space to extension personnel within the research institution.

## Proximity

### Hypothesis test

#### **Hypothesis 3**

Information flow will be greater from proximate than from distant sources.

Physical closeness and access seem to be important determinants of the amount of information SMSs receive from sources. The most Proximate source, the agricultural press, was the one providing the most information (Table 10.2). AIC specialists, the most Proximate of the three subsets of respondents, obtained the most information; the least Proximate, district specialists, obtained least (Table 10.3). In simple regressions, Proximity was the best single predictor of Information Flow overall, and was significant for respondents at all three institutions.

Part of this correlation may be spurious, due to the reinforcing effect of source type on the regression. The closest source (the press) also provided the most information (Figure 9.2), though it is not clear whether this was because it was close or because it provided more information (prolificacy) on a more regular basis than did the other sources.

Controlling for source type revealed that the effect of Proximity was still strong, though somewhat diminished (Table 10.4).

Among the four source types, Proximity was significant for AARD publications and other specialists, though not for AIC publications or the agricultural press (Table 9.11, Figure 9.2). In other words, specialists use AARD publications if they are accessible, and they obtain information from those colleagues who are close by. It is unclear why Proximity had no effect for the agricultural press or AIC publications.

Proximity was important overall even when controlling for other variables, yielding a beta value of .19, third after Familiarity and Reward (Table 10.4). In multiple regression for subsets of respondents, Proximity was significant only for other specialists as sources and among AIC specialists (Table 10.5 and Table 10.6), though closer inspection reveals that this seems to be because of correlations with Familiarity and the differences in Proximity between district and province personnel.

There is some indication of a curvilinear relationship between Proximity and Information Flow, with Proximity becoming more important at closer distances. This emphasizes the importance of improved distribution of research findings if they are to reach extension specialists and through them, field agents and farmers. It is not enough to ensure copies of publications are distributed to province-level offices; rather, they must be sent to those individuals that need them at both province and district levels -- at least to their offices, and ideally to their very desks.

**Increasing Proximity** Low Proximity is perhaps the most serious problem facing AARD's communication effort. Specialists cannot obtain information from publications they never see. Extension personnel do not get information because they are never sent it. This is not (as is sometimes claimed) a matter of poor postal services; rather, it is because mailing lists do not contain the addresses of extension personnel urgently in need of research-based information.

It is unrealistic to expect the 200 copies of a publication many AARD institutes currently distribute to meet the needs of 2000 extension specialists and 29,000 field agents scattered throughout a country the size of Indonesia.

It is unrealistic to expect a district SMS or a field agent to travel to the provincial capital (which may be more than a day's journey away) to consult a research publication which may (or may not) be in an institute library. If the publication is not in the specialist's own office building, or in one next door, the data show that the specialist is unlikely to use it.

It is also unrealistic to expect AICs, with their limited budget and facilities, to reproduce AARD publications for immediate distribution in their provinces. AIC personnel have little incentive to do so because of the credit-point system that rewards original authorship. Figure 8.1 shows that the delay in publication is so great that AIC publications exceed AARD sources in importance only in the eighth year after a technology is released. This is too slow.

And it is unrealistic to expect the few province-level staff who do currently receive

AARD publications to transmit the information contained therein to district personnel. The information is too voluminous, technical and complex to be transmitted orally, specialists travel and meet too infrequently to make this practicable, and users may need to refer back to the material frequently.

There is thus an urgent need to improve the distribution of AARD publications to ensure that they reach the people that can use them. Measures could include:

- Explore the use of alternative media to disseminate research findings (see the section on using the mass media below).
- Print larger print runs of existing publications.
- Increase publication distribution budgets to ensure the publications are sent out promptly.
- Distribute publications more widely. Priority should be given to ensuring at least one copy of each relevant publication is sent to each province and district *Dinas* office and the AIC libraries. Multiple copies should be sent where possible, especially to libraries where they are likely to receive heavy use. Publications should be sent to office (rather than home) addresses and to job titles (e.g., "Extension Section Head") rather than individual names. This will ease address list management.
- Improve the management of address lists. This should be computer-based, and coordinated by the Central Research Institutes or CALREC. An easy-to-use address list management program should be acquired and its use made standard throughout AARD. The necessary hardware and supplies (computers, printers, labels, envelopes) should be earmarked specifically for publication distribution. Distribution staff should be given training in how to maintain lists, and a system of regular updates and list cleaning should be initiated. Updated lists should be obtained annually from Ministry offices as well as from internal sources. Institutes should share lists to avoid duplication of effort. CALREC should have a key role in coordinating these activities and providing training.
- Target publication distribution to potential audiences. For instance, a publication on tidal swamp rice should be sent to areas with such an environment; only a limited number of copies need be distributed elsewhere, e.g., to libraries and universities. While this seems obvious, AARD institutes at present have no mechanism of ensuring this is done. The use of a computerized address database should ease this task. Eventually this could be in conjunction with a geographic information system containing information about land types and production systems in each area.
- Print as many copies as are needed. The print run of publications should be commensurate with the likely audience. This will depend on the topic of the publication, its geographical and commodity coverage, and the type of publication (e.g., technical guide, symposium proceedings, scientific journal).
- Make AARD publications available for sale through commercial bookstores throughout Indonesia. There appears to be a sizeable demand for some AARD titles,

especially among students and teachers. Proceeds from such sales should be placed in a revolving fund to support future publication activities.

- Allow individuals outside AARD to subscribe to serial publications such as journals.
- Make AARD publications available at a variety of locations: from the publishing institute, a central facility (such as a bookstore within CALREC or the separate Central Research Institutes), and the AARD headquarters and Ministry of Agriculture offices in Jakarta. It may be necessary to establish a system for transferring funds among institutions to enable such transactions.
- Clarify policies regarding who is qualified to receive AARD publications free of charge, and who is required to pay.
- Establish libraries in all *Dinas* offices to serve all personnel in that office. Once established, the library (rather than individuals) should be sent copies of AARD publications.
- Improve the cataloguing and shelving of materials in AIC and AARD libraries, and train users in library use. Many materials are currently inaccessible because of poor catalogs, unorganized storage, and poor librarian and user skills.
- Conduct occasional research on who receives AARD publications and where they get them. This would elucidate problems in the distribution system and ways they might be overcome. Such evaluations could also measure other aspects, such as preferred content, aspects that should be covered, the amount of scientific and technical detail required, and so forth.

## Structure

### Hypothesis test

#### **Hypothesis 4: Structure**

Information flow will be greatest from those sources an individual perceives it his or her job to use.

The relationship between Structure and Information was weak. Among the four sources tested, respondents most felt it their job to obtain information from AARD publications, yet this was their least important source. Their lowest priority as a source was other specialists, yet these ranked second in importance (Table 10.2). The relationship was stronger when the three institutions were compared: AIC specialists had the highest scores in both Structure and Information Flow (Table 10.3). The overall simple regression was negligible, and simple regressions were non-significant for all institutions and for all sources except the agricultural press (Figure 9.3).

When other variables were taken into account in multiple regression, Structure was

significant in only one: for the agricultural press. This indicates that if SMSs see it as their job to use the press as the source, they will do so. For other sources and for all three subsets of respondents, however, Structure was not a significant predictor of Information Flow. Hypothesis 4 is thus rejected for all sources except the press.

**Increasing Structure** The data indicate that specialists already regard it as their job to use AARD publications, and that exhorting them to do so is unlikely to have much effect on the amount of information they obtain. Structure was also non-significant for both AIC publications and other specialists. Among the four sources studied, the opportunities for using Structure to improve research-extension linkages are thus confined to the agricultural press.

Interaction with the press should not conflict with government rules or interfere with ministry policies on the premature release of new technologies, especially those that must pass through the centralized recommendation process described in Chapter 4. Nevertheless, numerous topics could legitimately be discussed in the press under current rules, including already released technologies, research in progress, and current farming practices.

If specialists think it is part of their job to use the press as a source, they will do so. They could be encouraged to do so by the following:

- Include research briefs in *Sinar Tani* on a regular basis, preferably in an easily identified column.
- Cooperate more closely with the private agricultural press, including *Trubus* and other specialized magazines. Such cooperation requires a greater understanding among AARD staff of the needs and limitations of the press.
- Produce press releases aimed at national and local newspapers and magazines. Such releases should include instructional stories with technical information aimed at extension and farmers, as well as public relations and policy pieces. AARD communication staff would need training in how to prepare such articles.

At present, SMSs have little incentive to stay current and knowledgeable in their specialties or actively to seek new information. (In fact, such search is likely to cost them money because of the smallness of their monthly working budget). They can gain promotion credits by attending training courses, to be sure, but access to these is not under the individual's control. Ways should be sought to provide such incentives -- such as increasing the opportunities for authoring articles based on current findings, stimulating peer recognition as a reward, and providing funding for attendance at research seminars and for conducting field research.

## Capacity

### Hypothesis test

#### **Hypothesis 5** Capacity

Information flow will be greater from credible and complete sources than from those that are less credible or complete.

Capacity did not prove to be a major predictor of Information Flow overall, though it was significant for individual sources. The highest Capacity source, AARD publications, provided the lowest Information Flow (Table 10.2). The group of respondents with the lowest opinions as to the Capacity of various sources, AIC specialists, scored highest on Information Flow (Table 10.3). The overall simple regression of Information Flow against Capacity was non-significant, despite all the simple regression coefficients for the various source types being positive, and two (AIC publications and the agricultural press) being significant (Figure 9.4). This apparent paradox was because higher Information Flow sources (the press and other specialists) had low Capacity, while the high-Capacity AARD publications yielded low flows, as revealed by the regression model that controlled for source types (Table 10.4).

Multiple regression failed to reveal any relationship between Capacity and Information Flow for any of the sub-samples (Table 10.4, Table 10.5, and Table 10.6), presumably because it was masked by the effects of other variables. Hypothesis 5 is thus only partially supported.

**Increasing Capacity** Overall, Capacity was an important influence on Information Flow only for the agricultural press and for AIC publications, though for district specialists it was significant for all sources. Many of the suggestions under Structure above for the agricultural press would also increase the Capacity of this source. Other suggestions include:

- Produce publications that cover topics in sufficient detail so as to be self-contained. For instance, *Warta Litbang* often reports that a research project has met with success but does not give enough information for readers to be able to apply the findings themselves. The same is true of some *Sambung Litluh* fact sheets. Because such publications are often the only source of information a reader has on a topic, they should include all necessary details to allow readers to use the information.

- Books should cover single topics or commodities (e.g., maize) rather than a broad range of unrelated topics (as in some symposium or seminar proceedings).
- Ensure that widely distributed publications such as *Warta Litbang* contain enough information to be useful. *Warta Litbang* should be expanded in size to accommodate this, and its content should be adapted to give it a more practical orientation.
- Ensure that authoritative experts (such as AARD scientists) are quoted in press articles and AIC publications.
- Include more research-based information in the agricultural press. This can be achieved by writing press releases and by closer cooperation with the press.
- Increase the research-based content of AIC publications through closer collaboration between the AICs and AARD institutes -- for instance, by joint publications, collaborative authorships, mutual editing of materials, and ensuring that all AICs have a full range of AARD publications in their libraries.
- Provide more and better training to boost the Capacity of individual specialists.
- Adapt a publication's format and design to make it appear more authoritative (e.g., improve the appearance of *Liptans*). Provide illustrations where applicable.

## Openness

### Hypothesis test

#### **Hypothesis 6** Openness

Information flow will be greater from sources that receivers regard as easier to understand and use.

There was some evidence supporting Openness as an influence on Information Flow. The agricultural press, with the second-highest Openness score among the four sources, yielded the highest Information Flow (Table 10.2). However, district specialists felt sources were most Open but had the lowest Information Flow; AIC specialists felt sources were least Open but had the highest flows (Table 10.3). Against this, the simple regression revealed that Openness was a significant predictor of Information Flow overall and for most of the sub-samples (Table 9.17, Figure 9.5). This situation is akin to that of Capacity, where the highest Information Flows come from the subsets scoring lowest in the predictive variable.

Possibly because of this, or because of its high correlation with Timeliness (Table 10.1), Openness failed to enter the final equation in the overall multiple regression (Table 10.4). It was significant for only one of the sub-samples, other specialists. The effect of Openness evident in the simple regressions thus seems to be masked by other variables when all are considered together. Hypothesis 6 is thus only partially supported.

**Increasing Openness** There is some evidence that improving Openness can increase Information Flow. Below are some suggestions for increasing the Openness levels of various sources:

- Design publications with extension needs in mind; they should contain enough information, written in a suitable form, to permit ministry officials and local extension staff to develop technology recommendations. The language used should facilitate their use in generating recommendations and their translation into materials suited for farmers. Technical guides are more suited to extension needs than are scientific journals (Sophia 1988, Sunarno 1983).
- Ensure that the practical implications of a research study are clearly stated. Many research publications currently fall short of providing clear guidelines for the practical uses of research findings. Examples are: expanding agronomic studies to include economic analyses, providing illustrations of equipment or techniques, including maps of areas in which a technology is thought to be suitable (e.g., if it is confined to a particular soil type), providing concrete examples of the use of a technology, and ensuring that each publication or article contains a separate section (labeled "Practical Implications" or a similar title) that summarizes the practical import of a set of findings.
- Increase the accessibility of scientists to answer questions and respond to field problems through more field visits in collaboration with extension personnel.
- Improve the handling of visitors to AARD institutes by establishing standard procedures -- such as showing slide-tape or video programs, tours of exhibit plots, and the provision of informational materials. Encourage extension personnel and farmers to meet with scientists. Such open access should be monitored so it does not interfere with research activities.
- Establish a rapid-response service to provide inquirers with references or copies of publications. This function could be performed by institute libraries under CALREC coordination. Such services should be advertised through *Warta Litbang* and AIC magazines.

## **Reward**

### Hypothesis test

#### **Hypothesis 7** Reward

Information flow will be highest from sources that provide receivers with the greatest rewards.

There is considerable evidence indicating Reward is a major influence on Information Flow. Among the four source types, other specialists had the highest Reward scores and the second highest Information Flow (Table 10.2). There was very little difference in perceived Reward levels among respondents at the three institutions (Table 10.3). Reward was a strong predictor in the simple regressions (Table 9.19 and Figure 9.6). It was the second strongest predictor of Information Flow in the overall multiple regression (Table 10.4), and entered three of the seven equations for the sub-samples (Table 10.5 and Table 10.6). Hypothesis 7 is thus supported.

**Increasing Reward** Publications can be made more Rewarding for extensionists by the following measures:

- Target publications to specific agroclimatic regions or commodity types.
- Ensure that research addresses field problems as identified by farmers and extension personnel. Where possible, research reports should be couched in terms of a field problem rather than a scientific or theoretical one.
- Ensure that research reports spell out the locations and conditions where findings can be expected to hold. For instance, the soil type, climate, season, and other key criteria should be restated in the conclusions (or "Practical Implications" section [see above]) to ease interpretation by extensionists.
- Outline in publications the practical implications of research findings in specific situations.
- Regularly survey extension personnel and farmers about problems they face, and develop publications and other media (such as training courses) that summarize research findings on these problems.

## **Energy**

### Hypothesis test

#### **Hypothesis 8** Energy

Information flow will be greatest from sources from whom the receiver devotes most effort to obtain information.

There was little evidence to support the amount of effort they devote to using a source as a determinant of the amount of information SMSs get from that source. The relationship is even negative in some instances. Respondents devote most effort to obtaining information from AARD publications, yet they actually obtained least from these sources (Table 10.2). Among the three groups of respondents, those at district offices expended the most effort to obtain information, but they obtained least (Table 10.3). Most simple regression slopes were flat or even negative (Table 9.21 and Figure 9.7). Energy failed to enter any of the multiple regression equations, except one, where it had a significant *negative* effect on Information Flow (Table 10.4, Table 10.5, and Table 10.6). Hypothesis 8 is thus not supported.

This does not mean that Energy is unimportant, however. Rather, the findings indicate that respondents recognize and seek to overcome the constraints to obtaining information. They expend the most effort trying to obtain information from AARD publications, but these are too inaccessible for them to meet with much success.

**Increasing Energy** The data indicate that in general, the amount of effort SMSs devote to obtaining information from a source does not affect the amount actually obtained. But this appears to be because of the costs of obtaining high-value sources such as AARD publications. Ways must be found to reduce the effort required to obtain these high-value sources, particularly by improving the publication distribution system (see under Proximity above).

## **Timeliness**

### **Hypothesis test**

#### **Hypothesis 9** Timeliness

Information flow will be greatest from sources that time them favorably.

Hypothesis 9 aimed to test the concept of Synergy. However, this was not a single concept, at least as measured in this study. I therefore replaced it with one of its components, Timeliness. Hypothesis 9 is thus revised to refer to Timeliness only.

There was considerable support for Timeliness as a determinant of Information Flow. The most Timely source, the agricultural press, also provided the most information (Table 10.2). Respondents at the three institutions did not differ significantly in their opinions as to the Timeliness of sources (Table 10.3). Simple regression revealed mostly significant positive effects of Timeliness on Information Flow (Table 9.23 and Figure 9.8).

When considered together with other predictors in the overall multiple regression model, Timeliness was the fourth and last to enter the equation (Table 10.4), and it was

significant in two of the seven multiple regressions performed on sub-samples (for AARD publications and for district specialists) (Table 10.5 and Table 10.6). Hypothesis 9, as amended, is thus accepted.

**Improving Timeliness** A number of measures can be taken to improve the Timeliness of sources. These include:

- Speed the production and distribution of publications. Such measures as strengthening the editorial staff of AARD communication units and computerizing the generation of mailing labels should help contribute to this goal.
- Produce and distribute certain publication types rapidly in response to field problems as they occur. Examples could include responses to pest and disease outbreaks and newly released crop varieties.
- Improve the regularity of existing serial publications such as *Warta Litbang* by allocating them higher priority in budgets. Where it is necessary to save money, it seems better to reduce the number of pages or print quality of a publication rather than to eliminate issues.
- Increase the use of the private mass media and especially *Sinar Tani*, through the means described below.
- Produce press releases and foster closer relationships with private-sector media reporters.
- Develop a regular column in *Sinar Tani* containing research information (possibly rotated among the various commodities or sub-sectors).
- Invite scientists or AARD communication staff to write articles for the media.
- Develop inserts in *Sinar Tani* and other publications for readers to remove and save. Topics could include integrated pest management techniques, the characteristics of newly released crop varieties, and a list of research sites and information sources.

## Overall

### **Hypothesis 10:** FP SCORET

Information Flow from a source to a receiver is influenced by the following aspects of the dyadic linkages between the source and the receiver: Familiarity, Proximity, Structure, Capacity, Openness, Reward, Energy, and Timeliness.

There is considerable support for four of the eight FP SCORET variables as determinants of Information Flow. Specialists use a source if it is close (Proximity) and well-known (Familiarity), and provides relevant, timely information (Reward and Timeliness). There is some evidence that specialists will use a source if it is easy to use and understand (Openness), see it as complete and credible (Capacity), and view it as part of their job to use it (Structure). There was little evidence that the amount of effort the specialist devotes to using a source (Energy) affects the amount of information a specialist obtains from it.

It seems, however, that the importance of the FP SCORET variables varied from source to source. There was less variation among the three institutions surveyed. This means that each source must be treated separately in planning a strategy to communicate with extension personnel (and presumably, with any other audience also). For instance, increasing a source's Proximity will improve Information from one source but not from another. A number of strategies for each source are suggested by the regression analyses. These are discussed in the next section.

### **Source-specific strategies**

Strategies for increasing Information Flows from research to extension should consider the characteristics of each source and audience group. What is effective for one source will not necessarily be useful for another. This section discusses the approaches that could be used for several source types.

Three basic strategies can be pursued to increase Information Flows:

- Attempt to increase the levels of important determinants of Information Flow for each source. This is equivalent to moving to the right along the regression lines shown in the figures in Chapter 9.
- Adapt source types so they are similar to other, more successful types -- for instance, adapting AARD publications so they are more like AIC publications. This is equivalent to shifting the AARD publications regression line to coincide with that of AIC publications.
- Carry research messages on other channels. In terms of the regressions in Chapter 9, this is equivalent to jumping from one line to another.

### **AIC publications**

For AIC publications, multiple regression revealed that Familiarity and Reward were the most important determinants of Information Flow. Openness, Capacity, and Timeliness were important in simple regressions, but did not enter the multiple regression equation when all factors were taken into account (Table 10.5).

In other words, extension specialists tended to use AIC publications if they were

familiar with them and if they thought they were relevant. Publications that were easy to use, that were complete and credible, and that addressed timely issues, also received high use.

Efforts should be made to increase the levels of each of these determinants, using some of the strategies listed under each determinant in the preceding section.

When compared with AARD publications, AIC materials provide SMSs with somewhat (though not significantly) more information. Specialists see them as easier to understand and use than the AARD publications. Efforts should thus be made to improve the Openness of AARD publications, for instance by writing in practical terms rather than scientific jargon, providing concrete examples, and spelling out the practical implications of research findings so as to ease the task of ministry and local staff in translating the findings into extension recommendations.

AARD should not rely on the AICs to be the sole source of research-based information for subject-matter specialists. Doing so places an unnecessary extra hurdle in the way of smooth research-extension linkages. The AICs were established to develop media materials aimed at farmers. In fact, their primary audience is field extension agents. They lack the resources to serve even this audience adequately, and their current publication print runs can serve only a handful of farmers (I was unable to evaluate the impact of their materials intended for broadcast). Figure 8.1 shows that the AICs are a minor source of information on AARD technologies until about eight years after the technologies are released. And the SMS population is small enough for AARD to serve directly.

A promising option is to develop joint working groups and editorial boards composed of AARD and AIC staff to develop materials aimed at extension personnel. In such teams, AARD would provide the technical expertise, while the AICs would ensure that the materials produced would fit the needs of extension personnel. Funding could be drawn from both institutions. A start has been made in this direction in the form of *Sambung Litluluh*, the fact sheets jointly produced by the AIC and researchers in South Sulawesi and Central Java. More such collaboration is required -- but care must be taken to avoid creating yet another institution or rigid set of rules in an already complex bureaucracy.

Other methods of increasing collaboration between extension and research personnel have been outlined above in the section on Familiarity.

### **The agricultural press and mass media**

Structure was the most important determinant of Information Flow for the agricultural press, indicating the extension personnel will use this source if they feel it their job to do so. The relevance of the press (Reward) was also important, as were its ease of use and the amount and credibility of information it contained.

Some ways of using the agricultural press and the mass media have been outlined in the section on Timeliness above. Research findings and other extension information could be disseminated more rapidly through channels the extensionists come into contact with most often: i.e., the agricultural press and other mass media.

But is putting research information into the mass media really a good idea? The decision as to which sources to use depends on several factors:

- Nature of the medium Some media are more suited to conveying technical information than others. Television, for example, can show motion and color well, but is not well suited to giving detailed instructions. Newspapers typically carry relatively short and non-technical material, and the quality of graphics is not high.
- Audiences Media have different audiences. Television has a mass audience of millions of both rural and urban dwellers. General newspapers are read mainly by the urban middle class. Magazines circulate among the elite.
- Costs Preparing and disseminating information can be costly and difficult. Producing a video is expensive. Printing and distributing publications can also be costly. And there may be institutional barriers -- for instance, in persuading a television or radio station to produce and broadcast a program, or getting a newspaper or magazine to print a story.

Not all types of agricultural technology are suited for widespread dissemination through the press and other mass media:

- The suitability of a new crop variety, for instance, may depend on local conditions, such as soil types and weather patterns. Skilled technicians may be needed to advise farmers on whether to use the new seeds.
- Some technologies may be suited only to limited areas, making the use of more widespread mass media inappropriate.
- Some technologies are too complex to allow dissemination via the media. Extension personnel and farmers may have to undergo intensive training in order to use them correctly (as in integrated pest management, Stone 1992).
- It may be undesirable to generate premature demand for a technology before the necessary inputs (e.g., seed, fertilizer, chemicals, vaccines, credit) are available.
- The media can carry only a brief summary of many types of technology. Their primary use may thus be to raise awareness of a technology's existence rather than to teach how to use it.
- The media should supplement rather than replace other channels. In order to apply technologies correctly in a wide range of situations, extension personnel will require considerably more in-depth and technical information than can be carried in a newspaper article. This information should continue to be supplied through training, technical publications, field testing, and other methods.

Nevertheless, many techniques could be disseminated more actively through the mass media. Examples are the use of conical woven bamboo containers as nests for chickens, the provision of water and salt to small ruminants under confined management, and post-harvest processing methods for food crops. These generally fall into the category of technology that is not important enough nationally to pass through the directorate-general, but is locally applicable and is not in conflict with official guidelines (Chapter 4).

AARD has created or tested a large supply of such technologies, but they reach extension personnel only slowly. Improved use of the agricultural and other mass media could greatly improve the dissemination of these technologies.

### **AARD publications**

The expense of travel and training courses, coupled with the large numbers and scattered distribution of extension personnel in Indonesia, mean that publications must continue to be the major conduit for research information reaching extension personnel. SMSs use AARD publications if they are familiar with them, if they are timely, and if they are close by. Efforts to increase use of these publications should therefore focus on these three characteristics.

Several suggestions for increasing the amount of information SMSs obtain from AARD publications are given above. Let me repeat: perhaps the most important problem to be solved is the poor distribution of these publications. Print runs must be increased, copies distributed to district *Dinas* offices, and mailing list management improved.

This does not mean that all AARD publications should be sent to district extension personnel, however. The more practically oriented publications such as *Warta Litbang* and technical guides should be sent to all district offices. Scientific journals are less useful to extension personnel because they are less easy to translate into extension recommendations. Whether books such as symposium proceedings are distributed so widely depends on the topic: a symposium on a basic research topic is less useful to extension personnel than is one on an applied topic.

Much of AARD's publication output is in the form of scientific articles of limited use to extension or policy makers (but providing large numbers of promotion-supporting credit points to their authors). AARD institutes should review their publication policies to ensure that the extension audience is receiving due attention. It may be necessary to develop new publication types and to devote extra resources to institute communication units to enable them to serve the extension audience better.

### **Interpersonal communication**

This study has shown that interpersonal communication is an important means by which SMSs obtain information. In Chapters 9 and 10, this was represented by the "other specialists" source category. SMSs obtained information from their peers if the information these provided was easy to understand and use (Openness), and if the peers were close by (Proximity).

Extension personnel should be encouraged to exchange information with each other and with others in the agricultural knowledge system -- particularly farmers, field agents, and researchers. While social relationships are important to put people at their ease, structured opportunities for interchange should be provided. These include meetings, exhibitions, training courses, joint research, and field tests. All these activities are currently being conducted by AARD and the extension agencies. Other possible methods not at present used are the secondment or exchange of staff, the provision of office space to extensionists, and other measures listed in the Familiarity section above.

### **Implications of the FP SCORET model**

I undertook this study with a practical aim in mind: to understand research-extension linkages in Indonesia in order to propose ways of improving them. I chose Havelock's HELP SCORES model as a theoretical base since it promised to elucidate the reasons extension personnel use certain information sources rather than others. The model has indeed proved valuable in doing so.

Nonetheless, a study of this nature is fraught with peril. Conceptual, theoretical, and operational pitfalls abound. Some can be foreseen and avoided; others will be stumbled into. Below are some of the conceptual and theoretical issues encountered in this study.

### **Operationalization of concepts**

Several weaknesses are evident in the operationalization of the FP SCORET variables. Major among these are the poor face validity and low reliability of several of the indices used. In part this was due to my inadequate operationalization of Havelock's original HELP SCORES concepts. In part it may also be due to the multidimensionality of some of those concepts (Havelock 1969:11/20). It is clear that they must be more carefully conceptualized and operationalized if this approach to studying information flows is to prove fruitful.

### **Direction of causality**

A major flaw in the FP SCORET model is in the uncertain direction of causality between the FP SCORET variables and Information Flow. For some, the direction is reasonably clear: for instance, the source's Proximity to the receiver is more likely to affect the level of Information Flow than the other way round. For other variables, however, the case is less clear. Do I use a source because I am Familiar with it, or do I become Familiar with it as I use it? Causation appears at least circular here, and may be stronger from Information Flow to Familiarity than vice-versa.

Even for the apparently clear case of Proximity above, it is possible to imagine a specialist keeping a book in her office or home because she gets information from it, rather than obtaining information from it because it happens to be close by. Libraries would not function if causality were all from Proximity to Information Flow, since no one would ever travel to a (relatively distant) library to borrow a book to take home to read.

The practical implication of the direction of causality is in determining which variables should be manipulated in order to increase information flows. The suggestions given above assume that causality is in the hypothesized direction, from the FP SCORET variables to Information Flow, or is at least circular. This study cannot rule out the alternative possibility, however. Nevertheless, the hypothesized direction of causation is plausible, leading us to believe that attempts to influence Information Flow by manipulating the FP SCORET variables should meet with at least some success.

### **Manipulating variables**

Some of the FP SCORET variables lend themselves to manipulation more easily than others. It is difficult and expensive to change the location of an experiment station (to increase its Proximity to its clients), change the structure of an organization (to increase Structure), or train 29,000 extension agents (to improve their Energy and Capacity). And such large changes are likely to cause as many problems as they solve. It is easier to change the format of an existing training course, or assign personnel to new roles within an existing organization.

While sometimes major changes are called for, they should not be resorted to unless there is a clear and urgent need. If the system is already performing reasonably well -- as the research and extension systems in Indonesia seem to be doing (witness the gains in rice, soybean and chicken production), it is probably better to fine-tune them than to wield a hatchet.

### **Interrelationships among variables**

Another flaw is that the model fails to take into account the obvious interrelationships among the independent variables. Throughout, I have assumed that the FP SCORET variables influence Information Flow independently of one another. There is ample evidence that this is not the case: significant correlations among items making up different variables and among the indices themselves, and the failure of several indices to enter the multiple regression model despite significant simple correlations with Information Flow.

Several theoretical reasons can be cited for these interrelationships. The "mere exposure" theory links Proximity to Familiarity. Role theory could link Structure and Energy. Havelock himself (1969:11/31, Havelock and Lingwood 1973:297) provides some brief ideas on how the variables might be causally related. With suitably conceptualized and operationalized variables, a path analysis could be used to test the proposed interrelationships among them. Such an analysis might also throw light on the direction of causality problem just described.

A practical implication of the existence of causal relationships among the FP SCORET variables is that it may be possible to affect Information Flow indirectly by adjusting one or other of the variables. For instance, increasing the research-based content of a publication (Capacity) may encourage SMSs to view it as part of their job to use that publication (Structure). And increasing the Timeliness of a publication or training program may also raise its credibility (Capacity) in the minds of the extensionists. The general lack of strong negative correlations among the indices indicate that it may be possible to improve scores on several factors simultaneously without jeopardizing the levels of others.

### **Information search and receptivity**

The respondents in this study appear to exert very little effort to obtain any information. This is not necessarily through any fault of their own, given the limited opportunity and funds they have for seeking information from outside. But the FP SCORET model lacks any measure of the ease with which information reaches the receiver. If such a variable were included, it might well prove to be a major influence on the amount of information obtained.

The lack of such a measure also restricts the present FP SCORET to situations where information search is highly constrained. In Atkin's (1973) terms, it may apply better to information *receptivity* rather than information *search*, or indeed to his other categories of information *yielding*, *rejection*, and so forth.

Nevertheless, highly constrained sources are typical of the situation of extension personnel in the developing world. The importance of Proximity and Familiarity in this study shows that it is imperative to ensure that information arrives on an extension specialist's desk if that information is to be used. This lesson should not be forgotten by research and extension organizations, many of which seem to rely on an easily broken oral chain to transmit messages up and down hierarchies and across vast distances.

### **Information flow: One-way or two-way?**

Throughout this study, I have treated Information Flow as if it were a one-way, source-to-receiver, movement. In reality, this is not so. Even in highly rigid, top-down systems, some feedback does filter back to the sources of information. In an agricultural knowledge system, such two-way flows are highly desirable.

Can the FP SCORET model be extended to form a two-way model? Certainly. Many of the variables in Havelock's original model are inherently two-way in nature: Linkage, Openness, and Reward. This task is facilitated because the FP SCORET model uses characteristics of the *relationship between* source and receiver, not features of the source and receiver as individuals. The difficulty comes in trying to operationalize such two-way concepts, particularly when dealing with non-personal sources.

### **Missing variables**

As Havelock points out, the HELP SCORES formulation omits many important factors that may affect information exchange. Some of these are primacy ("being first"), status, and values. This study identified prolificacy and ease of acquisition as possible additions to the list. Atkin's notions of the costs and benefits of obtaining information from sources may be particularly useful. I omitted or changed other factors (Homophily, Empathy, Linkage) because they were not compatible with the need to compare personal and non-personal sources. Like other "laundry lists" or factors, (A VICTORY, HELP SCORES), FP SCORET is thus by no means exhaustive. Rather, it should be seen as a useful checklist that can produce practical suggestions for change.

### **Personal and non-personal sources**

It is difficult to compare personal and non-personal sources directly. This study is no exception: including both in the study forced me to drop some concepts and alter others, and constrained the choice of question wordings. Using the receiver perspective helped overcome these difficulties: receivers are in the best position to judge the amount of information they acquire from various sources, and are able to compare widely different sources on the same scale -- an impossible task for more objective measures.

The personal/non-personal dichotomy is only an extreme version of the dilemma facing those who wish to compare information flows among source types. Similar problems face us when we try to compare the amount of information obtained from two non-personal media, such as television and newspapers, or even TV and radio. Each source type has characteristics that make it unique, and that may affect the amount of information we obtain from it. We have yet to identify suitable measures. Meanwhile, an index approach based on the receiver's opinions and memory seems the best route.

### **Information flow as a relational characteristic**

I have conceptualized information flow and its antecedents as features of the relationship between a source and a receiver. As stated above, this approach could be extended to embrace two-way communication. The important aspect of this view is that it is *relational*, viewing each source-receiver pair as a dyad. This makes it compatible with other relational approaches, such as network analysis and coorientation. Links with these approaches should be explored further.

### **Conclusion**

Poor agricultural research-extension links are a problem in Indonesia. This study has outlined some of the problems involved and suggested some solutions to these.

The impression one has is that research-extension links are poor because there has not been any systematic attempt to improve them. The AICs have filled a major gap in the agricultural knowledge system by developing materials for field agents. But these institutions are too under-funded to be able to fulfill even this role adequately. They thus have not aggressively sought out new research findings from AARD and disseminated these to their audiences.

Commitment from AARD has also been lacking. AARD institutes' communication activities have been skewed toward serving the needs of scientists and policy makers rather than extension. While many useful publications have been published, these have been produced in too small numbers and have received too restricted a distribution to have major impact.

This study did not investigate the relevance of AARD's research findings to Indonesia's farmers. The existence of a pool of relevant information was assumed at the outset. Rather, I sought to discover whether the information that has been generated is reaching extension personnel. The study shows that research information does reach extension personnel, but it does so very slowly.

Indonesia's extensionists are eager to obtain research-based information. A large body of research information exists, but it is not written in a form useful for extensionists, and it is not distributed effectively to them. Nevertheless, AARD institutes can take several simple measures to boost the amount of research information flowing to extension via publications. While this will require increased funding, the amounts involved are modest, and the potential payoff is large.

This study does not propose radical restructuring of the Indonesian research and extension system. I believe the changes I suggest will help these institutions serve farmers better and are pragmatic in that they build on existing institutions and activities rather than replacing them with new ones.

Indonesian authorities increasingly recognize that improved research-extension linkages are key to agricultural development. Recent moves within AARD to improve

research-extension links should have a significant impact on the spread of agricultural technologies in Indonesia.

Finally, with 41% of variance in Information Flow explained, the FP SCORET model has proved useful in predicting information flows. Further research will demonstrate whether it can be developed into a theoretical as well as a diagnostic tool. While this study has focused on the information sources of agricultural extension specialists in Indonesia, the FP SCORET model could be applied to other situations also. It may prove useful in explaining why people in general use certain sources for any type of information.