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No. 3

**Placing Agricultural Research
and Technology
Transfer in one Organization:
two Experiences from Colombia**

David Kaimowitz

WAITE MEMORIAL BOOK COLLECTION
DEPT. OF AG. AND APPLIED ECONOMICS
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ISNAR

International Service for National Agricultural Research

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands, on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing, and operations.

Of the thirteen centers in the CGIAR network, ISNAR is the only one that focuses primarily on national agricultural research issues. It provides advice to governments, upon request, on research policy, organization, and management issues, thus complementing the activities of other assistance agencies.

ISNAR has active advisory service, research, and training programs.

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Linkages
Discussion
Paper
No. 3

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INTRODUCTION TO THE ISNAR STUDY ON THE LINKS BETWEEN AGRICULTURAL RESEARCH AND TECHNOLOGY TRANSFER IN DEVELOPING COUNTRIES

David Kaimowitz
Study Leader

In 1987, the International Service for National Agricultural Research (ISNAR) initiated a major international comparative study on the links between agricultural research and technology transfer in developing countries. Like other ISNAR studies, this study was developed in response to requests from agricultural research managers for advice in this area. It is being carried out with the support of the Governments of Italy and the Federal Republic of Germany and the Rockefeller Foundation.

The objective of the study is to identify ways to strengthen the links between agricultural research and technology transfer systems in order to improve:

- (a) the relevance of research efforts through a better flow of information about farmers' needs for the research systems;
- (b) the transfer of technology to agricultural producers and other users of agricultural technologies.

Why the Study was Initiated

Many sources have noted the problem of poor links between research and technology transfer in developing countries:

"Bridging the gap between research and extension is the most serious institutional problem in developing an effective research and extension system." World Bank, 1985

"Weak linkages between the research and extension functions were identified as constraints to using the research in 16 (out of 20) of the projects evaluated." United States Agency for International Development (USAID), 1982

"All the 12 countries (in which research projects were evaluated) had difficulties of communication between research institutions and extension agencies." Food and Agriculture Organization (FAO), 1984

The serious consequences of this problem is effectively summed up in the following statement by a leading international expert in the field, Monteze Snyder: "The poor interorganizational relations between the extension agency and the research organization almost guarantee that research results will not reach farmers, and if they do, farmers will not be able to use them." Despite this situation, however, no major international study has been dedicated specifically to this issue. While there are a few good evaluation reports and academic studies in individual countries, much of what has been written about research-technology transfer links has been general or anecdotal. The results of the practical attempts which have been made to improve links have been disappointing.

A systematic study is needed to provide a set of simple, but not simplistic, suggestions on how research-technology transfer links can be improved in different situations.

Operational Strategy and Products

The study is to be conducted over a four-year period and has been divided into three stages. The first stage consists of a literature review, the development of a conceptual framework and case study guidelines, the production of 'theme papers' (see page iii) and pilot case study activities

in Colombia. The second stage involves carrying out case studies in six additional countries — Costa Rica, Côte d'Ivoire, the Dominican Republic, Nigeria, the Philippines and Tanzania. In each of these countries the studies will concentrate on specific subsets of the national research and

technology transfer systems. They will also document the links which were involved in the generation and transfer of a small number of specific new agricultural technologies. In the third stage, the various materials which have been developed will be synthesized into one set of concrete applicable guidelines.

Ultimately, four types of documents will be published as part of this special series of papers on research-technology transfer links:

1. *Theme papers* on key linkage-related topics. These have been written by specially commissioned international experts in the field.
2. *Discussion papers* which analyse one or a few major issues emanating from the case studies. About 15 such papers are expected to be produced, written by the case study researchers. They will focus on the most outstanding features of the links observed in the cases

and draw clear conclusions about them for practical use by managers.

3. *Synthesis papers* which present the lessons emerging from the case studies. These are being written by ISNAR staff.
4. *Guidelines* on how to design and manage the links between agricultural research and technology transfer for policy makers and managers concerned with the two activities. These will also be written by ISNAR staff, with input from the case study researchers, managers of national systems, and others.

We expect the theme papers to be published during 1989. Most of the discussion papers will be published during the following year and the synthesis papers and guidelines will probably be available in early 1991. Individual copies of all these papers will be available from ISNAR upon request, at the discretion of ISNAR.

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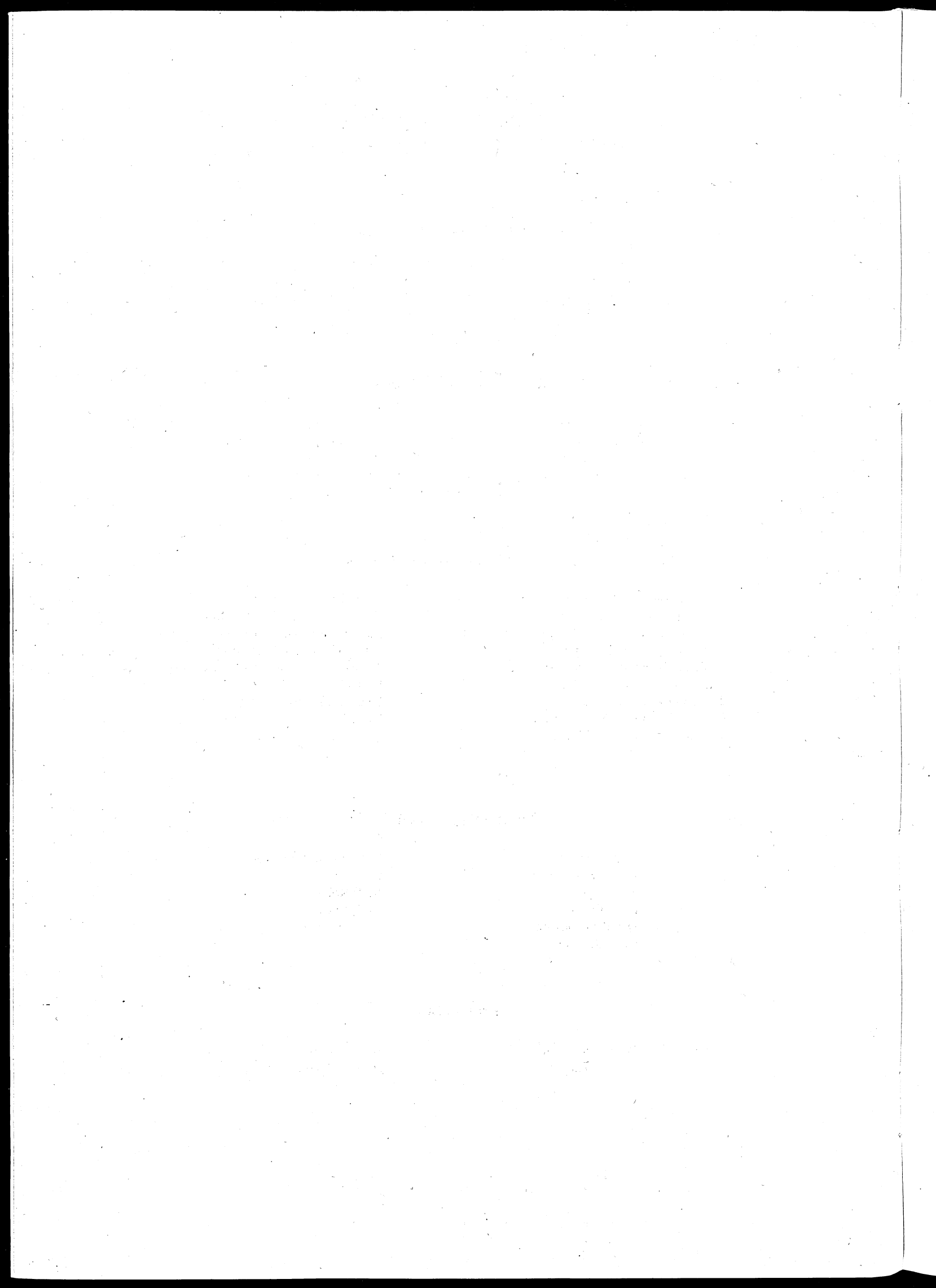
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PLACING AGRICULTURAL RESEARCH AND TECHNOLOGY TRANSFER IN ONE ORGANIZATION: TWO EXPERIENCES FROM COLOMBIA

David Kaimowitz

Summary

Two experiences from Colombia indicate that placing agricultural research and technology transfer in the same institution is neither a necessary, nor sufficient, condition for effective coordination between the two activities or for improved institutional performance. Additional factors

to consider include: the specificity of the problems addressed; the institution's capacity to manage the coordination; status differences and competition over resources; institutional size; and the level of politicization of the technology transfer activities.

Introduction

Poor coordination between agricultural research and technology transfer units is one of the most serious problems in the organization of effective technology provision systems in developing countries (World Bank, 1985; Snyder, 1986). This problem is often attributed, at least in part, to the administrative location of these activities in separate institutions or ministries (Blackenburg, 1984). This and other concerns have led various authors to assert that it would be better to place these activities in one institution (Collinson, 1981; Samy, 1986).

This paper addresses the validity of that assertion. Two distinct experiences in which both agricultural research and extension are in the same institution are examined: the Colombian Agricultural Institute (ICA) and the Colombian Coffee Growers Federation. ICA is a public institution with a broad mandate covering the entire nation and many plant crops and animal species. The Federation is a quasi-private organization (see below), concerned mostly with coffee in specific regions. In the first case the incorporation of technology transfer functions into a predominantly research institution in 1968 actually hindered the coordination between the two activities and

may have been partly responsible for a decline in overall institutional performance. In the second, however, having research and technology transfer activities in a single organization did, in fact, facilitate coordination and performance.

The issue of whether placing research and technology transfer in one institution will improve performance is particularly relevant for Latin America at the present time. After merging the two functions in one institution in 1981, Peru has recently decided to separate them. In Argentina, where the two activities have been together since 1957, there is a growing discussion about the relations between the two activities. In Chile, the extension service was abolished in the late 1970s, and the research institute took over the mandate for technology transfer. In Costa Rica, as well, research and extension have recently been brought into one department.

The paper's first section examines the ICA experience with merging research and technology transfer. Another analyzes the Coffee Growers Federation. Then conclusions are drawn regarding the general policy recommendation that agricultural research and technology transfer should be placed in the same institution.

1. The Colombian Agricultural Institute (ICA)

ICA, the Research Institute (1963-1968)

The Colombian Agricultural Institute (ICA) was formed in 1963. Although it officially had research, extension, and education responsibilities, overwhelmingly its primary function was research. A small agricultural communications program provided publications and in-service training for professionals of other institutions. The research program also produced certified seed in close coordination with a supervised credit program that distributed the seed. Extension was carried out by the Ministry of Agriculture as a separate service. ICA's efforts were concentrated on commercial crops, including rice, sesame, barley, soybeans, and sorghum. These crops are usually produced by relatively large growers in Colombia.

During its early years the institution was very effective. Although the coordination mechanisms were not elaborate, they seem to have been sufficient to achieve significant results. Sixty-two varieties were released between 1966 and 1969 (Ardila, 1984, p. 7). By 1970, almost all the country's sorghum acreage and over half the barley, rice, and sesame acreage was in improved varieties created by ICA. Commercial crop yields rose an average of 8% annually between 1965 and 1969 (Kalmanovitz, 1978, p. 69). Various studies have found high internal rates of return to ICA's research on rice, soybeans, and wheat during this period (Hertford et al. 1977).

ICA, the Multi-functional Institute (1968-1989)

A reorganization of the public agricultural institutions in 1968 transformed ICA into a multi-functional agricultural technology institute. The national extension service, various regional extension services, and the cotton, tobacco, and animal disease institutes were all incorporated into ICA. In addition, the institute was given responsibility for: the regulation of agricultural input production, distribution, and use; seed certification; animal and plant sanitary measures; the supervision of agronomists who provide technical assistance; and rural development activities for small producers.

These changes radically altered the institution's size and complexity. The number of employees jumped from 1,779 in 1967 to 6,272 in 1972, and the total budget more than doubled in real terms (Trigo et al. 1982).

The relations between research and technology transfer within the new context were poor (Zandstra et al. 1979). The technology transfer workers had little direct contact with the researchers, and the contact they had was often conflictual. Technology transfer staff complained of irrelevant research, researchers' lack of concern for socioeconomic variables, and their unwillingness to leave their experiment stations. They were also resentful of what they considered the researchers' patronizing attitudes, of not receiving appropriate credit for their contributions, and of being used solely to carry out manual tasks.

For their part, the researchers criticized the technology transfer staff's attempts to conduct adaptive research. These efforts were accused of being outside their mandate, duplicating previous work, suffering from faulty experimental design, and confusing

demonstration activities with experiments. Researchers also questioned extension's community development activities which, they said, left the extensionists little time to concentrate on technological problems.

Underlying these tensions was a strong competition for resources. After the 1968 reorganization, the distribution of resources within ICA shifted sharply away from research; at a time when ICA's overall real resources were constant and the financing for researchers' operational costs was falling. A similar shift occurred in training opportunities. Although the absolute number of researchers receiving scholarships increased, their percentage of total scholarships fell sharply. These changes were greatly resented by the researchers.

Clearly, the expectation that bringing the technology transfer activities into ICA would improve their coordination with research proved unfounded. In fact, conflicts intensified as the two groups, who shared neither common objectives nor a common methodology, were asked to work together and as competition over resources and the definition of the institution's mandate became more direct and explicit. Instead of one "ICA" culture, two very separate "research" and "development" cultures emerged.

The failure to effectively integrate the two activities may also have negatively influenced the institution's performance. After 1970 there was a drop in the number of new varieties released. Commercial crop yields stagnated and some even fell (Balcazar, 1985). ICA shifted some of its efforts towards crops traditionally produced by smaller producers, but here also, except for potatoes, yields improved little. Many knowledgeable

informants report that after a short period of dynamism associated with externally funded rural development

projects in the early 1970s, the institution suffered a general decline and loss of direction.

The Great Debate: Should ICA be Redivided?

This sense of decline led to an intense debate over what institutional model was appropriate for ICA. From 1977 onwards, numerous seminars, internal commissions, and external missions were organized to study the question. In one way or another practically every public and private institution concerned with agricultural technology in Colombia was involved. Eventually almost everyone reached the same conclusion: many of ICA's technology transfer activities should be separated from its research functions (Alarcón, 1986). The principal arguments for this follow.

- 1) **Excessive Size and Functional Diversity.** Combining too many functions into one institution made it unmanageably large, complex, and bureaucratic. Management was forced to attend to such a wide range of problems that it was unable to focus on long-term strategic goals or carry out in-depth analysis of specific problems. To manage such a large system, in which routine tasks and non-professional employees were predominant, required a hierarchical structure and inflexible rules. These were poorly suited for agricultural research, which requires a less formal, collaborative environment.
- 2) **Politicization.** ICA's involvement in development tasks of immediate national political interest, such as sanitation campaigns and credit programs, as well as the sheer quantity of resources under its control, fomented its politicization. This was reflected in frequent changes in directors and deputy directors (who are political appointees) and pressure, particularly in the non-research departments, to make

inappropriate appointments based on political considerations (Alarcon, 1986, p. 33). By bringing technology transfer, which is inevitably somewhat politicized, together with research, which is less likely to be politicized, the first activity contaminated the second.

- 3) **Structural Incompatibilities.** The institutional structure and geographical divisions necessary for technology transfer activities are very different from those needed by research. For the former it is important that greater attention be paid to political/administrative divisions, and a much larger local and regional infrastructure is required. Research, however, must concentrate on agro-ecological zones and requires a critical mass of researchers to be effective.

In 1984 the political decision was made to redivide ICA in 1984, and an initial internal reorganization was conducted to facilitate such a division. Nevertheless, a complete division was kept from occurring by difficulties in obtaining congressional support and by fears among those involved in non-research activities that their funding would be reduced if they were separated from research. The researchers themselves were partially placated by a large World Bank loan that improved their access to resources and helped to restore their institutional dominance. Besides, although there is some consensus for the need to separate many development-related activities from research, there was less agreement within ICA over the appropriate alternative institutional model and how research and technology transfer activities ought to be coordinated.

2. The Colombian Coffee Growers Federation

The Colombian Coffee Growers Federation is a nominally private growers' organization that has government representation on its national committee and receives most of its funds from a public levy on coffee exports, all of which goes to the Federation. The Federation was created in 1927, largely in response to marketing and policy problems, on which it has continued to focus its principal energies.

Most research within the Federation is conducted by the national coffee research center (Cenicafé). The Federation's rural extension service is responsible for transferring coffee technology.

Coordination between research and extension

Within the Federation, both research and extension respond to a common manager, the technical subdirector. Every two years 40 to 50 high- and middle-level research and extension managers hold a week-long meeting to discuss joint implementation of the Federation's technical policies. There are also multiple opportunities for high-level extension agents to come into contact with researchers (less for field staff).

A number of effective and well-established mechanisms to make research results available to extension agents. Cenicafé publishes a popular series of short bulletins covering specific technical themes of interest. Practically all extension agents read these bulletins, and most find them both enjoyable and useful (Olivera, 1982, p. 75). Every 10 years a manual is produced, summarizing the relevant research results and recommendations. In-service training, in which researchers play a major role, is consciously used to reinforce the technical messages

management wants to emphasize. National campaigns, institutional memoranda on technical issues, and demonstrations by regional research stations are also used to make sure a single clear technical message is passed on from research to extension.

Information also flows in the opposite direction, although somewhat less effectively. Some 43% of university-trained extensionists and 19% of those with only vocational training report having presented at least one specific research problem to Cenicafé (ibid: 113).

The conflicts between researchers and extension workers found in ICA are practically absent in the Federation. Although they have, on average, lower formal educational qualifications than their ICA counterparts, Federation researchers and extension workers are much less critical of each other's competence. The level of contact (both direct and indirect) is higher, as is their observed interdependence.

Institutional Performance

Admittedly, for many years the Federation had relatively little impact on coffee-growing practices. Yields were relatively stagnant, and few profitable recommendations were available for the Federation to promote. Most growers used traditional varieties, planted without fertilizer and at low densities.

From 1970 to 1980, however, there was a major shift in Colombian coffee technology. The introduction of the short *caturra* variety from Brazil made a much more capital- and land-intensive production profitable. Planting densities rose rapidly. National fertilizer consumption tripled. Nurseries became more common. Weeding was increasingly done by machetes or herbicides, rather than by hoe. Yields more than doubled. Moreover, a large proportion of those who adopted the new technology were small producers with less than three hectares of land (Arango, 1986).

It is not clear how much credit the Federation can take for these changes. *Caturra* might have eventually diffused through Colombia without the Federation's intervention and high coffee prices in the late 1970s provided a favorable climate for investing in coffee. On the other hand, in other Latin American countries which lacked an

efficient technology provision service like that of the Federation, these same changes took place much slower, if at all.

A clearer example of the organization's effectiveness can be found in recent campaigns to control coffee rust (*Hemileia vastatrix*) and coffee bean borer (*Hypothenemus hampei*), both of which pose potentially devastating threats to the Colombian coffee industry. After rust first appeared in Brazil in 1970, the Federation, in collaboration with the Colombian government, launched one of the largest and best-organized agricultural sanitation campaigns ever undertaken in Latin America. This campaign played an important role in keeping the fungus from reaching Colombia until 1983. By then the Federation had succeeded in developing a rust-resistant variety, and had perfected and disseminated information on effective fumigation methods for controlling rust. The coordination between research and extension in these efforts, particularly after 1983, was extensive (Kaimowitz, 1988).

The story of coffee bean borer, which has not yet reached Colombia, is similar. Already Federation researchers are involved in major efforts to train extension agents and producers in borer prevention, detection, and control.

Why is Research-Extension Coordination Better in the Federation?

Various authors have found that coordination between commodity-specific extension agencies and other agencies (including research) tends to be greater than in the case of general extension agencies (Kang, 1984, Ekperere, 1973). Specifically in the Federation, the fact that the researchers and extension workers share the same clearly defined areas of interest and client groups (i.e., that their domains correspond) has been an important factor in promoting their interaction. Both groups are specialists in coffee, and this provides the basis for meaningful communication. Moreover, status differences between them have been partially overcome by extension agents' great practical knowledge of coffee production. (In contrast, in ICA most technology transfer workers are generalists who haven't built up a similar high level of expertise about any particular crop or subject area.)

A second important factor is the Federation's unique institutional culture and value system. The roots of this culture can be found both in the Federation's unique status in Colombian society and its internal management practices (Errazuriz, 1986). The Federation was developed by the leaders of the coffee industry at a time when the national government's presence in the coffee regions was still quite weak; and in many ways it filled the vacuum that weakness created. Although originally promoted mostly by large growers and exporters, its role in efficiently substituting previous commercial and financial intermediaries has given it great prestige among small coffee producers. Its non-partisan character and emphasis on organizational efficiency, compared with the politicization and personal patronage systems typical of most Colombian institutions, have also helped in this regard. Thus the institution has a power and legitimacy unequalled in the Colombian context.

Management practices have also played an important role. There is an emphasis on hiring people from the coffee areas, particularly from coffee-growing families. This means Federation workers come from relatively similar backgrounds and helps to sustain the Federation's powerful ideological conceptions of "coffee country" and

"coffee family" and the idea that coffee production is not just a source of income, but a way of life.

Federation hiring is quite selective. It can afford to be because its relatively high salary and benefits packages and, perhaps more important, great prestige and power, make it an attractive employer. This helps to reduce status distinctions between research and extension. In many developing countries extensionists have a low self-image, reinforced by researchers' negative attitude towards them. In contrast, in the Federation, both extensionists and researchers come into the organization believing they and their counterparts are the most qualified people available.

Salaries, benefits, prestige, and other factors have also led to a high level of stability, both among Federation management and personnel. This has allowed technology development to be followed through to fruition and for long-term relations to develop between research and extension personnel. It has also contributed to the notably paternalistic "family" atmosphere which exists within the Federation, reminiscent of descriptions of the large Japanese corporations. Although management/staff relations within the Federation are perhaps even more hierarchical than in ICA, unlike ICA, the highest-level officials are addressed by their first names, and the institution is involved in every aspect of an employee's life, from sports to support in times of crisis. The ultimate effect of this atmosphere has been that researchers and extension agents share a common framework and self-image and have been socialized to consider themselves full participants in a joint effort.

Finally, the Federation is smaller and more geographically concentrated. It has only one-eighth the number of researchers of ICA and one-third the number of workers involved in technology transfer. Whereas ICA has six national research centers and must serve the entire nation, the Federation has one and can concentrate its efforts on relatively small, compact geographical areas. This has facilitated the cohesiveness of the Federation's researchers and extension agents.

3. Conclusions

The experiences of ICA and the Colombian Coffee Growers Federation show that combining research and technology transfer in one institution is neither a necessary nor a sufficient condition for effective coordination between the two activities or improved institutional performance. Prior to 1968, despite the fact that research and technology transfer were housed in separate institutions, ICA was able to effectively transfer

the new varieties produced by its researchers. Bringing the two activities together, if anything, made coordination and performance worse. On the other hand, it seems unlikely in the case of coffee that the coordination between research and extension would have been as extensive as it was, had these activities been placed in two separate institutions.

Five factors largely account for the different outcomes, particularly with respect to the coordination between research and technology transfer. First, unlike ICA, the Federation focuses on a single crop and client group. This permits a greater commonality of concerns between research and technology transfer. Second, the Federation has paid more attention to creating a uniform institutional culture and has not allowed independent "research" or "extension" cultures to develop. Third, this institutional culture, combined with the Federation's greater access to resources, has made it possible to reduce the status differences and competition for resources between researchers and technology transfer workers that have been so problematic within ICA. Fourth, the combined size of research and technology transfer proved to be unmanageably large in the ICA case, but not in the Federation. Fifth, the Federation's private status has allowed it to avoid the politicization experienced by ICA.

Politicization problems are more likely with technology transfer than research and, where they cannot be avoided, may be a strong argument for keeping research institutionally independent.

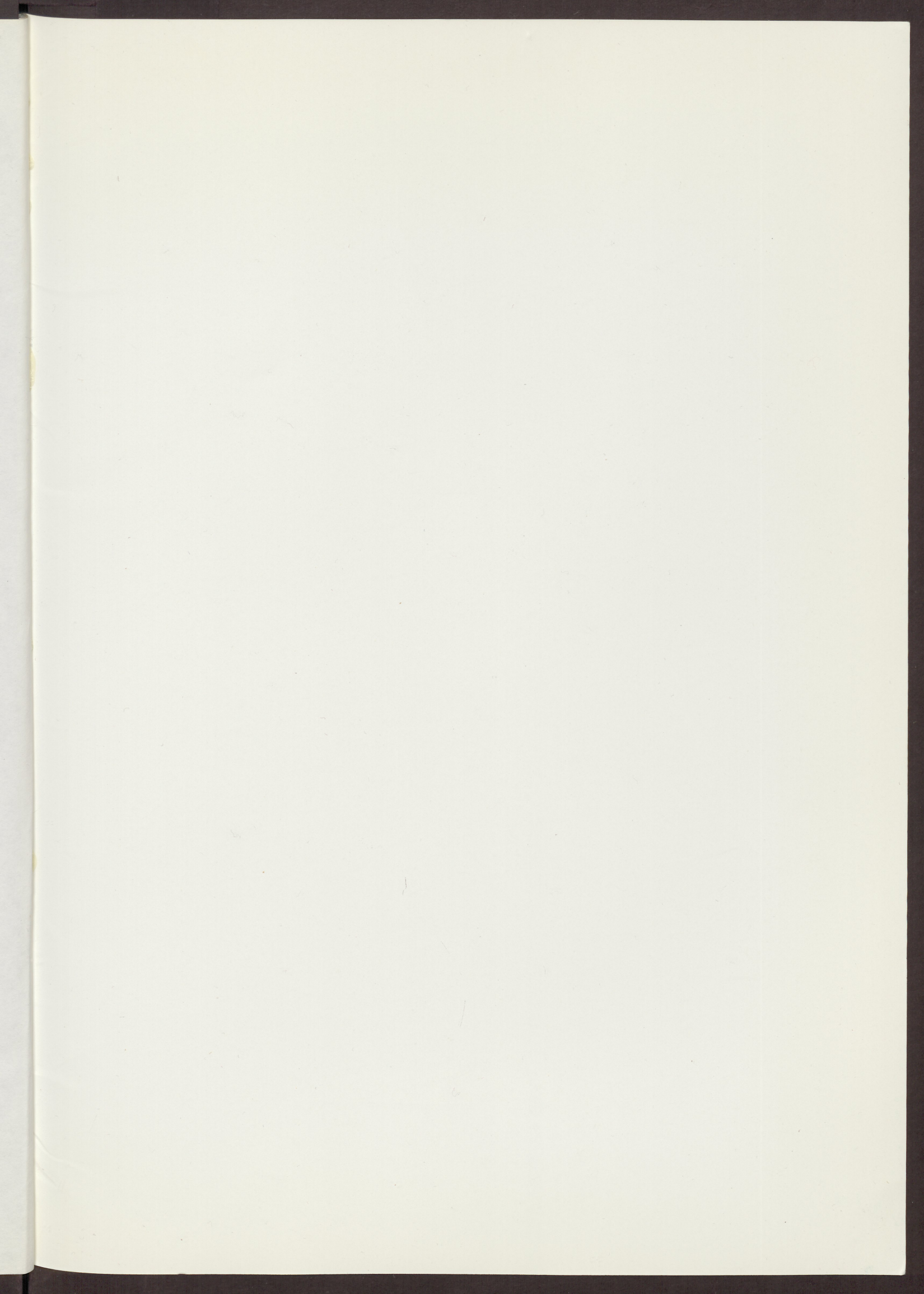
Given the key role played by these five factors, we conclude that housing research and technology transfer in one institution is likely to succeed where: (1) both research and technology transfer share a common sharply focused domain, be it a specific commodity or region, or a particular problem; (2) the interest, skills, and resources exist to actively manage the relations between the two activities; (3) the size of the combined institution would not be too large to be effectively managed, **and** (4) the technology transfer process is not likely to be highly politicized. Where these conditions do not hold, it is better to maintain the two activities separate.

Footnotes

1. David Kaimowitz is Research Fellow at the International Service for National Agricultural Research (ISNAR), P.O. Box 933705, 2509 AJ The Hague, Netherlands. This paper is part of a much larger international comparative study of the relationship between agricultural research and technology transfer currently being conducted by ISNAR. The author gratefully acknowledges the financial support of the Rockefeller Foundation, and the governments of Italy and the Federal Republic of Germany in this study and the excellent collaboration received from both the Colombian Agricultural Institute and the Colombian Coffee Growers Federation. The paper represents the views of the author and not necessarily those of any of the participating agencies.
2. Undoubtedly one should be cautious about trying to definitively attribute the apparent decline in institutional performance to the 1968 reorganization. A wide variety of factors can affect yields. The new emphasis on work with smaller producers involved a more difficult challenge, for which it was probably not reasonable to expect such dramatic results. Moreover, independent of the structural changes, after 1970 the institution's access to resources stagnated. The previous period had been one of substantial growth and dynamism. This being said, however, it is also probable that the institutional reorganization had a noticeable adverse impact of its own.
3. The Federation is also involved in some research and technology transfer in other crops besides coffee, but this is of relatively minor importance.
4. Needless to say, the relations between research and extension in the Federation are not perfect. A discussion of many of their shortcomings can be found in Kaimowitz (1988). Comparatively, however, the relations are much better than those found in ICA.

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