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Institutional Impacts of the Cassava Farmer Participatory Research and Extension Project in Thailand and Vietnam, 1993-2004

By:
Peter Calkins and *Vu Thi Thao*

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Contents

Institutional Impacts of the Cassava Farmer Participatory Research and Extension Project in Thailand and Vietnam, 1993-2004

Peter Calkins[*] and *Vu Thi Thao*[**]

Introduction

This report undertakes to trace, measure, and test the significance of the benefits to the implementing research and extension institutions of the Cassava Farmer Participatory Research and Extension (CFPRE) project in Thailand and Vietnam from 1993 to 2004. The project was also carried out more sporadically in China and Indonesia, but given the less complete nature of the results, the current report is limited to comparing results of surveys and focus groups on participants from Thailand and Vietnam. For a complete description of the geographical and agronomic characteristics of the study sites in the two countries, as well as an overview of the entire project, see Howeler (2004). The project was funded by the Nippon Foundation of Tokyo, Japan, and administered by the Centro Internacional de Agricultura Tropical (CIAT), with the strong collaboration of national, provincial, and local governments; agronomic research institutes; agricultural universities; extension organizations; village research coordination committees; local schools; and, most critically, the men and women farmers of the target regions.

Thus, the benefits of the project cannot be limited to the research and extension institutions directly studied in this report, but must include a whole series of other institutions that either directly participated in the CFPRE project or were indirectly benefited by its implementation. A minimal list of the direct institutional actors of the CFPRE includes eight distinct categories. At the

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"macro-social" (national/supranational) level we find:
(1) An international aid donor – the Nippon Foundation;
(2) An international non-governmental organization (NGO) – CIAT; and
(3) The national governments of two countries – Thailand and Vietnam.

The "meso-social" (regional) level includes:
(4) Government institutions involved primarily in **research** – the Department of Agriculture (DOA), Land Development Department (LDD), and the Thailand Tapioca Development Institute (TTDI) in Thailand; and the Institute of Agricultural Sciences (IAS), the Vietnam Agricultural Sciences Institute (VASI), and the National Institute for Soils and Fertilizers (NISF) in Vietnam;
(5) Government institutions involved primarily in **extension** – the Department of Agricultural Extension (DOAE) in Thailand; and
(6) Agricultural universities – Kasetsart University (KU) in Thailand, University of Agriculture and Forestry II (UAF2), Hue Agricultural University, and Thai Nguyen Agricultural University (TNAU) in Vietnam.

And finally, at the "micro-social" (village) level we find:
(7) Village-level organizations – the village research coordination committees; and
(8) Credit cooperatives and self-help groups spontaneously created by the farmers themselves as the project evolved.

Figure 1 portrays as overlaps among its eight uppermost circles the participatory network that links these eight types of direct actors within the CFPRE project. Application to cassava-based cropping systems (the ninth circle down) in turn leads to three types of outcome (bottom three circles of Figure 1): cassava yield, food, and income for rural people. In fact, the primary motivation of the CFPRE project was not to maximize cassava yields *per se*, although that was a formidable scientific and logistical challenge, but to help relieve poverty and improve standards of living in rural Vietnam and Thailand. This was to be attained by allowing disadvantaged farmers to achieve sustainably higher yields, greater food security (creating more robust health and nutritional status in the longer term), and higher net farm income (and wealth in the longer term), for example, see Howeler (2004; p. 15).

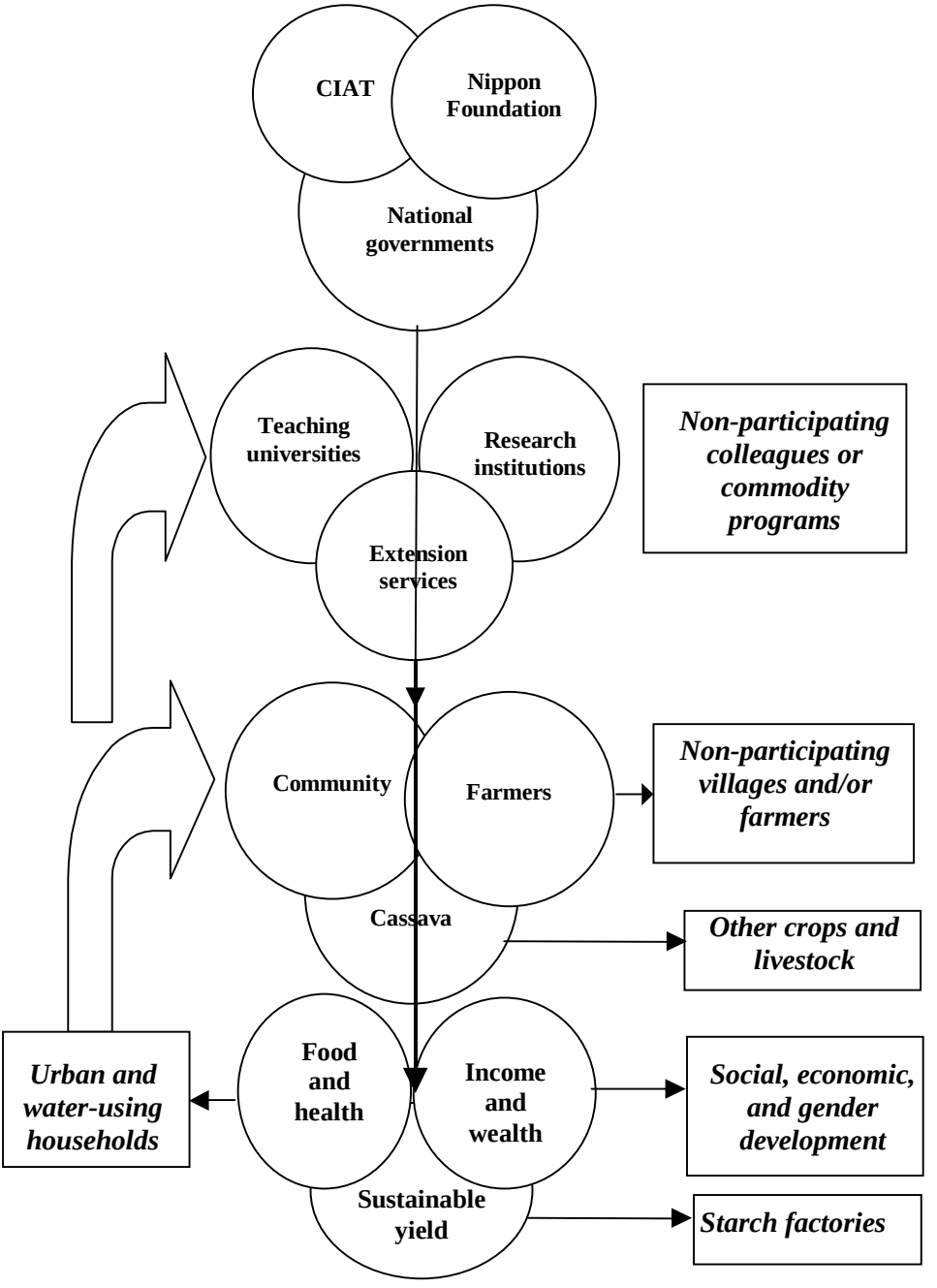

Figure 1. Direct and indirect institutional actors in the Cassava Farmer Participatory Research and Extension project.

In addition to these largely social and humanitarian objectives, the CFPRE project also set itself at least three institutional goals (Howeler, 2004; p. 6-7):

- Supporting national institutions in conducting strategic and applied research;
- Strengthening the farmer participatory research capacity in national institutions and in **selected farming communities** (our emphasis); and
- Improving institutional linkages and acceptance of a farmer participatory research (FPR) approach in collaborating institutions, with persons trained in FPR methodologies.

These institutional goals are formally analyzed in the present report. Because the social network of Figure 1 is not hermetically sealed off from the rest of society, we call attention from the outset to the many non-participant, indirect beneficiaries of the project who lie outside the areas of collaboration among the direct actor-beneficiaries. These are depicted as rectangles outside the convergence of the various circles. They include non-participating personnel within the research and extension institutes, non-participating farmers from the target villages and from other villages, the cassava and agricultural sectors of each country, and complementary livestock and crop commodities in interaction with cassava within new and existing farming systems. Also included are downstream water users benefiting from erosion control, poor urban consumers who may purchase cassava more plentifully, non-cassava producing livestock raisers, starch factories that benefit from the economies of larger and more sustained volumes, and women and ethnic minorities whose gender and social status, as well as their cassava production, may be improved through association with the project.

As human beings, the initiating and implementing personnel within the project institutions are aware of, and take pride in, any beneficial spillovers to non-participants. To the extent that these spillovers generate a sense of professional satisfaction, self-realization, or applied altruism, they may have a positive impact on future motivation and initiative by the implementing personnel, constituting in themselves a powerful institutional impact. Such positive feedbacks, which are formally tested wherever possible in this report, are depicted as large upward arrows on the left side of Figure 1.

Methods and Structure of This Report

Put simply, we seek to establish which of the downward arrows (direct institutional impacts to participants), sideward arrows (indirect impacts to non-participants), and upward arrows (institutional feedbacks) in Figure 1 are significantly present in CFPRE institutions, and to give a detailed systemic explanation of why (or why not). Our approach is based upon two broad levels of evaluation of institutional impacts: "internal" and "external". By internal impacts we mean how the researchers and extension personnel feel that the structure, procedures, behavior, collegiality, and efficacy of their home institution have changed as a result of involvement in the CFPRE project. For example: Are they in more direct contact on a daily basis with their superiors, their colleagues, or their subordinates? Do they feel greater motivation? Do they have higher understanding with and empathy for the farmer? Do they receive favorable comments on the CFPRE approach? Has the approach even been "copied" by colleagues for application to other crop and livestock commodities? And, above all, do they feel the project has changed their productivity as they go about their daily work?

External impacts, on the other hand, have to do with perceived positive effects on the world outside the walls of the home institution (upward arrows in Figure 1). Do respondents believe that farmers really do have higher yields? Is that because of the project or because of other projects and policies in place over the same 10-year period? Do project farmers perform better than non-project farmers? Has the project helped the poor catch up to the rich in per capita income? Have new conservation and other technologies emerged from the project? Are researchers in more frequent contact with policymakers, counterparts from other institutions, extension agents, and farmers? This second external set of institutional impacts mirrors back to the home institution its own agronomic, economic, and institutional impacts on other institutions and individuals, and as such may constitute a major institutional impact in its own right.

Objectives

To provide answers to these and other questions, we have set five specific objectives for the present institutional impact analysis of the Farmer Participatory Research Extension (FPRE) cassava project in Thailand and Vietnam:

(1) To measure the perceived institutional impacts (on procedures, priorities, strategies, work efficiency, communication, learning, collegiality, enthusiasm, and partnerships) of the FPRE approach, involving networking among government officials, researchers, extension workers, farmer-participants, and farmer non-participants, as compared to traditional research and extension programs for cassava development.
(2) To identify and then assign a relative weight to the perceived determinants (stage of farmer involvement, direction and intensity of communications, emergence of institutions and partnerships, etc.) of those impacts.
(3) To assess whether the perceived impacts of the FPRE approach have differed significantly by region or country; the participatory status of farmers; or the institution, discipline, seniority, or gender of the respondent.
(4) To determine the problems in internal implementation (misunderstanding, farmer disincentives, budget constraints, time available, field logistics, etc.) or the external environment (policies, markets, culture) that have prevented results to date from being greater.
(5) To recommend strategies and means to improve the FPRE approach in the future.

Achieving these objectives will allow us to find answers, not only to specific questions such as those listed earlier, but also to three more general questions as to the overall institutional impacts of the CFPRE project:

(1) Do the greatest institutional benefits take the form of improved management procedures, bottom-up strategies, higher priority to cassava, greater work efficiency, enhanced communication, deeper technical/scientific knowledge, greater understanding of farmers, higher collegiality and enthusiasm, or greater personal motivation?

(2) Have there been significantly differential institutional impacts between Vietnam and Thailand, the various regions of each country, or participating and non-participating farmers?
(3) Have the potential impacts of the FPRE approach been reduced primarily by **internal** budget limitations, scientific knowledge, and management procedures; or by **external** policies and economic conditions?

Conceptual Framework and Literature Review on Farmer Participatory Approaches

Client-participatory research and dissemination (CPRD) networks are open, interactive, dynamic systems par excellence. First, their institutional impacts not only affect each of the direct participants, but as noted above, their open nature leads them to spill over to peripheral beneficiaries outside the network. The institutional externalities of CPRDs may often be of greater value than their internal benefits, making traditional economic impact assessment a problematic tool (Safilios-Rothschild, 1981). Similarly, within such an open system the focus commodity (in this case cassava) necessarily competes with or complements other agricultural commodities useful to the client population, generating higher or lower yields, more or less net farm income, greater or lesser food security, better or worse gender and ethnic relations. These interactive effects return a sense of pride, altruism, self-realization, and professional accomplishment to the researchers and extension workers who initially provoked such changes in the client's milieu, thereby fuelling their motivation and enthusiasm to continue. Finally, some of the largest effects of the project may be dynamic, taking time to accumulate, especially where human learning and natural resource rebuilding are involved. Therefore, to judge whether or not a project has been a "success", one must take into account both internal and external impacts over several rounds and from a long-term perspective.

The present study uses a conceptual framework based on the theoretical strengths and weaknesses of farmer participation, the analysis and evaluation of networks, and the benefits and pitfalls of institutional analysis. The recent literature is rich in each of these areas. The following subsections present the sources of inspiration for the hypotheses to be tested in the current analysis.

The farmer participatory paradigm: Strengths and advantages

Selener (1997) lays out four main areas of application of participatory research: in community development, within institutions, in schools and with farmers (it can be argued that the CFPRE project combines all four of these contexts). Selener notes that within each context the type and level of participation, democracy, power, and control of the research process are critical determinants of success. Within farmer participatory research *per se*, Heinrich (1993) presents results from Botswana over a 7-year period. Similar to the present project's Village Research Coordination Committees in Thailand, that research was also conducted through research-oriented forums for the collaborative design, testing, and evaluation of a wide range of agricultural technology options. Final benefits included more focused and pertinent orientations for the research program; increased cost-effectiveness and agronomic efficiency; expanded research capacity; and stronger links among farmers, extension personnel, and the research station.

Meanwhile, Sinclair and McGregor (2001) synthesize social, economic, and ecological perspectives around process-based research, based on a participatory, farmer-centered model of research and development. Weijenberg et al. (1995) cite farmer participation of agricultural research as a means to speeding up the rate of technology generation, transfer, and adoption. Especially when combined with institutional reforms, new modes of regional cooperation, and extension mechanisms based on an ecoregional research agenda, farmer participation can help increase the relevance of agricultural research.

Garrity et al. (2000) use the example of contour hedgerow systems to control soil loss on cassava fields to review experiences of adoption of forages for ruminant nutrition and erosion control, emphasizing the use of FPR trials as a key institutional innovation. They stress the empirical framework of interaction between technical components and institutional arrangements, naming constraints to predict under which circumstances each cropping system is likely to be adopted.

Campilan (2002) portrays the conceptual and methodological issues of FPR, using the experience of the Centro Internacional de la Papa (CIP) with potatoes in several countries, including Vietnam. Campilan found that the primary advantages of FPR were that it enabled scientists to access local agricultural knowledge, tap farmers' inherent capacity for learning and experimentation, employ local resources and material inputs to develop appropriate technology, and take advantage of community groups and institutions to facilitate research.

Berrueta-Soriano et al. (2003) use the example of solar technology development to show how farmer participation with solar equipment conceptualization can help design coffee dryers congruent with the growers' socio-economic situation and culture, and their own vision of natural resource management in Mexico. Meanwhile in Sri Lanka, Senaratne (2003) inventories the institutional and policy barriers to adoption of sustainable agricultural systems as a whole. The 30 years of experience there suggest that farmer participation must be strengthened at all levels, in part to modify research and extension system priorities, and in part to identify meaningful institutional incentives to promote adoption among farmers.

Williamson (2002) uses case studies of farmer participatory training and research in cocoa, coffee, nuts, and tea in various countries including Vietnam to help growers improve their marketing and post-management strategies. Conclusions from such FPRE showed how to make tree cash cropping more economically, socially, and environmentally beneficial as well as showing the institutional and policy incentives needed to increase farmer flexibility.

The experience of FARM, an NGO in southern Ethiopia, underscores the fact that farmer participation may lead to improvements not only in technology, but also in the institutional environment and the skills of government and NGO staff (Jonfa, 1996). Farmers feel ownership of trials if they are the ones who rank and score the results, giving them a feeling of empowerment. Kamuanga et al. (1997) stress the financial savings of the FPRE approach by citing the case of agronomic research budget cuts in Cameroon. These led to the more cost- and impact-effective evolution of a three-stage FPRE strategy (similar to that used in the present cassava research. And Amézquita et al. (1998) report

multidisciplinary CIAT research on, and adoption of, resource-conservation practices in the fragile hillsides regions of Latin America.

Such impacts of farmer participation have repercussions on, and are further amplified by, factors outside the participatory system as such. Brunori et al. (2001) have found that farmer participation even enhances Italian farmers' understanding and response to general policy tools of the government, bringing large externalities to projects based on the participatory approach.

Constraints to and drawbacks of the farmer participatory approach

Any approach may have negative impacts when applied in an inappropriate context, and these are clearly outlined in Petch and Mt-Pleasant (1994). The authors warn of the dangers of attempting to adopt the FPRE paradigm when small rural development organizations must cope with highly diverse agro-ecosystems without the necessary access to institutional facilities, expertise, and fields for agronomic research. While this is not the case in the CFPRE project, the point is well taken.

Lynam and Farley (1999) regret that FPRE is still a marginal paradigm in national research and extension systems, both because it is seldom used, and because even when mentioned, it is through lip service to the idea, rather than incorporating the substantial advantages of the approach.

Hall and Nahdy (1999) decry the often-stifling context of national agricultural research systems that may severely limit the potential impacts of farmer participatory research. Power struggles between farmers and researchers, the professional identities of scientists, the level of skills and human capital, and doubts concerning the validity of farmer participatory methods all retard or block positive institutional transformation of the national research system.

Martin and Sherington (1997) address such difficulties of FPR, pointing specifically to the common gulf between participatory research projects and national research organs. They underscore the need for strong farmers'

associations and intermediary organizations to bridge that gulf by enhancing management innovation, skills, working procedures, institutional linkages, communication, coordination, and monitoring. Such institutions could also lead to more transparency and hence transferability of experience from one site to another.

Mosse (1995) points to the major social and cultural constraints to people's participation in planning within a hill tribe in western India. The production and use of local knowledge is determined by planning systems based on different agendas. It is insufficient to transfer knowledge in a "top-down" or "one-way" direction to people. Conditions must be put into place for sustained participation in rural development. To overcome some of these handicaps, a research workshop was held in Vietnam with participants from 13 countries that helped to formulate recommendations for more effective implementation of the FPRE paradigm in a wide variety of contexts (Gowda et al., 1993). Another constraint is perceived ideological and paradigmatic divergences between the Cartesian approach associated with both agronomic and statistical social science on the one hand; and the gender-sensitive, ethnographic, participatory, micro-level methods on the other. Gladwin et al. (2002) suggest several means of reducing the apparent contradiction between these two schools of thought. They insist that, when well handled, the strengths of each school may be clearly and effectively combined. The focus groups and statistical surveys of the present research attempt to do just that.

Institutional analysis

Vanderlinden (1999) addresses the potential of local institutions to foster cooperation for the management of commonly owned natural resources, with specific application to property rights and livestock mobility in Niger. Sumberg and Okali (1997) develop a framework for experiments undertaken spontaneously by African farmers. They find that results to date have been small and local, with little impact on the national research program.

Gender analysis, one key dimension of institutional impacts, is too often overlooked in evaluations of the farmer participatory approach. Sulaiman (2000) argues that gender analysis and needs assessment methodologies must

be used, including participatory rural appraisal and focus groups. (Both of these methods were actively employed in the CFPRE project.) The author shows the need to empower women farmers through informal education in Indonesia, where several cultural values and norms prevent women from participating in extension services, but argues that the economic opportunity cost of women's participation would have to be compensated monetarily.

Ekboir (2003) argues against economic investment impact analysis for research evaluations, favoring complex adaptive systems as a replacement. The author argues that difficult-to-measure policies, markets, and interactions among researchers, input suppliers, and farmers must be taken into account over the long term; and that what counts most is to evaluate the new rules and patterns of participation in research networks.

Farrington and Nelson (1997) first develop a generic logframe, and then show how this conventional project management tool can be adapted to the monitoring and review of FPR, especially when adopted by funding agencies as a way to monitor the outputs of a project. Because of the dynamic, interactive nature of the FPR process, logframes have to be updated more frequently in this context than in conventional projects.

Network analysis

Den Butter and Morgan (1998) demonstrate how network analysis can be used to interpret both the structures and institutional arrangements one observes in the real world. They conclude that it is not the structure as it appears on paper, but the way it is used that is critical to the successful interactions. In the present research, we attempt to detect such differences in the way general FPRE structures are used.

Sokolovsy and Cohen (1981) show how social network analyses can overcome many of the inadequacies of traditional measures of sociability (in their case, within a target group of inner-city elderly people). Each individual network can be charted within each type of interaction in terms of its frequency, intensity, and duration. This yields both quantitative and qualitative indicators of the range of a person's relations. While the present CFPRE study

could not pursue this approach in as much depth, we use network analysis for each respondent to chart the frequency, intensity, and direction of network ties both within and outside institutions.

Peng (2004) applies network analysis to a subject close to the Vietnamese institutional framework for the present study: the role of kinship and entrepreneurial networks in China's transitional economy. He combines the new institutionalism (how formal and informal structures can spur economic growth) with social network analysis. He finds networks to be particularly helpful in fostering the creation and spread of informal institutions. Blom-Hansen (1997) agrees, demonstrating that policy network analysis as part of the new institutionalist paradigm can help answer three questions: why networks come into existence, why they change, and why they are so persistent.

The present report draws upon this rich literature to identify and unravel the key relationships inherent in Figure 1. However, because the survey and focus group research instruments were administered only to research, university, and extension personnel at the second tier of the figure, this report can deal directly neither with governmental and international institutional impacts at the top of the chart nor with farmer impacts at the bottom. Instead, indirect evidence of institutional change is amassed through the perceived impacts of research university and extension personnel upon politicians and farmers. Moreover, the very different institutional structures of Vietnam and Thailand make strict comparison by institution type and region difficult. In Vietnam, multidisciplinary research and extension teams work in specific geographical localities. Meanwhile, cassava development in Thailand is organized into separate teams of researchers on the one hand and extension workers on the other, who either have national-level mandates or have worked in several parts of the country. The resulting non-comparability of focus group and survey questionnaire results means that some dimensions of our hypotheses can only be tested in one or the other country.

The vision of perceived impacts on other institutions within Figure 1 is used in two ways. First, it serves as a methodological cross-check and complements other farm-level studies being performed (see Purcell 2004; Lilja et al. 2005), which to date have found generally positive impacts of the project

at the farm level yet are beset by several ambiguities that the present research may solve. Similarly, the impacts on government officials are gauged by the number of contacts per week between project workers at diverse sites and various levels within the two countries.

The resulting empirical framework

While this first use of the perceived institutional impacts at other tiers must by its very nature remain purely subjective, the second use is to incorporate those perceptions of impacts upon external institutions—which we postulate to be honestly expressed even where possibly erroneous—**directly** into the professional utility functions of project workers. We may express that utility function in the following way:

Professional utility = *f* (perceived institutional impacts, job motivation, internal personal relations within organization, external personal relations with other organizations, salary, years of experience, seniority, country, site, type of organization, gender); where

Institutional impacts = *f* (farmer participatory research and extension efficiency, other professional approach efficiency); and in turn

Farmer participatory research and extension efficiency = *f* (spontaneous appearance of new farmer institutions; more accurate perceptions of agronomic, economic, social, and gender impacts on farmers; improved professional knowledge and management ability; increased communication within the organization, with colleagues/government, and with farmers; emulation/ positive reaction by colleagues; better understanding of and respect for farmers and positive change in fundamental values and beliefs).

Meanwhile:

Job motivation = *f* (feeling of altruism, feeling of self-worth); and in turn

Feeling of altruism = *f* (perceived alleviation of poverty, malnutrition, ill-health, and deprivation in the rural areas of one's country);

Feeling of self-worth = *f* (perceived respect in the minds of government and NGO cadres, colleagues, and farmers);

Internal personal relations within organization = *f* (FPRE approach, other professional approaches); and

External relations with other organizations = *f* (FPRE approach, other professional approaches).

While the above empirical framework must remain approximate, it illustrates how the utility function of other people (farmers, administrators, and colleagues) can be directly incorporated into the utility function and performance of project workers, bringing about potentially huge institutional impacts.

These are not overlooked in the following analysis. Specifically, the focus groups and open-ended questionnaire responses point to which of the arguments in the above relations are perceived to have been the most important in determining the results of the CFPRE project. Tests of means then isolate significant differences in those key arguments by country, site, seniority, gender, and type of organization, to verify the extent to which the institutional impacts of this project are sensitive to local and personal conditions. Finally, multivariate regressions endeavor to isolate across the entire sample the most important determinants of institutional, agronomic, and economic impacts as a basis for formulating future projects and government policies.

Hypotheses to be tested

Although many specific hypotheses could have flowed from the above literature review, the following 10 hypotheses most efficiently fulfill the objectives of the research.

Hypothesis 1. FPRE personnel believe that the use of participatory methods explains the greater adoption rate of new varieties by FPRE vs. non-FPRE farmers.

Hypothesis 2. The relative weight of FPRE vs. alternative explanations of agronomic impact increases significantly with project-related field activities and effective partnerships with other institutions.

Hypothesis 3. A perceived overall income increase for all farmers is also believed to make it harder for the poor to catch up in relative income to the rich; but the type of technology (unimodal varietal, bimodal soil conservation), the respondent's region, institution type, and rank all significantly color those perceptions.

Hypothesis 4. The perceived economic impacts on farmers are viewed differently by FPRE personnel of different rank, in different institutions, and of different age, gender, and discipline.

Hypothesis 5. The raising of consciousness towards full farmer respect depends upon the frequency of interaction with farmers, extension agents, and other subordinates within one's institution; the ability of policymakers to create a favorable environment for adoption; and the willingness of the farmers themselves to adopt technology.

Hypothesis 6. FPRE project personnel who see the positive impacts of farmer participation have benefited from understanding advisers, subordinates, and policymakers; and show a significantly greater tendency to become involved in robust work networks outside their institutions.

Hypothesis 7. Those who see positive effects from the project; feel their supervisors, subordinates, and extension agents understand farmers; and are egalitarian (feel they are helping the poor relatively and absolutely) are significantly more likely to maintain strong networks with extension workers and farmers.

Hypothesis 8. Those who are genuinely concerned with farmers, particularly poor ones, and feel that their subordinates understand farmers, are more likely to feel pride and enthusiasm in their work and wish to share their ideas with policymakers and researchers in other institutions.

Hypothesis 9. FPRE staff members that participate most actively in internal communication networks are lower-ranking personnel who see the positive impacts of FPR in technology adoption, but feel that current policies are inadequate.

Hypothesis 10. Perceptions of total institutional impacts differ significantly by country and type of institution.

Methodology

Steps in the research and analysis process

Testing these hypotheses rigorously and objectively required a six-stage research process:

(1) Define "institutional impacts" and other key operating terms for the variables to be analyzed in this research.
(2) Establish an empirical framework linking institutional impacts both to the FPRE network, and to their direct vs. indirect and external vs. internal causes.
(3) Rank and rate for each institution the most important impacts of the FPRE cassava project; group them into five categories for clearer comparisons among countries, regions, and institutions.
(4) Explain each type of impact by linking it to its key causes individually (correlation matrix), and then collectively (multiple regression).
(5) Rank and rate for each institution the most important constraints to even greater impact from the FPRE approach; group them into five categories for clearer comparisons among countries and regions.

(6) Generate strategy recommendations for reducing each of those constraints in the future.

Methods to collect information

These internal institutional impacts were measured in 10 of the 11 teaching, and research and extension institutes involved in the project in Thailand (KU, DOA, LDD, TTDI, and DOAE) and Vietnam (IAS, NISF, VASI, UAF2, and TNAU) by two means:

- A detailed individual questionnaire (see Appendix I), which was compiled and analyzed statistically on Statistical Package for the Social Sciences software (SPSS), and
- Five focus group discussions, with on average two institutions present, in which positive impacts and hindrances to greater success were collectively laid out and then ranked by vote (the results of the focus groups are given in subsequent chapters).

The external impacts were evaluated by two instruments: selected questions in the questionnaire of Appendix I and certain of the spontaneous comments from the same focus group discussions noted above, as well as open-ended questions from the survey. Field visits were also conducted to observe cassava production technology in each country (Dong Nai in southern Vietnam, Rayong in southeastern Thailand).

Analytical methods to answer the questions and validate the hypotheses

Our analytical strategy proceeded in four stages.

1. Tabular and graphical analysis of focus group results with weighted vote in five sites (three in Vietnam, two in Thailand)

First, we conducted focus group discussions in which individual participants wrote down a list of responses to a given question (positive impacts, negative constraints). We recorded all their answers on a whiteboard,

and then allowed each participant to vote for the five answers they considered to be the most important, with the following ranking: 10 points for the single most important response, 7 for the next, 5 for the third, 3 for the fourth, and 1 for the fifth. We then totaled the score for each question, sorted the scores by descending order, and classified the associated responses into five types of impact (management work, scientific and professional knowledge, understanding of farmers and their environment, motivation, and work efficiency) or five types of problems (operating budget, government policies, internal management, external economic and market conditions, and necessary knowledge or information). In cases where an answer seemed to straddle more than one of these categories, we divided the points among them. Finally, we drew cobweb diagrams for each group to illustrate which general class of (a) impact or (b) problem was the most important in each of the five focus group locations.

2. Tests for significant difference of means by subsample from survey questionnaires

There were 38 respondents for these tests, which were conducted using both (a) tests for significance of differences of mean across countries or institutions, and (b) bivariate correlation matrices between pairs of variables between the two countries. These analyses (which for reasons of space limitations, are not presented in this report) are straightforward in SPSS, and allowed us to isolate the most probable causal variables for the next step.

3. Multiple regression analysis to determine the weight and sign (+/-) of the most important variables to be enhanced in future strategies

In this step, we sought through iterative process the single most satisfactory equation to test each of our 10 hypotheses. As a general rule, the impact we wished to explain was set as the “dependent” or explained variable; the competing possible sources of that impact were set as “independent” or causal variables; and the country, institution, gender, and rank of the respondent were set as “intermediate” or conditioning variables.

4. Qualitative synthesis of group discussions

In addition to the summary tables and cobweb diagrams described above, we also tabulated the entire set of responses given by the 38 participants to the open-ended questions in the questionnaire. These are available upon request at peter_calkins2004@yahoo.com or thao_cares@yahoo.com.

Research Results to Answer the Study Questions

We start by answering the three questions laid out for this research.

(1) Do the greatest institutional benefits take the form of improved management procedures, bottom-up strategies, higher priority to cassava, greater work efficiency, enhanced communication, deeper technical/scientific knowledge, greater understanding of farmers, higher collegiality and enthusiasm, or greater personal motivation?

The answer to this question is mixed (Figure 2). The institutional benefits felt by each of the three institutional and two disciplinary groups across the two countries are substantial, but widely divergent. While it might appear disconcerting to some that the results of a single approach applied within the same project would vary so markedly, we prefer to interpret it as a reflection of the great flexibility of the approach, bringing to each institution the benefits that are most needed to compensate their historic weaknesses and to better respond to the needs of farmers.

(2) Have there been significantly differential institutional impacts between Vietnam and Thailand, the various regions within each country, or participating and non-participating farmers?

Tables 1 to 5 give the complete list of perceived impacts by descending order of priority in the five sites.

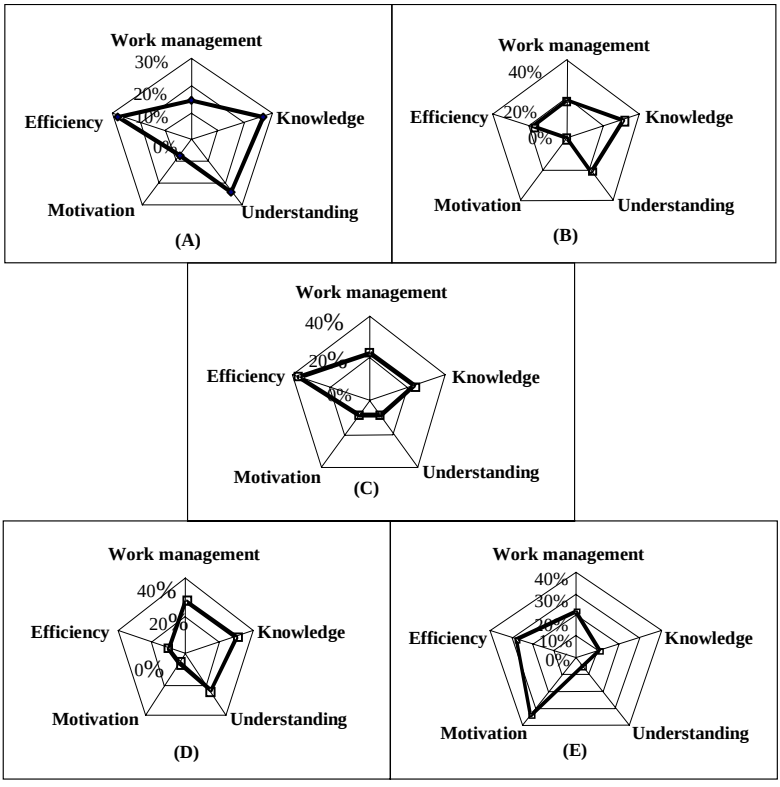

Figure 2. Contrasting patterns of perceived institutional benefits from the Cassava Farmer Participatory Research and Extension (CFPRE) project: (A) Dong Nai, Vietnam; (B) Vietnam Agricultural Sciences Institute (VASI), Hanoi, Vietnam; (C) Thai Nguyen, Vietnam; (D) as seen by researchers, Bangkok, Thailand; and (E) as seen by extension workers, Bangkok, Thailand.

Table 1. Perceived impacts[a] of the Cassava Farmer Participatory project in Dong Nai, Vietnam.

Positive impacts	Mgmt	Knwldg	Undstg	Mtvtn	Effcy	Total
Changed research methodology, awareness, thought, feelings	-	21.5	21.5	-	-	43
Captured recent market needs-better targets focus of future research	15.5	-	-	-	15.5	31
Research and technology transfer more efficient	-	-	-	-	23	23
Can learn farmer experience and habits, pinpointing benefits and difficulties	6.5	-	6.5	-	-	13
Can learn concretely the experiences of each colleague and expert	-	12	-	-	-	12
Farmers voluntarily adopted new advanced technology innovations without imposition from researchers	-	-	-	10	-	10
Research cadres and farmers understand each other better, and can help each other more	-	-	10	-	-	10
Strengthened practical knowledge, in turn makes positive impacts on extension work at farmer level	-	7	-	-	-	7
Helped farmers cultivate on time, in season	-	-	-	-	5	5
Changed attitude to extension work: to implant innovations with success need to capture necessary and sufficient farmer conditions.	-	-	-	2		2
Helped improve extension training work with respect to other crops	-	2	-	-	-	2
Percentage of total votes	13.9	26.9	24.1	7.6	27.5	

a. Mgmt, management; Knwldg, knowledge; Undstg, understanding; Mtvtn, motivation; and Effcy, efficiency.

Table 2. Perceived impacts[a] of the Cassava Farmer Participatory project in Hanoi, Vietnam.

Positive impacts[b]	Mgmt	Knwldg	Undstg	Mtvtn	Effcy	Total
More communication research and development opportunities between domestic/ international scholars; farmers/ researchers	-	-	43	-	-	43
Learned farmers' approach and methods to better focus future research direction, particularly for cassava	31	-	-	-	-	31
Made research activities generate scientific technical progress, transfer technical science faster, and save time and money	-	10	-	-	20	30
Learned needs, problems, advantages, and disadvantages of cassava farmers, to propose solutions and better target research	-	13.5	13.5	-	-	27
Changed research attitude: R&D must be more integrated and "packaged" to farmers	-	22	-	-	-	22
Fostered research skills in approaching, evaluating, and transferring advanced technology	-	-	-	-	20	20
Provided good opportunity to learn in more integrated way about cassava research	-	15	-	-	-	15
Captured farmer role in research-innovation-technology transfer	-	12	-	-	-	12
Made necessary connection between research and marketing	-	-	-	-	10	10
Captured local know-how and knowledge	-	8	-	-	-	8
Communicated research results faster and more efficiently	-	-	-	-	8	8
Diversified knowledge and thus strengthened writing capacity	-	4	-	-	4	8
Improved traditional approach by introducing participatory one	7	-	-	-	-	7
Considered both researcher and farmer knowledge	7	-	-	-	-	7
Participatory research method helps install advanced technologies (new techniques and new variety) more sustainably	-	-	-	-	5	5
Learnt knowledge and experience from farmers	-	5	-	-	-	5
Methodology can be applied to other projects, other kinds of crops	5	-	-	-	-	5
Learned methodology of farmer participatory research	-	1	-	-	-	1
Percentage of total votes	19	30	21	0	18	

a. Mgmt, management; Knwldg, knowledge; Undstg, understanding; Mtvtn, motivation; and Effcy, efficiency.

Table 3. Perceived impacts[a] of the Cassava Farmer Participatory project in Thai Nguyen. Vietnam.

Positive impacts	Mgmt	Knwldg	Undstg	Mtvtn	Effcy	Total
Techniques to collect, choose, and analyze information more efficiently so as to discover more efficient means of solving problems	-	-	-	-	40	40
Increased ability to teach and help students think better, thus raising student ability to apprehend conditions in the villages	-	31	-	-	-	31
Experience in approaching farmers from which can implement every future project more efficiently	9	-	-	-	9	18
Scientific and experiential basis to realize other projects in future	13	-	-	-	-	13
Using participatory methods in the construction of each project is more logical for the school	8	-	-	-	-	8
Can broaden relationships within scientific research work.	-	-	-	8	-	8
Have conditions to interact with farmers from which can know their heart-felt thoughts and aspirations	-	-	7	-	-	7
Can learn many farming systems of the farmers	-	-	4	-	-	4
A more cooperative and sharing work attitude	-	-	-	3	-	3
Percentage of total votes	22.7	23.5	8.3	8.3	37.1	

a. Mgmt, management; Knwldg, knowledge; Undstg, understanding; Mtvtn, motivation; and Effcy, efficiency.

Table 4. Bangkok researchers' list of perceived impacts[a] of the Cassava Farmer Participatory project.

Positive impacts[b]	Mgmt	Knwldg	Undstg	Mtvtn	Effcy	Total
Learn new knowledge from CIAT, such as about soil fertilizers	-	25	-	-	-	25
Will now apply FPR to other projects because I see its merits	12.5	12.5	-	-	-	25
Learn how farmers select practices from demonstration plots	-	-	23	-	-	23
Get opportunity to apply FPR approach for first time	-	23	-	-	-	23
No longer work alone, but in partnership with researchers, extension workers of other institutions, and farmers	10	-	-	10	-	20
DOA accepts FPR approach as new policy	20	-	-	-	-	20
Knowledge about efficient production to help farmers increase income	-	-	-	-	18	18
Combine many institutions and ministries into one unified program; this makes the FPR approach clearer for farmers	15	-	-	-	-	15
Farmers more confident to express themselves because of their increased knowledge	-	-	12	-	-	12
Understand what farmers need, when and where to better serve/convince them	-	-	11	-	-	11
Realize some of old technologies developed at research centers do not work; reorient our research priorities	-	3.5	-	-	3.5	7
Farmers trust researchers and extension worker	-	-	4	-	-	4
Better planning for future because of better coordination among many institutions	1.5	-	-	-	1.5	3
Gain more knowledge (local wisdom) from farmers	-	0.5	0.5	-	-	1
Motivation in working with farmers because we understand them better	-	-	-	1	-	1
Percentage of total votes	28.4	31	24.3	5.3	11.1	

a. Mgmt, management; Knwldg, knowledge; Undstg, understanding; Mtvtn, motivation; and Effcy, efficiency.
b. CIAT, Centro Internacional de Agricultura Tropical; FPR, farmer participatory research; DOA, Department of Agriculture.

Table 5. Bangkok extension workers' list of perceived impacts[a] of the Cassava Farmer Participatory project.

Positive impacts	Mgmt	Knwldg	Undstg	Mtvtn	Effcy	Total
Can apply farmer participatory research (FPR) to other crops and with other colleagues	38	-	-	-	-	38
Approval from boss (who sees results) makes my work easier	-	-	-	-	29	29
More cooperation from farmers and officers	-	-	-	14	14	28
Satisfaction/self-actualization that living standards of farmers have improved	-	-	-	17	-	17
Increased knowledge and experience with FPR tools and methods	-	16	-	-	-	16
Have more reason to analyze the project	-	-	-	11	-	11
Easier to work because project targets are clearly defined	-	-	-	-	10	10
Feel that farmers love us (happy, motivated)	-	-	-	10	-	10
I feel happy I am working for the King	-	-	-	10	-	10
Changed my work approach from teaching to facilitating	8	-	-	-	-	8
Know more about farmers' problems and their community	-	-	7	-	-	7
See clearly which technologies farmers can/cannot do	-	3.5	3.5	-	-	7
We feel we are teachers of the FPR approach	-	-	-	5	-	5
Work more effectively with farmers who are more self-reliant	-	-	-	-	4	4
Chance for field trips, seminars, and study abroad	-	-	-	3	-	3
Learned wisdom of farmers/indigenous knowledge	-	3	-	-	-	3
Understand better criteria with which farmers evaluate new varieties/technologies	-	-	1	-	-	1
Team received an international award (King's vetiver award)	-	-	-	1	-	1
Percentage of total votes	22.1	10.8	5.5	34.1	27.4	

a. Mgmt, management; Knwldg, knowledge; Undstg, understanding; Mtvtn, motivation; and Effcy, efficiency.

The above results thus suggest a resounding "yes" in reply to this question. It is clear that, far from being a top-down, iron-fisted approach, FPRE allows for significant local variability. That is, in effect, its greatest strength: it uses farmer knowledge of local conditions to arrive at locally appropriate solutions. It also teaches all partners in the research process the most pertinent types of knowledge. Unfortunately, because the research and extension structures in Thailand are much more pan-national, we can clearly associate respondents with geo-ecologic localities only in the case of Vietnam. Table 6 reveals significantly different means for key variables between Hanoi and Thai Nguyen; Table 7, between Dong Nai and Hanoi; and Table 8, between Dong Nai and Thai Nguyen. The reader will further note that the locality in the first column generally has a higher score for all variables than the corresponding score of the second column; exceptions are highlighted in boldface.

Table 6. Results of significant differences in means, Hanoi (HN) vs. Thai Nguyen (TN), Vietnam.

Hanoi was significantly different from Thai Nguyen in:	HN	TN
Age of respondent	57.1	37.0
Years' experience	30.4	14.0
% participating adopted farming system technology by other projects	14.3	8.8
% non-project adopted farming system technology by other projects	9.3	4.0
Score of other development policies in adoption of varieties	8.1	4.7
Score of other development policies in FS adoption	7.7	4.3
Score of other development policies in soil conservation adoption	7.5	4.3
High starch content in varietal adoption	4.9	4.2
Drought resistance in varietal adoption	4.0	**4.8**
Fertilizer availability in varietal adoption	3.0	1.6
Role of farmer knowledge	3.0	2.7
Male household head in varietal adoption	1.4	**2.8**
Male household head in conservation adoption	1.1	**3.0**
Phoned boss last week	1.0	**2.5**
Phoned by boss last week	1.4	**3.0**
Contacted extension agents	1.2	**2.0**
Called face-to-face meeting with boss	1.0	**2.5**
Impact of poor farmer income as % or rich	0.9	**1.6**

Table 7. Results of significant differences in means, Dong Nai (DN) vs. Hanoi (HN), Vietnam.

Dong Nai was significantly different from Hanoi in:	DN	HN
Role of farmer knowledge	2.6	**3.0**
% participating farmers adopted other techniques	80.0	30.0
% participating adopted		
Soil conservation by other projects	14.7	6.3
Other techniques by this project	50.0	20.0
Other techniques by other projects	30.0	9.8
% non-project adopted		
Variety	87.6	45.6
Variety by this project	59.1	31.4
Farming system technology	62.9	27.9
Farming system technology by this project	41.0	18.5
Farming system technology by other projects	19.3	9.3
Soil conservation	54.3	28.8
Soil conservation by this project	38.9	19.8
Other techniques	75.0	14.0
Other techniques by this project	45.0	7.0
Other techniques by other projects	30.0	6.0
Score of		
Demonstration plots in soil conservation adoption	6.9	**8.8**
Demonstration plots in varietal adoption	6.9	**9.6**
Other development policies in varietal adoption	5.5	**8.1**
Demonstration plots in farming system technology adoption	6.6	**8.5**
Cross-visits in farming system technology adoption	6.6	**8.6**
Good price in varietal adoption	4.7	3.7
Labor availability in varietal adoption	3.6	2.3
Low capital and labor input to establish in soil conservation adoption	2.7	**3.9**
Fertilizer availability in increased income per capita	4.3	3.3
Low dependency ratio (proportion of dependent non-workers in household) in increased income per capita	2.3	**3.4**
Contacted policymaker	3.0	0.4
Farmer participatory research on cassava has led to new approaches to variety multiplication and distribution	1.0	0.6

Table 8. Results of significant differences in means, Dong Nai (DN) vs. Thai Nguyen (TN), Vietnam

Dong Nai was significantly different from Thai Nguyen in	DN	TN
Rank in organization	2.43	**5.0**
High starch content in varietal adoption	5.0	4.2
Drought resistance in varietal adoption	4.0	**4.8**
Fertilizer availability in varietal adoption	3.4	1.6
Effectiveness in reducing soil erosion in conservation adoption	4.7	3.6
Low capital and labor input in conservation adoption	2.7	**3.8**
Fertilizer availability in increased income per capita	4.3	3.2
% participating adopted farming system technology by other projects	19.7	8.8
% non-project adopted other tech	75.0	5.0
By this project	45.0	0.5
By other projects	3.0	**4.5**
% participating farmers adopted		
Soil conservation	68.6	15.0
Soil conservation by this project	52.1	9.0
Other techniques	80.0	2.0
Other techniques by this project	50.0	0.6
Other techniques by other projects	30.0	1.4
% non-project farmers adopted		
New varieties	59.1	38.7
Farming system technology	62.9	20.0
Farming system technology by this project	41.4	11.0
Farming system technology by other projects	19.3	4.0
Soil conservation	54.3	5.0
Soil conservation by this project	38.9	0.5
Score of farmer participation in other technology adoption	6.5	**10.0**

(3) Have the potential impacts of the FPRE approach been reduced primarily by internal budget limitations, scientific knowledge, and management procedures; or by external policies and economic conditions?

Again, we see that the answers to question 3 are highly mixed (Figure 3.)

Tables 9 to 13 give detailed lists of constraints elicited from each focus group by descending order of priority in each site. The results clearly suggest that it is impossible to say flatly whether implementation problems have been

mainly in the form of external policies and economic conditions, or in terms of internal management, knowledge, motivation, or even budget. This question cannot be answered as a general principle, for there is far too much variability from one region and disciplinary group to another.

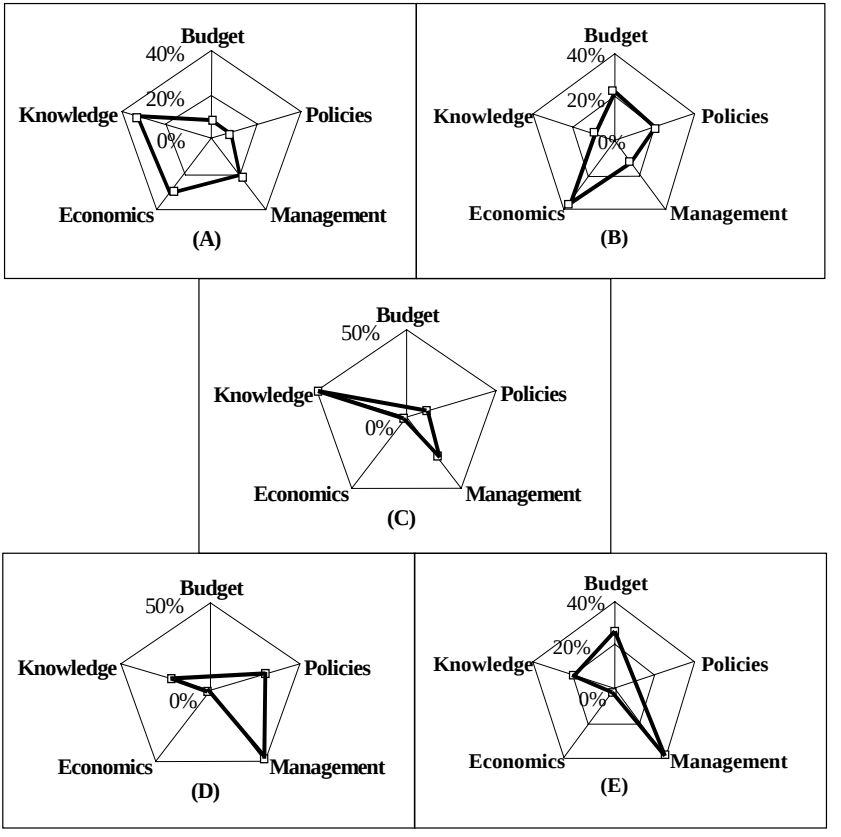

Figure 3. Contrasting patterns of factors constraining greater institutional impacts from the Cassava Farmer Participatory Research and Extension (CFPRE) project: (A) Dong Nai, Vietnam; (B) Vietnam Agricultural Sciences Institute (VASI), Hanoi, Vietnam; (C) Thai Nguyen, Vietnam; (D) as seen by researchers, Bangkok, Thailand; and (E), as seen by extension workers, Bangkok, Thailand.

Table 9. Constraints[a] on the Cassava Farmer Participatory project impact as perceived in Dong Nai, Vietnam.

Constraints within institution or factors in external environment	Bdgt	Pols	Mgmt	Econ	Knwldg	Total
Unstable market prices	-	-	-	39	-	39
Level of farmer awareness still low and inadequate	-	-	-	-	22	22
Co-ordination mechanisms among state, researchers, extension workers, and farmers still imperfect	-	-	21	-	-	21
Difficult to change cultivation habits and agricultural values of local farmers	-	-	-	-	15	15
Insufficient operating funds to implement the project.	13	-	-	-	-	13
Awareness of some leading local cadres to realize the project still limited	-	-	-	-	11	11
Government investment policy, particularly policies toward cassava research and cassava price protection	-	11	-	-	-	11
Government planning/projection in reformulating local agricultural output structure is ambiguous	-	-	9	-	-	9
Econ conditions of farm households difficult in each target site	-	-	-	8	-	8
New method so farmers cannot yet cooperate well with researchers	-	-	-	-	3	3
Technical transfer process not adequately reached all cassava areas	-	3	-	-	-	3
Cooperation between factories (consumers) and farmers (suppliers) not yet in harmony	-	-	1	-	-	1
Percentage total votes	8.3	9.0	19.9	30.1	32.7	

a. Bdgt, budget; Pols, policies; Mgmt, management; Econ, Economics; and Knwldg, Knowledge.

Table 10. Constraints[a] on the Cassava Farmer Participatory project impacts as perceived in Hanoi, Vietnam.

Constraints within institution or factors in external environment	Bdgt	Pols	Mgmt	Econ	Knwldg	Total
Livelihood of farmers remains in difficulty; farmer understanding or awareness regarding sustainable cassava cultivation limited	-	-	-	20.5	20.5	41
Policy/decision-making ability and awareness (in investment and development) of local leadership at province and district level remains limited	-	27	-	13	-	40
Budget for project implementation remains limited	40	-	-	-	-	40
Product processing and marketing limited	-	-	-	30	-	30
Cooperation among partners participating in project still not close-knit, especially on part of researchers, producers, consumers/ manufacturers, and policymakers in cassava production areas	-	-	30	-	-	30
Economic efficiency of cassava lower that that of other crops	-	-	-	19	-	19
Area to be planted to cassava (long-term agricultural structure) not clearly specified; sometimes farmers wish to plant additional cassava, but their land projected to plant other crops, or other kind of land constraints	-	12	-	-	-	12
Difficulty getting to project site (distant, little transportation)	8	-	-	-	-	8
Government attention to cassava less compared to other crops	-	7	-	-	-	7
Project too small scale, time to realize activities too short to change farmers' awareness	5	-	-	-	-	5
Fund available not appropriate to expand extension activities	1	-	-	-	-	1
Capacity training for researchers not received enough attention	-	-	-	-	1	1
Percentage total votes	23.1	19.7	12.8	35.3	9.2	

a. Bdgt, budget; Pols, policies; Mgmt, management; Econ, Economics; and Knwldg, Knowledge.

Table 11. Constraints[a] on the Cassava Farmer Participatory project impacts as perceived in Thai Nguyen, Vietnam.

Constraints within institution or factors in external environment	Bdgt	Pols	Mgmt	Econ	Knwldg	Total
Still lack enthusiastic support from district level authorities	-	15	15	-	-	30
Understanding or ability of extension agents regarding farmer participation research (FPR) techniques remains limited	-	-	-	-	30	30
Cooperation among partners participating in project still not close-knit, especially on part of local partners	-	-	22	-	-	22
Because farmer skill level still low, produce cassava with extensive technology; new technologies are introduced, want to wait and see results before deciding whether to adopt, retards progress	-	-	-	-	14	14
Local-level ability of research and management cadres still limited	-	-	6.5	-	6.5	13
Farmers have habit of relying on others and hoping for more help from project (variety, fertilizer)	-	-	-	-	12	12
Financial contribution from participating central and local governments remains small	5	-	-	-	-	5
If available funds could be increased to both cadres that have to realize project and to farmers, then results would be more efficient	4	-	-	-	-	4
Percentage total votes	6.9	11.5	33.5	-	48.1	

a. Bdgt, budget; Pols, policies; Mgmt, management; Econ, Economics; and Knwldg, Knowledge.

Table 12. Constraints on the Cassava Farmer Participatory project impact as perceived by Bangkok researchers.

Constraints within institution or factors in external environment[b]	Bdgt	Pols	Mgmt	Econ	Knwldg	Total
Inconsistency and uncertainty in approach supported by policymakers/ decision-makers	-	48	-	-	-	48
Research officers have many other projects, so not enough time for farmer participation research (FPR)	-	-	27	-	-	27
Researchers move often; no continuity and sustained knowledge	-	-	12.5	-	12.5	25
Requires external organization, e.g., CIAT, to force collaboration	-	-	24	-	-	24
Frequent changes in DG and DDGs of our institutions	-	-	19	-	-	19
Cassava price too low through policy/ international competition	-	6	-	6	-	12
Poorly prepared demonstration and lack of information about costs etc. to give clear ideas to farmers	-	-	-	-	11	11
Little support from bosses (dean, directors, head, etc.) for FPR because they do not understand	-	-	3.5	-	3.5	7
No project leader to break institutions/ departments barriers	-	-	7	-	-	7
No promotion of FPR (through seminars, field days to Vietnam) involving researchers and policymakers	-	2.5	2.5	-	-	5
No budget for FPR and agricultural research in general	5	-	-	-	-	5
For past 2 years, decentralization has led to coordination problems in defining regional emphasis	-	3	-	-	-	3
For most of project no official policy supporting FPR approach	-	3	-	-	-	3
Farmers lose interest quickly after researchers leave the area	-	-	3	-	-	3
Lack of teamwork among workers who truly understand FPR	-	-	1.5	-	1.5	3
Need more time for FPR to show clear impact and success	-	-	-	-	3	3
Thai people undervalue cassava as food, feed, and crop needing care; also think it degrades the soil	-	-	-	-	1	1
Percentage total votes	2.4	29.1	48.5	1.7	15.8	

a. Bdgt, budget; Pols, policies; Mgmt, management; Econ, Economics; and Knwldg, Knowledge.

b. CIAT, Centro Internacional de Agricultura Tropical; DG, Director General; and DDG, Deputy Director General.

Table 13. Constraints on the Cassava Farmer Participatory project impact as perceived Bangkok extension agents.

Constraints within institution or factors in external environment[b]	Bdgt	Pols	Mgmt	Econ	Knwldg	Total
Not enough money, especially because FPR costs more	44	-	-	-	-	44
Other agencies do not understand FPR, so difficult to cooperate	-	-	22	-	-	22
Workload too big - provincial governor (CEO) more independent	-	20	-	-	-	20
Administrators do not appreciate/pay less attention to FPR	-	-	20	-	-	20
Lack of continuity in extension officer staff; change people and responsibilities too often	-	-	14	-	-	14
Not enough promotion/publicity for FPR approach	-	-	-	-	14	14
Difficult to change farmers' attitude and behavior	-	-	-	-	11	11
Farmers want free varieties, fertilizer, or money for participation	5	-	5	-	-	10
Officers lack knowledge to set up conclusive experimental design	-	-	-	-	8	8
Low level personnel feel need more per diem to do FPR work	8	-	-	-	-	8
More sites but fewer personnel	3.5	3.5	-	-	-	7
Delays in purchasing materials for the project; cannot do in time	-	-	7	-	-	7
Partner institutions do not have time or readiness to cooperate	-	-	4	-	-	4
Have to change sites/district because boss changed	-	4	-	-	-	4
Takes a long time for farmer to accept a technology	-	-	-	1.5	1.5	3
Bosses change often, have to re-educate about FPR	-	-	-	-	3	3
Change of policies means cannot continue some technology demonstrations (e.g., chemical fertilizers)	-	3	-	-	-	3
If relative price of cassava low, farmers do not want to participate	-	-	-	3	-	3
Lack of budget; inadequate sites to involve ideal no. of farmers	3	-	-	-	-	3
Percentage total votes	30.5	14.7	34.6	2.2	18.0	

a. Bdgt, budget; Pols, policies; Mgmt, management; Econ, Economics; and Knwldg, Knowledge.
b. FPR, farmer participatory research; CEO, Chief Executive Officer.

Research Results to Test the Hypotheses of the Study

Having answered in detail the three questions laid out for this research, we may now formally test the 10 hypotheses we derived from the pertinent literature. We divide these hypotheses into three blocs: agronomic, economic, and institutional impacts in line with the clusters of circles at various levels of Figure 1. We validate each hypothesis for statistical significance using multivariate regression equations (Appendix 1 gives full detailed list). Only if the sign on each variable is theoretically explicable, its *t*-statistic significant, the *F*-statistic of the entire equation greater than 4, and its adjusted R^2 greater than 0.25, do we accept a given equation as a reliable explanation of reality. *** indicates a variable that is significant at the 99% level or greater, ** a variable that is significant at the 95% level, * any variable that is significant at the 90% level, and n.s. any variable that is non-significant at the 90% level.

Agronomic impacts

Hypothesis 1. FPRE personnel believe that the use of participatory methods explains the greater adoption rate of new varieties by FPRE vs. non-FPRE farmers.

Percent greater varietal adoption by project farmers over non-project farmers = 25605* + 0.31** *operating and conceptual changes brought about by the project*[1] – 6734* *rank of farmer understanding by subordinates vs. bosses*

$F = 4.5$ adjusted $R^2 = 0.28$ **(1)**

The results of regression 1 do not allow us to reject this hypothesis. The *F*-statistic is greater than 4, the adjusted R^2 greater than 0.25, all three of the coefficients to the right of the equal sign are significant, at least at the 90% level, and the signs on the coefficients can be explained logically.

The equation confirms that the perceived increase in adoption rate of participating farmers over their non-project counterparts is explained by operating and conceptual changes brought about by the project. In addition, the

negative sign on the following variable shows that it is vital that bosses and other superiors understand farmers more than subordinates. If, to the contrary, subordinates believe they know more than their bosses[2], this has a negative impact on perceived varietal adoption by participating farmers.

Hypothesis 2. The relative weight of FPRE vs. alternative explanations of agronomic impact increases significantly with project-related field activities and effective partnerships with other institutions.

Combined impact of project on varietal and conservation adoption = -91985*** + 0.279** *impact of cross-visits + training courses + farmer participation* + 17622*** *rank of farmer understanding by outside researchers* – 0.66*** *non-extension institutions*. This variable = 0 for extension institutions, 1 for research institutions, and 2 for universities.

$$F = 14.2 \qquad \text{adjusted } R^2 = 0.69 \qquad \textbf{(2)}$$

We cannot reject this hypothesis.

The unique CFPRE project-related research and extension activities (notably cross-visits, training courses and farmer participation) are highly significant in explaining the adoption behavior of farmers. This is consistent with the econometric results based on farmer surveys for the same project in Vietnam and Thailand (see Purcell, 2004). Meanwhile, the high importance given to the level of understanding of farmers by researchers in other institutions points to the need for strong partnerships within the FPRE network.

The last variable of the equation was included to see whether perceived impacts differed between extension-based and non-extension institutions within the FPRE network. Disappointingly, university personnel have a significantly lower perception of agronomic impacts than research workers, who in turn are more sanguine than extension workers. The undesirable significance of this variable points to the need to communicate the real levels of adoption success of the project to research- and university-based collaborators, assuming of course that those closer to farmers have a clearer image of true impacts. Purcell

(2004) confirms that adoption levels were in fact higher than many researchers believed.

Economic impacts

Hypothesis 3. A perceived overall income increase for all farmers is also believed to make it harder for the poor to catch up in relative income to the rich; but the type of technology (unimodal varietal, bimodal soil conservation), the respondent's region, institution type, and rank all significantly color those perceptions.

Relative income gain of poor over rich farmers = -0.531*** *farmer participation increased income/capita* + 0.00002 *** *percentage greater varietal adoption by project farmers* – 0.000009** *% greater soil conservation adoption by project farmers* + 0.48*** *region*[3] – 0.00002*** *non-extension institutions* – 0.124** *rank in organization* – 0.124*** *impact of cross-visits + training courses + farmer participation* – 0.000003[n.s.] *operating and conperceptual changes brought about by the project* – 0.380[n.s] *woman respondent*

$F = 4.9$ adjusted $R^2 = 0.53$ **(3)**

The regression results lead us to generally affirm this hypothesis. Gender, which is highly correlated with rank, is not a significant variable in itself. Furthermore, the operating and perceptual changes within FPRE implementing institutions do not in themselves help the farmers catch up.

Specifically, the equation suggests that, while unimodal varietal adoption through the project does help the poor catch up with the rich, bimodal soil conservation technology has the opposite effect[4]. This implies the need for loans and special help programs for poor farmers who wish to better conserve their soil. There seems to be an advantage favoring income equality in the north vs the south of Vietnam, and peripheral regions versus the Bangkok area in Thailand. Non-extension institutions once again significantly underestimate the relative income gains of poor farmers. Increased income/capita tends to

work against income equality (at least in the short-run), as do the cross-visits, training courses, and farmer participatory activities of the project. This last finding suggests the need to target poor farmers in greater numbers as participants in FPRE activities.

Hypothesis 4. The perceived economic impacts on farmers are viewed differently by FPRE personnel of different rank, in different institutions, and of different age, gender, and discipline.

Project participation increased income/capita = 2.64** – 0.59*** *relative income gain of poor over rich farmers* + 0.000019*** % *greater varietal adoption by project farmers over non-project farmers* + 0.58*** *region* – 0.000028 *non-extension institution* – 0.21*** *rank in organization* – $0.34^{n.s.}$ *women respondents* – $0.017^{n.s.}$ *age of respondent* + $0.12^{n.s}$ *non-agronomic discipline*[5]

$F = 5.39$ adjusted $R^2 = 0.58$ **(4)**

We must reject the age, gender, and disciplinary part of this hypothesis, but unfortunately cannot reject the rest.

Again, we find that the respondents as a whole believed that exacerbating income inequality was necessary to raising overall income levels. While greater varietal adoption was good for increasing income per capita, it was less so in the south of Vietnam and the Bangkok area of Thailand (region). Non-extension personnel would seem once again more out of touch with the real income benefits to farmers (again assuming that those closer to farmers see impacts more clearly), as were those more highly placed within the implementing institutions. Future FPRE projects should attempt to forestall these undesirable discrepancies in both project impacts and implementer perceptions.

Hypothesis 5. The raising of consciousness towards full farmer respect depends upon the frequency of interaction with farmers, extension agents, and other subordinates within one's institution; the ability of policymakers to create a favorable environment for adoption; and the willingness of the farmers themselves to adopt technology.

Positive view of farmers, early consultation, and participation in adoption and setting research priorities[6] = $26.38^{n.s.}$ + 21387.237*** *contacts by farmers last week* – 1737*** *contacts by extension agents last week* – 7404.5*** *called face-to-face meeting with subordinate last week* – 20.8** *rank of understanding of farmers by policymakers* – 9881*** *non-agronomic discipline* + 1.0*** *% greater varietal adoption by project farmers*

F = 31000000 adjusted R^2 = 0.99 **(5)**

We must reject some elements of this hypothesis. While appreciation of farmers as full-fledged and creative fellow-scientists depends positively upon varietal adoption and the frequency of farmer contacts; the more non-extension personnel contact extension agents and bosses contact their subordinates, the **less** they are likely to respect the knowledge of farmers.

Clearly something else is happening here, which we may explain by a short circuit in the feedback loops depicted in Figure 1. It may well be that in those sites where farmers are not adopting, disappointed bosses and non-extension personnel feel more compelled to meet with and attempt to motivate the personnel who are in most direct contact with cassava farmers. This could also simply mean that more boss-contact means less farmer contact, as everyone has total meeting time constraints. The ambiguity of this situation should thus receive a follow-up study in the project areas where adoption rates have been low.

Hypothesis 6. FPRE project personnel who see the positive impacts of farmer participation have benefited from understanding advisers, subordinates, and policymakers; and show a significantly greater tendency to become involved in robust work networks outside their institutions.

External (upward + downward, initiated or received) communications last week = 62*** – 0.00088*** *combined impact of project in varietal and conservation adoption* + 4.5*** *non-agronomic discipline* – 7.6*** *rank of farmer understanding by direct supervisor* – 5.1*** *rank of farmer understanding by subordinates* – 5.2* *rank of farmer understanding by policymakers*

$F = 70$ adjusted $R^2 = 0.96$ **(6)**

Somewhat unsurprisingly the regression results lead us to reject this hypothesis entirely.

Total two-way communication links, both "downward" to farmers and extension personnel and "upward" to collaborators in other institutions and policymakers, seem to increase when FPRE implementers are worried about the project's agronomic impacts and (implicitly) are made by those who hold in high esteem the knowledge of collaborators in other institutions and of extension workers. (This is why the sign on the other ranking variables is negative.) This is not to say that the project failed to have strong agronomic impacts, but rather that people did not hesitate to communicate when they thought they needed help. This is an important insight into the workings of the collaborative network surrounding any FPRE project.

To further refine this insight, we now isolate the determinants of two-way "downward" communications with extension workers and farmers.

Hypothesis 7. Those who see positive effects from the project; feel their supervisors, subordinates, and extension agents understand farmers; and are egalitarian (feel they are helping the poor relatively and absolutely) are significantly more likely to maintain strong networks with extension workers and farmers.

Downward contacts with extension agents and farmers last week = 55.5*** + 5.7*** *non-agronomic discipline* + 2.0*** *rank of farmer understanding by extension agents* – 4.7*** *rank of farmer understanding by subordinates* + 7.6*** *impact on poor farmers' absolute income* + 5.1*** *relative income gain of poor vs. rich farmers* – 0.00056*** *combined impact of project on varietal and conservation adoption* – 7.7*** *region* + 35*** *Thailand*

$F = 913$ adjusted $R^2 = 0.998$ **(7)**

We cannot reject this hypothesis.

Total downward contacts increase as one moves from agronomy to other disciplines, as one esteems extension workers as significantly more knowledgeable about farmers than direct supervisors or subordinates, and as egalitarianism increases (perceived positive impacts on poor farmer income, relative impact on poor farmer income). This increase in contacts seems to occur, in line with what we have seen above, when the project worker lacks confidence about farmer adoption of improved varieties or conservation techniques. Moreover, southern Vietnam, the Bangkok area, and Thailand as a whole seem to witness more frequent contacts with extension agents. This does not mean that the project did not do well in all of these areas, but it tells us when communication is most likely to occur.

Hypothesis 8. Those who are genuinely concerned with farmers, particularly poor ones, and feel that their subordinates understand farmers, are more likely to feel pride and enthusiasm in their work and wish to share their ideas with policymakers and researchers in other institutions.

Two-way upward contacts last week = -0.23$^{n.s.}$ + 0.97*** *poor farmers gained relatively more than rich farmers* + 0.47** *rank of farmer understanding by subordinates* – 00013*** *combined impact of project on varietal and conservation adoption*

F= 95 adjusted R^2 = 0.95 **(8)**

We cannot reject this hypothesis.

Contacts between FPRE implementers and outside institutions increase significantly as the perception that the FRPE has helped poor farmers catch up to relatively to rich farmers. FPRE personnel make such contacts more frequently if they feel they can count on their junior staff for insightful answers to their questions. The FPRE enthusiasm on the part of these personnel is such that they will actually contact outside institutions more often the less positive the perceived agronomic results have been! This is both a tribute to the ease of communication within the FPRE network, and the need for outside help from colleagues or policymakers.

Hypothesis 9. FPRE staff members who participate most actively in internal communication networks are lower-ranking personnel who see the positive impacts of FPR in technology adoption, but feel that current policies are inadequate.

Internal communication links last week = 24.6*** + 3.7*** *non-agronomic discipline* – 1.2*** *rank in organization* – 4.6*** *rank of farmer understanding by policymakers* + 0.0003*** *percent greater varietal adoption by project over non-project farmers* + 0.0007*** *impact of cross-visits + training courses + farmer participation* – 0.00037*** *combined impact of varietal and conservation adoption*

F = 41 adjusted R^2 = 0.94 **(9)**

We cannot reject any part of this hypothesis.

The results of regression 9 confirm that those people who have high levels of internal networking are likely to be non-agronomists lower down in the organization who accord a lower rank to the understanding of farmers by policymakers. Such people will logically rely more heavily upon experts within their own institutions, which explains the higher level of internal networking. Although they affect a high score to the success of such non-traditional project activities as cross-visits, training courses, and farmer participation, these younger staff feel that, in the end, the project did not achieve its full potential of promoting both varietal and conservation adoption.

Hypothesis 10. Perceptions of total institutional impacts differ significantly by country and type of institution.hypo

Operating and conceptual changes brought about by the project = -8256$^{n.s.}$ + 40806** *Thailand* + 0.51** *% increased varietal adoption by project vs. non-project farmers* + 8256$^{n.s.}$ *impact on poor farmer income as percentage of rich farmer income* – 0.084$^{n.s.}$ *non-extension institutions*

$F = 4.2$ adjusted $R^2 = 0.26$ **(10)**

We must reject half of this hypothesis.

On the one hand, the fact of being in Thailand **does** help make those operating and conceptual changes more permanent. This positive impact is enhanced where CFPRE farmers have a higher level of varietal adoption over non-project farmers. On the other hand, the operating and conceptual changes brought about by the project are independent of the type of institution in which the respondent works (and for that matter of the perceived impacts of the CFPRE on poor farmers).

Conclusions

Summary of the scientific results

Results of the three research questions

First and foremost, the FPRE approach has been a success not in spite of taking on such widely variable forms with such locally appropriate emphases in the five study sites of this analysis, but precisely because it has done so (question 1). This is above all a reflection of the great flexibility of the approach, bringing to each institution in each country (question 3) the benefits that are most needed to compensate their historic weaknesses and better respond to the needs of farmers.

Next, it is important to continue regular group discussions or focus groups to identify ongoing problems, rather than waiting 5 to 10 years. The hope would be that in each institution the very-real complaints would be limited to one or two key areas (e.g., Bangkok researchers, question 3), so that immediate corrective action could be taken.

Third, it is important for each FPRE institution to keep networks open with both policy makers “above”, and farmers and field extension workers “below”. In this way, whatever problems arise can be addressed swiftly and appropriately. This is because (question 3) it is impossible to say flatly whether implementation problems have been mainly in the form of external policies and economic conditions, or in terms of internal management, knowledge, motivation, or even budget.

Fourth, we may identify specific areas for improvement in each context, as well as interesting possibilities for institution building in the future, through increased networking. The results have demonstrated that Bangkok researchers claim to suffer most from lack of budget, in which the Bangkok extension agents are quite strong. Interdisciplinary collaboration could do much to strengthen both institutions. Bangkok extension agents in turn request further help in all aspects of management, which could be achieved in part by networking more closely with Hanoi FPRE personnel, who report the lowest incidence of problems in this area. These latter, in turn, feel they are most

handicapped by problems in the economic environment, and could benefit from dialoguing with both the Bangkok researchers just mentioned and their compatriots in Thai Nguyen. These last in turn feel they suffer most from lack of knowledge, which would allow Hanoi institutions to return the favor.

Results of the 10 research hypotheses

The first conclusion from the regressions is that FPRE brings great attitudinal, competency and work-process changes (Hypothesis 1) that motivate those in participating institutions to believe that their institutions really do have an impact on rural livelihood. Partly as a result, the cross-visits and direct farmer consultation do increase agronomic impacts (Hypothesis 2). These new modes of research and extension, respectively, should be extended as widely as possible.

Second, the project's unimodal varietal adoption has helped poor farmers close their income gap with better-off farmers; while more capital-intensive soil conservation has not (Hypothesis 3). The results point to the need for micro-credit programs to enhance the income-generating and -distributive impacts of the project.

Third, these perceived impacts are viewed with more skepticism by those closest to farmers (Hypothesis 4), and by worried officials and bosses who visit farmers to see what is wrong (Hypothesis 5). Most of the communication with outside institutions and extension workers seems to take the form of cries for help (Hypotheses 6 and 7). Closer and more frequent monitoring appears necessary, and this in turn would require substantial increases in budget and time allocations for farmer-oriented approaches. It also would require a program to stimulate the feeling of altruism by all project personnel, and particularly to sensitize bosses and decision- makers of the valuable knowledge held by extension workers and subordinates (Hypothesis 8).

Fourth, those lower in rank, and non-agronomists, should be encouraged in their efforts to increase internal networking to acquire the knowledge and moral support they need to be effective (Hypothesis 9). This knowledge seems particularly important in the case of the adoption of technologies more complex than varietal adoption. This is not to belittle the importance of

improved germplasm as the cornerstone of the FPRE program (Hypothesis 10), but merely to say that those with less agronomic experience have to be brought up to speed in order for the full impacts on farmer livelihood to be achieved.

Strategic Recommendations for Future Research and Project Formulation

We now turn to the final and ultimately most important question that an institutional impact study of this type can ask: What concrete measures and strategies can be suggested to overcome those constraints to enhance the scope and impacts of the FPRE approach in the future? Drawing upon the above scientific conclusions, as well as the answers to the open-ended questions written by individuals from each country, we may formulate the following specific site-by-site recommendations.

Dong Nai, Vietnam

The FPRE staff members in southern Vietnam call first of all for a national policy to stabilize cassava prices paid by each processing factory to the farmers; otherwise, farmers will produce only half-heartedly. There are many precedents (e.g., Taiwan) to show that there must be a contract between factories and farmers. This stabilization policy could be supplemented with state support of the price level.

The Dong Nai experts also recommend that new, more productive processing technology be developed, and that this be associated with more diverse varieties to increase the value of cassava, not just its starch content. Each type of cassava is required: for livestock feed (30%-40%) and starch content (70%). In this context, farmers also must spread out their planting dates so as to supply cassava more steadily to the starch factories.

To open up markets and seek new customers, the uses of the bioproducts need to be increased; for example, the stems can be used to grow mushrooms, the leaves for compost. Because of the high transportation costs, factories must be built in areas where none exist to date, and multiplied in existing processing

areas. Processor associations would then be required to minimize competition among factories.

If the state intends to invest capital in extending irrigation, it should concentrate more on integrated cropping systems, including cassava, which may have a longer-term impact. According to the experience of other countries in the region, China has gained long-term value through extension of irrigation. Cassava must do well under rainfed conditions, but every crop has a different production value (e.g., rice vs. maize) under adequate irrigation. The state with the highest cassava yields is Tamil Nadu in India, because cassava is grown under irrigation.

Hanoi, Vietnam

The FPRE team in the capital of Vietnam calls first for keeping a strong place for cassava development in national research (some scientists think it should be removed from development planning). The team stresses the need for even greater cooperation amongst the five stakeholders—project designers, researchers, policymakers, producers, and processing factories—in order to work out even better solutions in the future.

The Hanoi experts further recommend the vital importance of natural conditions and people, which they say explain why cassava in Vietnam's northern mountainous region has developed so much better than in the south. Farmers in northern mountainous areas are mostly ethnic minority people. When researchers work in the villages, these farmers adopt the demonstration models, but they abandon the technology when the researchers leave. Even if demonstration models obtain good results, few farmers visit demonstration fields on their own initiative, a problem that is exacerbated by the small number of extension agents who work in the mountainous villages; because there is only one agent per village, s/he cannot visit every hamlet. To solve this problem, innovative farmers must also explain the field model's results and teach new technologies to other farmers. Only then will the decision-making abilities of farmers improve.

The Hanoi experts further recommend the implementation of large-scale demonstration fields to create momentum for multiplying project results. To date, project designers have proposed small-scale demonstration fields, partly because of the small budget of localities to support the multiplication of cropping demonstrations. These models have been multiplied widely at places supported by the Vietnamese Government. They merely introduce innovative technologies to farmers on a small scale so that most farmers are not attracted to adopt these technologies. Moreover, researchers select study sites near roads for convenient travel. Hence, future demonstration fields should be implemented in distant places. Farmers could immediately see some results of demonstration models such as high productivity; however, they could not see the impacts on soil fertility. Therefore, training courses in the future will be necessary to help farmers improve their knowledge/perception.

The Hanoi group also calls for marketing research to be conducted on a regular basis. Cassava has now become a market commodity. On the demand side, the Root Crop Research Center has conducted a survey on cassava-growing areas in an attempt to estimate total national demand and international demand. Since cassava has a definite market share, such estimations should be continually updated. On the supply side, processing enterprises must assure their input supply by establishing raw material supply zones. For example, one processing enterprise lacks raw material in Yen Bai Province. Farmers do not want to sell their products to the enterprise because the market price is higher. Marketing contracts between farmers and enterprises have become a necessity. Based on the estimates by agricultural technicians of the total area that could be used for growing cassava, entrepreneurs should build small- and medium-scale enterprises, and take into account the balance between the abilities of raw material zones and capacity of enterprises.

Finally, it is vital that interdisciplinary researchers participate in the project. Agronomists cannot relieve all constraints, and must be allowed to focus on development of sustainable cassava cultivation systems. They should then discuss how to spread the results of demonstration models, transfer innovative technologies to farmers, identify land where cassava may be grown, and advise new cassava processing enterprises.

Thai Nguyen, Vietnam

The first policy issue for the Thai Nguyen experts is to **change local authorities' perceptions**. Even today, the project lacks the enthusiastic support of district authorities in terms of policy and management because cassava does not figure in the list of development priorities for each region. Therefore, officials pay less attention to cassava. Instead, they should encourage their subordinates to cooperate with researchers and even to change their development policies, as has been the case in Van Yen District, Yen Bai Province.

The second recommendation is to transform farmers' knowledge and perceptions. Farmers can make decisions alone. The Thai Nguyen group calls for an expansion of the project to include training courses to supplement the building and adopting of models as the only tools for changing farmers' perception. To finance these activities, the Thai Nguyen group wants to look for donors to multiply the project results over a much larger area.

Third, it is necessary to concentrate on extension activities. For example, the Ford Foundation funded TNAU to implement extension activities for the final-year students. Agricultural universities should introduce participatory approaches into the curriculum to inculcate both practical knowledge and habits about participatory approaches. Extension agents should be trained and re-trained methodically. Then they can apply the FPRE approach to other projects as well. The experts even feel that they should directly contact farmers in their fields and let them decide by themselves, with no need to invite them to come to the university as before.

Fourth, the Thai Nguyen experts call for a preferential policy for researchers to stimulate their motivation and ability to perform quality research. Salary levels must be raised to a satisfactory level. When a researcher creates a new variety, s/he only receives 200,000 VND (about US$13; US$1 = 15,822 VND); this hardly encourages researchers to devote their knowledge and time to research activities. The education budget for researchers in TNAU received from the Education and Training Ministry was from 200 million to 300 million VND to conduct 20 research projects at the ministerial level (for 2 years), and 10 research projects at university level.

Finally, the Thai Nguyen group recommends a policy for managers who implement development policies. Such a policy should focus on updating both authorities' and farmers' knowledge in ways appropriate to the market economy. Managers at different levels have to participate in discussions with researchers before conducting a project. Managers have not been trained in or received information about FPRE, creating low effectiveness, even though they participated in conducting the project. Project designers, managers, researchers, farmers, and producers have to work together to build a joint activity plan so that all stakeholders may share in formulating the project goals and integrating the activity into their own work.

Bangkok researchers

Bangkok researchers strongly recommend that a long-term national policy be put into place to overcome the inconsistency and uncertainty of support for the FPRE approach. They call for the education of their superiors, not only in terms of technical knowledge, but also in terms of appeals to love of country and greater appreciation of farmers.

The Bangkok researchers further recommend that objective cost-benefit and environmental analyses be done without policy distortions. They feel such analyses would show that cassava production does not deplete the soil more than other crops on poor soils and is at least as profitable from the point of view of long-term sustainability once environmental impacts and international prices are taken into account.

To perform such analyses, they call for training in economic analysis so that they can better convince policymakers of these facts. They then plan to hold seminars, to which the big bosses would be invited; and then to take them to visit FPRE sites as part of their pre-election campaigns. To devote more time to FPRE, personnel must have their job descriptions completely rewritten and clarified. Only then can FPRE be fully integrated into their other crop research responsibilities.

Finally, Bangkok researchers feel that the political and economic power of cassava growers needs to be increased. The price of cassava in Thailand is too

low, as the combined result of internal policies and international competition. There are many potentially important new markets for cassava, such as biodegradable plastics, animal feed, and ethanol for automotive fuel. There is also a large demand for cassava in China. Thailand must add value through processing, such as exporting animal fed or ethanol made from cassava.

Bangkok extension agents

Bangkok extension agents, meanwhile, recommend increased funding for FPRE, an approach that costs more than traditional extension. To this end, they recently sent a proposal to the government, currently awaiting approval, for 250 million baht (US$1 = 39.5 baht) over 5 years for cassava in 1000 cassava villages nationwide. They plan to add 200 FPRE villages nationwide per year. In addition, they recommend that provincial extension officers can send proposals to their Chief Executive Officer (CEO) governor for such crops as mungbean, maize, sweet corn, and cassava. Further funding for FPRE could be gleaned from district-level governmental organizations, who already allocate10% of their budget to agricultural development. Such funding could be earmarked for FPRE in cassava. Failing all that, international donors such as the Nippon Foundation could be solicited to sustain the FPRE work.

Extension workers in Thailand, like their researcher colleagues, also call for revised job descriptions with a clear place set aside for FPRE. For example, if the new proposal to the national government is approved, they will need to train about 300 officers as well as 15 assistants in the FPRE approach. Who will do that, and in what time? Work overloads, personnel changes and understaffing already sap the motivation of many extension workers.

Extension agents further recommend a major campaign to publicize and to teach officials, administrators, and the general public about the FPRE approach. They would like to produce a video about the FPRE cassava project’s successful results to be shown to leaders at all levels and sent to national TV. They plan to ask for time to present FPR project results during monthly staff meetings, and to organize a seminar about FPR as a new approach to extension with the Nippon Foundation cassava project as a case study. The proceedings would be published.

Final Word

Overall, it is clear that the CFPRE project was a very strong success, both agronomically and institutionally. This report has sought to shed light on the specific factors that have differed from country to country, discipline to discipline, and institution type to institution type within that broad picture. It is hoped that the careful reading of this report, despite its obvious limitations, will help in the improved design of FPRE projects in the future.

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Endnotes

1. This variable is defined as the composite score of perceived increases in farm income, changed research priorities, changed research strategies, spillover effects to other crop resource, changed resource management, new partnerships, new approaches to varietal distribution, favorable comments by

bosses or colleagues, researcher's heightened perception of farmers, and boss' or colleagues' heightened perceptions of farmers.

2. This suggests that supporters of FPRE believe they know more about farmers than their bosses do, which is entirely consistent with the whole revolutionary, bottom-up philosophy of FPR!

3. This variable takes the following values: Dong Nai = 0, Hanoi = 1, Thai Nguyen = 2, Bangkok = 3, Kalasin = 4, eastern Thailand = 5, Nakhonrachasima = 6, northeast and western Thailand = 7.

4. This is also consistent with the econometric results from farm survey data (Purcell, 2004).

5. This variable takes the value of 0 for agronomists, 1 for other physical scientists, 2 for economists, 3 for sociologists, and 4 for other disciplines.

6. This composite score variable is the sum of the respondent's view of farmers' role, the stage of first farmer's consultation, the changes in cassava and farming system research priorities due to FPRE, and the perceived importance of direct farmer participation upon varietal, farming system, other technology, and soil conservation adoption.

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Appendix 1: Results of Respondents Answers to Questionnaire.

Questionnaire variable	No	Min	Max	Ave	*s*	CV
Dong Nai = 0, Hanoi = 1, Thai Nguyen = 2, Bangkok = 3, Kalasin = 4, Eastern = 5, Nakhonrachasima = 6, NE+W = 7	31	0	7	2.1	2.0	93
Non-extension institution (extension = 0, research = 1, university = 2)	11	0	2	0.4	0.7	185
Gender (woman = 1, man = 0)	31	0	1	0.3	0.4	172
Age of respondent	37	24	70	48.2	10.8	22
Years worked	35	1	45	21.5	12.2	57
Rank in organization	38	0	8	3.9	2.4	61
Non-agronomic discipline (agronomist = 0, economist = 1, social scientist = 2)	37	0	4	0.9	1.6	183
Viewpoint on role of farmers (4 = valued most highly)	35	0	4	3.8	0.9	25
Stage of first farmer consultation (4 = latest)	36	0	4	1.9	1.0	53
Role of farmer knowledge (3 = most vital)	37	0	3	2.7	0.6	23
Were enough farmers/sites included?	37	0	1	0.4	0.5	116
% participating adopted						
Variety by this project	34	18	100	60.3	25.5	42
Variety by other projects/factors	34	0	72	28.4	23.1	81
Farming system by this project	31	0	90	40.0	25.5	64
Farming system by other projects/factors	31	0	31	12.8	9.0	70
Soil conservation by this project	33	3	90	44.3	26.3	59
Soil conservation by other projects/factors	33	0	30	8.9	8.5	96
Other techniques by this project	22	0.6	70	27.6	22.3	81
Other techniques by other projects/factors	22	1.2	40	12.5	10.6	85

Continued.

Appendix 1 (continued).

Questionnaire variable	No	Min	Max	Ave	*s*	CV
% participating farmers adopted						
Variety	35	40	100	89.0	16.7	19
Soil conservation	34	10	100	55.6	26.5	48
Other techniques	24	2	90	39.8	30.2	76
Farming system	32	0	100	54.7	29.4	54
% non-project farmers adopted						
Variety	35	25	100	71.9	26.0	36
Variety by this project (ripple effect for variety)	35	8.7	100	45.1	25.2	56
Variety by other projects/factors	35	0	80	26.8	22.7	85
Farming system	28	0	100	38.9	25.0	64
Soil conservation	32	5	90	41.3	23.7	57
Other techniques	24	0	90	33.2	28.0	84
Farming system by this project	27	0	80	28.1	21.1	75
Farming system by other projects/factors	27	0	30	11.1	9.1	83
% non-project adopted						
Soil conservation by this project (ripple effect for conservation)	32	0.5	90	30.7	21.5	70
Soil conservation by other projects/factors	32	0	30	9.8	7.5	77
Other techniques by this project (ripple effect for other techniques)	23	0.5	60	19.0	17.7	93
Other techniques by other projects/factors	23	2	40	16.1	12.9	80
Score of						
Demonstration plots in variety adoption	35	1	10	8.9	1.8	20
Farmer participation in variety adoption	35	2	10	9.2	1.5	16
Working on the field in variety adoption	31	1	10	6.5	2.6	39
Cross-visits in variety adoption	35	4	10	8.0	1.8	23
Training course in variety adoption	35	3	10	7.6	1.8	24

Continued.

Appendix 1 (continued).

Questionnaire variable	No	Min	Max	Ave	*s*	CV
Score of						
Traditional extension service in variety adoption	35	3	10	6.7	2.0	30
Neighbors/ relatives/friends in variety adoption	34	2	10	6.7	2.4	35
Self-help groups in variety adoption	34	3	10	6.6	2.1	32
Other organizations/projects in variety adoption	34	1	10	5.3	2.7	52
Other development policies in variety adoption	34	1	10	5.6	3.2	56
Demonstration plots in farming system adoption	33	3	10	8.1	1.9	24
Farmer participation in farming system adoption	33	4	10	8.9	1.7	19
Working in field in farming system adoption	31	1	10	5.9	2.5	42
Cross-visits in farming system adoption	33	2	10	7.7	1.8	24
Training course in farming system adoption	33	1	10	7.2	2.1	30
Traditional extension service in farming system adoption	33	1	10	6.1	1.8	29
Neighbors/ relatives/friends in farming system adoption	32	2	10	5.9	2.1	36
Self-help groups in farming system adoption	32	1	10	5.8	2.2	38
Other organizations/projects in farming system adoption	32	1	10	4.7	2.4	50
Other development policies in farming system adoption	32	1	10	5.1	2.9	58
Demonstration plots in soil conservation adoption	36	1	10	8.0	2.3	29
Farmer participation in soil conservation adoption	36	1	10	8.9	2.2	25
Working in field in soil conservation	33	1	10	6.0	2.5	41
Cross-visits in soil conservation adoption	36	2	10	7.7	2.2	29
Training course in soil conservation adoption	36	1	10	7.4	2.2	30
Traditional extension service in soil conservation adoption	36	1	10	6.2	2.0	33
Neighbors/ relatives/friends in soil conservation adoption	35	1	10	5.6	2.5	44
Self-help groups in soil conservation adoption	35	2	10	5.9	2.2	38
Other organizations/projects in soil conservation adoption	34	1	10	5.0	2.5	51

Continued.

Appendix 1 (continued).

Questionnaire variable	No	Min	Max	Ave	*s*	CV
Score of						
Other development policies in soil conservation adoption	35	1	10	4.9	2.9	60
Demonstration plots in other technologies adoption	23	4	10	8.2	1.6	19
Farmer participation in other technologies adoption	23	3	10	7.9	2.1	26
Working in field in other technologies adoption	20	1	10	6.0	2.3	39
Cross-visits in other technologies adoption	22	3	10	7.2	1.8	25
Training course in other technologies adoption	22	2	10	7.2	1.7	23
Traditional extension service in other technologies adoption	22	1	10	5.9	2.1	35
Neighbors/ relatives/friends in other technologies adoption	22	1	8	5.3	2.0	37
Self-help groups in other technologies adoption	22	1	10	5.4	2.4	44
Other organizations/projects in other technologies adoption	23	1	10	5.4	2.8	52
Other development policies in other technologies adoption	23	1	10	5.3	2.6	50
Available plant material in variety adoption	37	0	5	3.9	1.3	33
High yield in variety adoption	38	3	5	4.9	0.4	8
High starch content in variety adoption	37	3	5	4.7	0.5	11
Suitability for poor soil in variety adoption	32	1	5	4.0	1.2	29
Drought resistance in variety adoption	31	2	5	4.1	0.8	18
Good price in variety adoption	34	2	5	4.3	0.8	19
Low production cost in variety adoption	32	2	5	3.8	1.0	25
Long storability of planting material in variety adoption	36	2	5	3.5	1.0	29
Good taste in variety adoption	30	1	3	1.7	0.7	40
Fertilizer availability in variety adoption	29	1	5	3.0	1.2	40
Formal education in variety adoption	27	0	5	2.8	1.3	47
Low dependency ratio in variety adoption	27	0	5	2.1	1.3	60
Labor availability in variety adoption	31	0	5	3.1	1.2	39

Continued.

Appendix 1 (continued).

Questionnaire variable	No	Min	Max	Ave	*s*	CV
Credit availability in variety adoption	28	0	5	2.8	1.4	50
Female household head in variety adoption	28	0	5	2.3	1.3	58
Male household head in variety adoption	28	0	4	2.2	1.2	54
Effective extension service in variety adoption	31	1	5	3.9	1.0	25
Participation in this project in variety adoption	32	1	5	4.1	1.0	23
Effectiveness in reducing soil erosion in conservation adoption	38	1	5	4.5	1.0	22
Low capital and labor input to establish in conservation adoption	34	0	5	3.5	1.3	37
Low capital and labor input to maintain in conservation adoption	36	0	5	3.5	1.3	38
Increase yield in conservation adoption	35	0	5	4.3	1.1	26
Labor availability in conservation adoption	33	0	5	3.2	1.6	48
Cheap and availability planting material in conservation adoption	34	0	5	4.0	1.2	30
Improved soil fertility in conservation adoption	32	1	5	4.4	0.8	19
Ease of use in conservation adoption	34	0	44	5.1	7.0	137
Other economic value in conservation adoption	32	0	5	3.6	1.3	38
Formal education in conservation adoption	27	0	5	3.1	1.3	40
Low dependency ratio in conservation adoption	24	0	5	2.8	1.3	46
Labor availability in conservation adoption	25	1	5	3.4	1.0	31
Credit availability in conservation adoption	26	0	5	2.7	1.5	55
Female household head in conservation adoption	24	0	4	2.3	1.4	63
Male household head in conservation adoption	25	0	4	2.0	1.4	69
Effective extension service in conservation adoption	31	1	5	3.9	1.1	28
Participation in this project in conservation adoption	34	1	5	4.4	0.9	22
Did a significant new conservation practice emerge from this project? (yes = 1)	36	0	1	0.9	0.3	31

Continued.

Appendix 1 (continued).

Questionnaire variable	No	Min	Max	Ave	*s*	CV
New varieties in increased income per capita	37	2	5	4.6	0.8	16
Resistance to soil erosion in increased income per capita	37	0	5	3.9	1.1	30
Improved soil fertility in increased income per capita	36	2	5	4.4	0.8	17
Other cultural practices in increased income per capita	34	0	5	3.4	1.4	42
Fertilizer availability in increased income per capita	33	1	5	3.9	1.0	27
Formal education in increased income per capita	29	0	5	3.1	1.5	50
Low dependency ratio in increased income per capita	26	0	5	3.0	1.2	40
Labor availability in increased income per capita	30	0	5	3.4	1.0	29
Credit availability in increased income per capita	26	0	5	3.0	1.5	52
Female household head in increased income per capita	27	0	5	2.4	1.3	54
Male household head in increased income per capita	25	0	5	2.4	1.4	60
Effective extension service in increased income per capita	34	1	5	4.0	1.0	26
Phoned boss last week (times)	37	0	20	1.8	3.4	185
Phoned by boss last week (times)	37	0	10	1.1	1.9	172
Phoned subordinates last week (times)	37	0	50	4.8	9.0	187
Phoned by subordinates last week (times)	37	0	20	1.9	4.7	242
Called general staff meeting last week (times)	37	0	11	1.1	2.0	191
Attended general staff meeting last week (times)	37	0	4	0.6	0.9	158
Contacted farmers last week (times)	37	0	60	4.4	10.2	235
Contacts by farmers last week (times)	37	0	10	1.0	2.2	229
Contacted extension agents last week (times)	37	0	30	3.8	5.7	149
Contacts by extension agents last week (times)	37	0	53	3.0	9.0	299
Called face-to-face meeting with boss last week (times)	37	0	6	1.5	1.7	111
Face-to-face meeting with boss last week (times)	37	0	4	0.3	0.8	252

Continued.

Appendix 1 (continued).

Questionnaire variable	No	Min	Max	Ave	*s*	CV
Times last week						
Called face-to-face meeting with subordinate	37	0	22	3.4	5.1	148
Face-to-face meeting called by subordinate	37	0	14	1.3	3.3	260
Contacted researcher in other institution by email, Fax, phone	37	0	20	2.7	4.5	165
Contacts by researcher in other institution by email, Fax, phone	37	0	15	1.0	2.8	271
Contacted policy maker by e-mail, Fax, phone	37	0	3	0.2	0.6	341
Contacts by policy maker by email, Fax, phone	37	0	2	0.2	0.5	225
Rank of farmer understanding by						
Direct supervisor	34	1	5	3.7	1.1	29
Subordinates	32	1	5	3.8	1.2	31
Policymakers	32	1	5	2.5	1.3	53
Researchers in other institutions	33	1	5	2.6	1.1	41
Extension agents	35	1	5	3.5	1.1	32
Farmer participation in project changed						
Priorities/importance of cassava and farming systems research (yes = 1)	38	0	1	0.9	0.3	39
Strategies of cassava and farming systems research (yes = 1)	38	0	1	0.6	0.5	77
FPR experience with farmers influenced own research or priorities for extension (yes = 1)	38	0	1	0.9	0.3	30
Farmer characteristics/knowledge directly influenced development or improvement of technology (yes =1)	38	0	1	0.8	0.4	52

Continued.

Appendix 1 (continued).

Questionnaire variable	No	Min	Max	Ave	*s*	CV
FPR on cassava has						
Given new approaches to research on other crops or feedstuffs in your institute (yes = 1)	38	0	1	0.7	0.5	65
Given new approaches to natural resource management (yes = 1)	37	0	1	0.7	0.5	70
Led to new partnerships and collaboration (yes = 1)	38	0	1	0.6	0.5	82
Led to new approaches to variety multiplication and distribution (yes = 1)	34	0	1	0.6	0.5	85
FPR adoption by other individuals or departments in this institution (yes = 1)	37	0	1	0.8	0.4	49
FPR comments favorable by colleague or boss for extension and technology development	37	0	2	1.8	0.5	29
FPR has changed researcher's viewpoint, evaluation, or judgment of farmers (yes = 1)	37	0	1	0.8	0.4	45
FPR has changed bosses and/or colleagues viewpoint, evaluation, or judgment of farmers (yes = 1)	35	0	1	0.9	0.3	36
Operating and perceptual changes brought about by the project	31	4	12	9.3	2.4	26
Positive view of farmers, early consultation, and participation in adoption and setting research priorities	32	15	32	27.3	3.7	14
Impact of cross-visits + training courses+ farmer participation	21	35	120	95.0	17.7	19
Percent greater varietal adoption by project farmers over non-project farmers	35	-12	70	17.1	21.9	128
Percent greater conservation adoption by project over non-project farmers	32	-30	55	15.0	18.8	126

Continued.

Appendix 1 (continued).

Questionnaire variable	No	Min	Max	Ave	*s*	CV
Combined impact of project on varietal and conservation adoption	30	3	10	8.4	1.7	20
Last week						
Internal communications	37	0	90	17.8	23.1	130
Downward outside contacts with extension agents and farmers	37	0	90	12.1	20.6	169
Upward contacts with other researchers and policymakers	37	0	34	4.1	7.1	172
External (upward + downward) communications	37	0	110	16.3	25.3	156
Farmer participation in this project in increased income per capita	34	1	5	4.3	1.0	23
Absolute impact on poor farmer income	37	0	2	1.8	0.6	31
Poor farmers gained relatively more than rich farmers	38	-1	1	-0.4	0.8	-209
Impact of poor farmer income as percentage of rich farmer income	37	0	2	1.0	0.6	63

Cover Photograph: Courtesy of Dr. Reinhardt Howeler. Photo taken in Van Yen district of Yen Bai province in north Vietnam showing an improved cassava variety (Hainan 24) with improved practices, including double hedgerows of *Tephrosia candida* to control erosion.

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