develop an integrated vision of the research and development issues relevant to their program; learn how to teach and organise classes. Visits to CIAT contributed to their understanding of institutional organization and functioning. Informal contacts during their visits led to the introduction of tissue culture and participatory research into the Bolivian program. In synthesis, they 'learned the best things in their life'. In their specific scientific fields, training permitted the pathologists to identify the principal pathogens and their geographic locations, as well as develop control strategies. Once his training was finished, the breeder hybridized the traditional variety and is about to release the first one developed by Bolivian scientists. At the same time, the seeds specialist developed and applied artesanal methods of producing certified seed on the farms of small producers.

At the institutional level, a stable, well-equipped, multidisciplinary research team was formed, with third generation replacements. In the opinion of the present leader of the program, 'training was the key' to its success and without it 'progress would have been far slower' A survey of university authorities concluded that the bean program provided outstanding, probably unique, leadership at national level, due to its highly qualified staff. It was the only program which operated on the basis of clear goals and objectives, and had brought renown and status to the university. The university curriculum was modernised, with material on bean production introduced for the first time. Eighty nine *Ingeniero Agrónomo* theses on all aspects of bean production and consumption were submitted to the university in the period 1978 to 1999. The average grade for these exceeded 70/100. An impressive aspect of the program relates to the very detailed documentation of results and impact, and that an exhaustive internal evaluation was carried out in 1999. Main research findings were related to the development and release of disease resistant varieties of bush beans; the development of an innoculum; identification and control of major pathogens; economic aspects of disease control; agronomic practices (e.g. sowing dates/region); seed production; changes in rural and urban consumption patterns. No improved bean varieties were released in Bolivia before CIAT training occurred. Afterwards, 8 new varieties were released in 1980-89, and 7 more in the period 1990-2000. These were obtained by selection and by hybridisation, relying heavily (97%) on parental materials brought into Bolivia by the research team, mainly from the CIAT genebank. By 2005, one variety of purely Bolivian origin was about to be released.

At the inter-institutional level, the program founded the Bolivian Bean Network (REDBOF) in 1997, with participation of 10 other institutions. One indirect result was that 6 members of these sister institutions went to CIAT for training in the period 1989-99. Links were also formed with seed production, distribution and export institutions. Notable among these was ASOPROF(1990) consisting of 11 farmer organizations with about 1800 members which, with technical assistance from the program, played a major role in artesanal certified seed production for export The program also provided input into the national institution (SENASAG) responsible for setting norms for seed production and certification in general. In 1989, the program became a member of the CIAT-led Andean Bean Network, PROFIZA. The final report of this network shows the contribution of the Bolivian team to have been outstandingly productive. When PROFIZA ceased to exist, the program set up a national network, PRONALAG (2001) with coverage expanded to other grain legumes. The program has successfully developed its international relations (e.g. cooperation with the University of Wageningen for the development of innoculum; with FAO and CIP for the establishment of a diagnostic laboratory). Partnership with CIAT in a biofortification project (Fe and Zn) will continue. The program has developed the capacity to pay for germplasm and consulting services from international Centers, and expects contributions from producers and the commercial sector to ensure continuity once Swiss funding ends in 2005.

The training of professionals, farmers and housewives has been a major component of their activities. In the period 1989-99 alone, 80 demonstrative plots were set up, 52 courses/workshops held for 930 farmers and technicians, 69 field days held for 3827 technicians and farmers, 13 publications produced

on technology transfer; 228 workshops on nutrition and use of beans in family diets for 7845 housewives, 147 cooking demonstrations for 73991 families; use of beans promoted at 25 agricultural shows, as well as through radio and television programs; 13 courses held on the production and use of clean seed for 1004 farmers and technicians.

Table 2.2 summarises some of the results obtained in the field. They are obtained from different sources so information on every item was not available for each of the years shown. Together they indicate major changes in land sown to beans and the reduction in winter fallow; increased production of beans for consumption and certified seed; the growth of export earnings; cost reductions due to disease resistant varieties and to less weed infestation in the summer crops (resulting from the introduction of beans as a winter crop in the rotation); employment generation and an increase in domestic bean consumption, especially among poorer households. A 1999 survey carried out by the program showed other benefits perceived by growers to include: improved nutrition, less incentive to emigrate in search of work, better access to production inputs, better education for the children; and reduced energy costs from the acquisition of solar panels. A later study (2003) estimated the cumulative value of the incremental production of the new varieties was estimated as US$ 2.87 million.

Conclusions

The training carried out in this case responded directly to the institution´s needs. It was mainly individualised, coordinated over a whole research team and sustained over a long period of time so that the skills of individual members evolved and gaps in the team´s collective skills were filled. Although other factors related to outcome (e.g. excellent, continuous leadership; institutional support, financial support, market opportunities) were favourable, it is the team leader´s view that CGIAR training was an indispensable component. Because of CIAT´s unique knowledge of bean production under lowland tropical conditions and of the available germplasm, it is unlikely that a similar contribution could have been made by other institutions. The results have been outstanding to date, and there is a good probability that they will be sustained in future, given the solid base established with large numbers of producers of beans for consumption and seed, as well as with seed distribution and export companies. This program became one of the most productive members of the Andean bean network, PROFIZA, so capacity building through training of this individual member contributed to strengthening the rest.

Table 2.1 :Training of scientific staff of the UAGRM´s bean program at CIAT

Generation	Name	Field	Time (days)/type[a]	Date	
				Start	Finish
First	Francisco Kempf	Interdisciplinary	33 (SC)	21/08/78	22/09/78
First	Jesús Soto	Breeding	106 (SC +I)	27/08/79	10/12/79
Second	Juan Ortube	Agronomy	153 (SC + I)	03/02/86	05/07/86
		Data processing	5 (SC)	28/09/92	01/10/92
		Participatory	18 (SC)	25/04/96	12/05/96
		Research	12 (SC)	25/10/99	05/11/99
		Breeding			
Second	Carlos Rivadeneira	Pathology	83 (SC + I)	24/09/90	15/12/90
		Breeding	12 (SC)	25/10/99	05/11/99
Second	Marco Koriyama	Farming Systems	88 (SC +I)	02/2/87	30/04/87
		Agronomy	88 (I)	18/9/90	14/12/90
Third	Maria Isabel Cazón	Pathology	54 (I)	04/05/93	17/06/93
Third	Angelica Hernández	Entomology	34 (I)	31/07/94	02/09/94
			13 (I)	28/11/99	10/12/99
Third	Tito Anzoategui	Breeding	91 (I)	18/09/95	17/12/95
		Breeding	12 (SC)	25/10/99	05/11/99
		Molecular tech.	26 (SC)	21/10/02	15/11/02

[a] SC= Short course, I = Individual training

Table 2.2: Changes over time in land use, bean production and consumption in the area of Santa Cruz

	1979	**1991**	**1999**	**2005**
Area sown (ha	0	18,000	23,000	20,000
Area under improved varieties (%)	0	-	80	-
Winter fallow (% total area)	81	-	14	-
Disease resistant varieties released	0	-	7	25[a]
Production (MT/year)	0	12,000	25,000	-
Certified seed produced 9MT/year)	0	665	-	-
Export (MT/year)	0	14.8	10.2	-
US$ (million/year)	0	6.9	8.7	5-10
Employment generated (days/year)	0	-	450,000	-
Production cost reduction (%)[a]	0	-	15	0
Summer weed control cost reduction (US$ million, 1979-99)	0	-	1.5	-
Consumption (% **households**, *kg/head/year*)				
Rural	0	*6.0*	**75**; *23.5*	-
Urban	0	*4.0*	**50**, *6.0*	-
Poor urban	-	-	**84**, *14.0*	-

[a] Through the Andean network PROFIZA

Sources:

- Interview: Dr. Juan Ortubé, Leader, Bean Program, Instituto de Investigaciones Agrícolas de 'El Vallecito', Universidad Autónoma Gabriel René Moreno, Santa Cruz.
- Johnson, N.L., D. Pachico, O. Voysest. 2003. The distribution of benefits from public international germplasm banks: the case of beans in Latin America. Agricultural Economics 29: 277-286
- Ortubé, J. 1999. Informe del proceso de la autoevaluación del programa nacional de frejol en relación con el proyecto de frijol para la zona andina-PROFIZA (desde 1989 hasta 1999). Facultad de Ciencias Agrícolas, Universidad Autónoma Gabriel René Moreno, Santa Cruz, 66 pp.
- Ruiz de Londoño, N., Arbey G., J., Pachico, D. 1999. Adopción e impacto del frejol (*Phaseolus vulgaris* L) en Santa Cruz, Bolivia, 1999. CIAT-PROFIZA-COSUDE, CIAT, Cali, Colombia 37 pp.
- Voysest, O. 2000. Un cultivo ancestral avanza a la modernidad. Informe Final del Proyecto Regional de Frijol para la Zona Andina PROFIZA. CIAT, Cali, Colombia, 72 pp.

3. PROINPA Foundation, Cochabamba

(*Partner Institution: PROINPA: Fundación para Promoción e Investigación de Productos Andinos; Main CGIAR Center involved: CIP)*

This case documents an exceptional degree of involvement by the CGIAR in the evolution of a single institution through training and other institutional strengthening support.

Background

PROINPA was set up (1989) as a potato project within the national agricultural technology institute, IBTA. IBTA had considerable difficulties due to unstable leadership and reduced resources. It was closed in 1998, and national support to agricultural R&D greatly reduced, putting research and genetic resource conservation activities at serious risk. Funding for PROINPA has been continuously available from the Swiss (SDC) and, from 1992-98, through a World Bank loan to IBTA.

Implementation

Perhaps the major contribution of the CGIAR to the strengthening of PROINPA was in an advisory and leadership role which undoubtedly had an important learning component. CIP participated initially with the SDC in the proposal to establish PROINPA in 1989, with an agreement of support from both institutions for twelve years. Although part of IBTA, PROINPA had its own directorate and autonomy in terms of financial management and hiring of staff. CIP scientists were located in Bolivia and served as International Director (co-responsibility with a National Director) and as heads of most of the technical departments. CIP presence on the staff continued until 1998. There were frequent visits from other CIP staff in advisory capacities. For example, during the first year 1989-90, three members of Management, including the Director General, a virologist, an entomologist, the librarian and the accountant came periods of up to 5 days. With the collapse of IBTA imminent in 1997, CIP participated in the process of planning institutional change to ensure independence and stability, and in designing a sustainable financial strategy to compensate the reduction in funds from Swiss and national sources. PROINPA was transformed into a foundation in 1998, with CIP represented in its directorate. ISNAR played an advisory role in strategic planning in the years 1999-2000, using PROINPA as a case study in the New Paradigm initiative. IPGRI was also represented on the directorate after 2000. Once the foundation was established, national staff assumed full responsibilities for technical, administrative and financial matters, and the two remaining CIP staff were transferred to the Andean potato network (PAPA ANDINA). CGIAR presence (CIP, IPGRI) continues at the level of the Assembly (maximum decision-making body), and as collaborators (CIP, CIAT and IPGRI) in research projects.

From its beginning, PROINPA established a policy of hiring and training young professionals. Forty nine members of staff received training from one or more of the CGIAR Centers in a diversity of areas during the period 1989-2004 (Table 3.1). CIP and IPGRI participated mainly in themes related to genetics and breeding, CIP in crop protection and CIAT in participatory research. A total of 14 scientists received individual, specialised training for periods up to 30 months. In addition to the 49 trained while in- service, four more scientists who joined PROINPA had been trained previously at CIMMYT, in one case on six occasions.

Outcomes and impact

There has been a very high retention rate of the PROINPA professionals trained in-service since 1989, with 41 of them still serving the institution. This in itself is an exceptional achievement, given the instability of most Bolivian institutions. Today, the General Manager is a CGIAR trainee. Immediately beneath him there are nine leadership positions, including heads of units (e.g. planning and evaluation; investment and finances), heads of regions and heads of scientific areas. Of these nine, seven are CGIAR trainees, with only the leaders of communications and agroindustrial research as exceptions. A survey was carried out among staff to determine the importance they attached to training at different types of institution. Ten of the 18 respondents had been trained at CGIAR Centers and other institutions (e.g.: universities in the north and south). Five of these rated their CGIAR training as the single most important experience for them personally, and all ten rated it as very valuable. In interviews, they emphasised the benefits of informal learning through collaborative projects and other contacts with the Centers. Some of them recorded that contacts with the Centers had changed their work attitude from one of simply complying with a job to one of service, and considered that this had pervaded the institutional culture of PROINPA.

At the institutional level, PROINPA evolved in about 10 years from a potato project within IBTA (1989) to an autonomous foundation in 1998. The institution has 115 staff, with activities in three regions of the country (highlands, northern valleys, southern valleys and Chaco). Their mandate has expanded from potatoes alone to eight other Andean roots and tubers, three Andean grains, three cereals, three legumes, three vegetables and one fruit crop. The number of professional staff has increased somewhat but the number with graduate degrees has more than tripled. The institution has been entrusted by the state with management of the germplasm banks of Andean roots and tubers (1998) and Andean grains (1999) which were in serious danger of erosion. These included 2056 accessions of Andean roots and tubers and 3141 accessions of *Chenopodiaceae* by 2001. Although funding has not increased since the foundation was set up, the financial base has diversified considerably, with the Swiss block grant, national projects and international projects each accounting for about a third of the total. PROINPA presently executes 54 research projects, 28 of which have international funding. Donors include UK, Holland, EU, FAO, IFAD, McKnight, Belgium, Switzerland, Kellogg, Denmark, Germany, USAID, Italy and FONTAGRO. The process of change has not been easy and management´s main concerns now relate to funding and to the difficulty of maintaining long term priorities and covering overhead and administrative costs when a high proportion of total funds come from short term projects.

The generation of scientific information has increased and evolved, as illustrated by Table 3.2. Output of scientific publications tripled between 1992-3 and 2002-3, and the balance of authorship changed. CIP scientists appear as the sole authors or senior authors of most publications up to 1993. Thereafter, PROINPA took over the leadership. The unusually high number of publications in 1998-2001 is due to the inclusion of written abstracts in congress proceedings. PROINPA´s scientific standing was recognised nationally by the award of the National Academy of Sciences in 1997. Thereafter, PROINPA publications won first awards in national and international competitions (e.g.: Belgian

State Secretary for Development Cooperation (1998), Spanish Phytopathology Society (1998), Latin American Potato Association (2000)). The institution´s activities, including publications, are documented in reports which are published about biennially.

At the inter-institutional level, PROINPA has become recognised for national leadership in many areas. These include genetic resource conservation and characterization, potato pest and disease control, and participatory research methods (see Case 1). The institution is responsible for monitoring and evaluating projects executed under the new Bolivian System of Agricultural Technology (SIBTA) and continues to contribute to policy decisions at national level (e.g. the national strategy for biodiversity conservation). It is an active member of the Andean potato network (Papa Andina) and listed 37 municipalities, 51 national institutions and 47 international institutions as collaborators in research, outreach and training in 2004.

PROINPA´s own training activities include collaboration in undergraduate, diploma level and Master´s level courses with local and foreign universities. For example, the Master´s course on management of genetic resources and biotechnology is run in collaboration with the local Universidad Mayor de San Simón, the Peruvian Universidad Nacional Agraria and two Belgian universities. PROINPA co-edits the journal ´Revista Agricultura´ which has run to over 30 numbers. PROINPA staff collaborate with CGIAR Centers in short courses for national professionals (e.g. with IPGRI on participatory evaluation of germplasm, 2003), and provide numerous short courses themselves. In addition they work directly with producers, mainly through farmer field schools and CIAL´s in collaboration with the municipalities and NGO´s. These activities are supported by a wide variety of publications, audiovisuals, and radio messages for farmers and technicians.

At the present time, PROINPA estimates that it reaches more than 11,000 beneficiaries directly and over 45,000 indirectly through new technology generated. This is notably in the management of various major pests and diseases of potatoes, varietal selection for late blight and nematode resistance, and management of seed potatoes. Examples of the results include the identification of varieties with 2-5 times higher yields than the commonly grown one, through participatory selection (Morochata); reduction in insect damage in potatoes from 48.9% to 8.5% by technology transfer using farmer field schools in the highlands (Ayo Ayo and Umala); reduction in the use of chemicals in pest and disease control and a predicted US$ 1680 benefit per farmer due to training in potato blight control (Morochata). In other crops, increases of 100% in yields of peppers were reported in 40 communities (Chuquisaca) leading to a doubling of family income from this source; and increases of 25% in the price paid for quinua in 27 communities, thanks to better quality control (Irpa Chico). Over the longer term, benefits would be expected from the conservation of native genetic resources not only *ex situ* but, by organic production and innovative marketing, *in situ* as well.

Conclusions

There was general agreement among PROINPA staff that CIP´s contribution was an indispensable element in the institution´s evolution into the strongest agricultural research institution in Bolivia today. The building of an institution with a high probability of remaining sustainable over time is an exceptional achievement, given the chronic politicisation and instability of Bolivian institutions over the last decades. CIP´s contributions at the planning stage, especially in relation to establishing a solid financial base and international contacts, and leadership at the program level, as well as training in specific research areas, all had important learning elements which are clearly recognised by the institution... The question which arises is whether such a heavy investment in a single institution was justifiable for an international center. CIP had compelling reasons to support PROINPA, at a time when all national institutions were in crisis. They needed at least one effective partner in the country of origin of many potato varieties which were of potential significance in fulfilment of the Center´s

global mandate for the crop. Otherwise there was a risk that unique germplasm would be lost. In this sense, support to a specific institution contributed to the Center´s ability to continue to produce improved genetic material as international public goods. Added to this, it was desirable to be able to continue to work in the poorest country in South America where potatoes are the staple crop. That CIP should have entered into the fields of institutional planning and management, albeit with support from ISNAR, is explicable since no other institution would have had the same incentive to contribute. This case is therefore arguably one where strict adherence to the IPG and comparative advantage criteria for CGIAR Centers´ activities might not have been appropriate.

Table 3.1: Formal training received by PROINPA staff, according to type, theme and Center (1990-2004)

Center	CIAT		CIP		IPGRI		Total	
Type[a]	I	G	I	G	I	G	I	G
Theme								
Breeding	-	-	1	-	-	-	1	-
Biotechnology	-	-	4	-	-	3	4	3
Genetic Resources	-	1	1	2	1	8	2	11
Crop Protection	-	-	3	-	-	-	3	-
Information/Documentation	-	2	1	2	2	6	1	8
Participatory Research	1	14	1	1	1	8	1	22
Impact Assessment	-	-	1	-	-	-	1	-
Not recorded	-	-	1	13	-	-	1	13
Total	**1**	**17**	**12**	**15**	**1**	**25**	**14**	**57**

a I: Individual training (2 days – 29 months). G: Group training (1 – 40 days).

Table 3.2 Time trends in numbers of PROINPA scientific publications and authorship

	Number of Publications *PROINPA + CIP*				
	Author's institution:		Senior author:		Total
	PROINPA	CIP	PROINPA	CIP	
1991-92	**2**	**-**	**-**	**-**	**2**
1993	**-**	**5**	**9**	**5**	**19**
1998-01	**71**	**-**	**6**	**8**	**85**
2002-03	**29**	**-**	**27**	**3**	**59**

4. TROPICAL PASTURES NETWORK AND SEED PRODUCTION

(Partner institutions: Empresa de Semillas Forrajeras (SEFO)-Universidad Mayor de San Simón (UMSS), Cochabamba; main CGIAR Center involved: CIAT)
This case was chosen as an example of outcomes associated with a CGIAR Center-led international research network, which had strong training objectives.

Background

The International Tropical Pastures Network (RIEPT: Red Internacional de Evaluación de Pastos Tropicales) was set up in 1976 by CIAT It operated in 24 LAC countries until 1996, with the objectives of training professionals in the evaluation and production of forage species, sharing and evaluating germplasm in different localities and generating extrapolable scientific information. During its twenty-year duration, 685 professionals were trained through the network. In Bolivia, active participants came from four institutions: the UMSS with its associated seed company SEFO, the Universidad Autónoma Gabriel René Moreno (Santa Cruz), the Centro de Investigación Agrícola Tropical (CIAT- Santa Cruz) and the national research institution, IBTA. The Swiss government had financed a pasture program at the UMSS since 1969, predating the RIEPT, and concluded that the scarcity of seed was the main factor limiting the adoption of improved pasture technologies. The British technical mission at CIAT-Santa Cruz provided some support to pastures work there from 1978, but the projects with most financial support were on production systems and the conservation of criollo cattle. IBTA was disbanded in 1998 and many of its staff left the area of research completely.

Implementation

Bolivia ranks fifth in number of RIEPT trainees, with a total of 37, despite its small professional population compared with countries with higher trainee numbers (Colombia, Brazil, Peru, México). Table 4.1 summarises the type of training undertaken at CIAT headquarters. Most of the trainees were agronomists. Five of the six forage scientists at the UMSS and SEFO were CIAT trained, and the data are shown separately for them because of the particular outcomes described below. The Table shows that a wide range of themes was covered, including training of trainers. General agronomy and pasture management and the specialised areas of seed production, systems and soils predominated. A common pattern was for professionals to attend courses of up to two months, followed by specialised individual training. The latter was often of considerable duration. In 36% of the cases, it lasted 4-6 months and in 41% cases more than six months. One MSc (entomology) and one PhD (soils) student was included. In addition to formal training, the RIEPT provided learning experiences and exchanges of information at their annual meetings, and through their numerous publications which included the scientific journal ´Pastos Tropicales´. CIAT staff frequently visited the national institutions members of the RIEPT, providing additional advice and support.

Outcomes and impact

At a personal level, scientists underlined the broadened vision of pastures research which experience at CIAT had given them. Concepts of pastures within an integrated production systems context and of soil-plant-animal interrelationships as an integrated whole, were mentioned specifically. These integrated concepts were pioneered by CIAT at a time when a disciplinary treatment of the subject predominated elsewhere in research and teaching. Trainees agreed that the practical content of training at CIAT had been valuable and that visits to the center had improved their understanding of institutional management, strategic planning and information management. On the other hand, there was also a perception that part of the training was related to technologies which did not find commercial application, and was determined by the research interests of CIAT (e.g. the mixed

legume-grass pasture technology and the corresponding species evaluated). Consequently, not all their training was put to use. A clear exception was the training in seed production. This was perceived as an indispensable element of the subsequent growth of the forage seed industry, because of the skills acquired. No other institution had experience comparable to that of CIAT in the management of lowland tropical forages, or seed production there from. Apart from the skills acquired in production and quality control, particular importance was attached to CIAT´s advice in setting up the seed company, and to their continuous support in the difficult process of incorporating small farmers into the production of high quality seed.

At the institutional level, outcomes were mixed. For various reasons, including institutional instability and lack of funding, strong, sustained tropical pastures research capacities did not develop in the participating institutions. There was no widescale adoption of the grass-legume mixed pasture technology which was emphasized through the network. Some selection of grasses (e.g. *Brachiaria* spp*)* and legumes did take place, but Bolivia is one of the few members of the RIEPT which did not officially release forage cultivars evaluated through the network because there was no official mechanism for doing so. In contrast, an effective institutional arrangement was developed for the production of forage seeds, which has been sustained since its foundation. It grew out of the UMSS´s seed production research unit (set up in 1972 with Swiss funding) which evolved into a seed production company (1977) with several national institutions as partners and technical support from CIAT. It later (1986) became an independent mixed company (Empresa de Semillas Forrajeras, SEFO) with the UMSS, the Swiss SDC and small farmers who produce the seed as partners. Seed is now produced on over 1000 small farms in five departments with widely different ecologies, from the highlands to lowland tropics. Some 650 of the farmers are active members of the company and own 49% of the shares. Despite financial difficulties during times of national recession, the company is now economically self-sufficient and is able to make investments for future improvements. The present leader, himself CIAT trained, underlined the importance of CIAT training in specific aspects of seed technology and also their advice and support in the logistics of setting up the company and incorporating small farmers as primary producers. This was due in large part to the continuous interest and support of the CIAT forage seed specialist over a number of years. SEFO worked initially on corn and oats (i.e. species not covered by the RIEPT) but at present has a wide coverage of tropical species including several cultivars generated by CIAT. There is linkage between SEFO and the academic activities of the UMSS. Staff participates in the forage production courses and supervise student theses on genetic improvement and seed production at the university's research center (La Violeta), some of which are financed by SEFO. SEFO also provides continuous technical assistance, as well as certain supplies, to the seed producers to ensure yields and quality.

SEFO now produces seed of more than 40 species, used for forage, green manure, ground cover and nematode control. Quality standards exceed those required internationally. Annual production rose to 505 MT in 1996 and has remained in the range 336-568 MT each year since then. The approximately 7000 MT of seed sold in Bolivia since the start is estimated to have covered about 350,000 ha with improved forages. About 400 MT of seed from 19 mainly legume species have been exported to 17 countries in Europe, Asia, the USA, Latin America and the Caribbean, SEFO is the region´s leading producer of *Arachis pintoi* which it exports to twelve countries. Employment has been generated for about 5000 people on the farms which produce the seed as much of it has to be harvested by hand. Community development projects directly involving SEFO have included improvements in housing, irrigation, sewage, roads, drinking water supply, schools and sports fields.

Conclusion

Training through this international research network was perceived by interviewees to have led to useful outcomes at the personal level, in terms of concepts, vision and principles, even though they

were not always able to put their knowledge to full use, and it did not always lead to impact at the institutional or field level. Therefore, it did not contribute fully to the aims of the network by generating new knowledge about the forage species in question. The factors associated with this include institutional instability and lack of funding but also, in the perception of the interviewees, the ´top-down´ nature of part of the technology involved. This may be a danger inherent in large international networks, especially for the weaker members. The training in seed production, on the other hand, filled a need which had already been identified. The success of the seed enterprise was attributed to the combination of relevant, specialised training and continued support over a long period time from the Center; a strong commercial demand for the product; the long-term availability of funding; stable, independent institutional arrangements; and continuous excellent local leadership. At the same time, the model of export quality seed production based on partnership with a large group of small farmers merits replication elsewhere.

Table 4. 1 Training of Bolivians carried out at CIAT through the RIEPT, according to type and theme

	Number of training activities attended					
Institution:	**UMSS/Seed Co.**		**Others**		**Total**	
Type[a]:	**I**	**G**	**I**	**G**	**I**	**G**
Theme						
Agronomy	4	4	13	2	17	6
Seed Production	3	6	1	2	4	8
Systems	2	2	1	1	3	3
Soils	3	2	3	2	6	4
Entomology	-	-	1	1	1	1
Animal Management	-	-	-	4	-	4
Weed control	1	-	-	-	1	-
Breeding	1	-	-	-	1	-
Training of trainers	-	-	-	3	-	3
Total	**14**	**14**	**19**	**15**	**33**	**29**

[a] I = Individual, G = Group training

Sources

- Interviews with: staff from CIAT-Santa Cruz; UMSS and SEFO, Cochabamba, including Ing. Gastón Sauma,, Manager of SEFO
- Sauma, Gastón. 2004. Producción de semillas forrajeras en SEFO-SAM, Bolivia. Internal doc. 9 pp
- Holmann, F., Rivas, L., Argel, P. Y E. Pérez. 2004. Impacto de la adopción de pastos *Brachiaria* en Centroamérica y México. CIAT, Colombia 32 pp

ANNEX XV
Ecuador country report

1. Overview of capacity needs

Background

Ecuador has about 13 million inhabitants. The economy depends on oil, money sent by emigrants, and agricultural products (in that order). Poverty has increased dramatically since 1995, reaching 68% in 2000 with an insignificant decrease since then. At the same time, the distribution of income became less equitable, emigration increased and about 22% of the population presently lives abroad. About 30% of the total work in agriculture, which contributes approximately 10% of the GNP. Over 60% of all agricultural properties are less than one hectare. In general, there are low levels of productivity, low added values of agricultural products through local processing, high levels of over-exploitation of natural resources, and high levels of contamination of soils and water.

Policy

The present government is a transitional one until 2006. There have been 17 Ministers of Agriculture in the past 6 years. Unsurprisingly, all interviewees agreed that there is no agricultural research and development policy in force at present, and this has been a constant feature of agricultural R&D in the past.

In the absence of a defined policy at national level, there is debate about the balance in resources which should be devoted to the traditional food and ´new´ export crops. Authorities in the Ministry of Agriculture and Livestock see as priority needs the identification and development of crops with export potential; biological control of pests and diseases to reduce levels of contamination and production costs; and the processing and commercialization of agricultural products. They see little future in continuing to devote resources to the traditional food crops (e.g. potatoes, wheat) for which Ecuador can never be competitive in international markets. There is considerable concern about the impact on national agriculture of the Free Trade Agreement presently under discussion between Andean countries and the USA. On the other hand, the national institution responsible for research (INIAP) devotes a large part of its resources to traditional crops such as potatoes, cereals and legumes, which are the bases of the production systems of the majority of farmers, especially the poorest. The new Director of INIAP expects to give priority to `organic´ production through genetic selection for disease resistance, biological means of pest and disease control and organic fertilization; to processing and commercialization aspects of the traditional crops; and to the collection, characterization and exploitation of native and endangered plant and animal species.

In this scenario, there is evidently a need for capacity strengthening, including training, in the area of policy. Beyond that, the precise role of training in the overall scheme of agricultural development will depend on how national policies are defined.

Research capacity

Ecuador is among the countries with the lowest expenditure on R&D on the continent. It invests only 0.26% of the agricultural GNP in agricultural research and development (compared with 1.12% for LAC, and 0.53% for Colombia, its main competitor). It was estimated to have 83 scientists and engineers in R&D /million people (1996-2000), the lowest figure published for Latin America except Nicaragua. The total number of researchers (387 in 1996-7) was the lowest in the Andean region, except for Bolivia.

The majority of the agricultural research capacity has traditionally been in the national institution, INIAP. Since the Ministry of Agriculture and Livestock's extension service closed about 15 years ago, INIAP has also taken on increasing technology transfer activities. However, INIAP continues to struggle with major institutional problems, which severely limit its effectiveness (Case Study 1). There are a few vigorous and effective NGO's, such as the Grupo Randi Randi, with good research capacities and ability to attract project funding, but the universities' participation is very limited (see below).

Under these circumstances, continued training of INIAP staff should be accompanied by structural reform of the organization, which the present Director is striving for. But training is recognised by the Director as a vital component in developing capacity to carry out the institution's ambitious agenda. He sees a continuous need for refresher courses and higher degree opportunities, especially for researchers in the areas of biotechnology, biological pest and disease control, processing and marketing for local and international trade. This kind of training would have to be provided by outside sources, whether CGIAR Centers or foreign universities. At the same time, there is a need to strengthen through training the NGO's which are involved in research, as they are less subject to the kinds of structural problems which beset the national institutions. INIAP and partner NGO's have considerable experience in training of trainers for farmer field schools, community based research committees and other kinds of extension work, but training in new methodologies and impact assessment will continue to be necessary.

University Education

There are 22 faculties of agriculture (or related areas) with very variable academic levels. A few private universities maintain standards of excellence, but the public ones have generally deteriorated. Theses are required for the 'ingeniero agrónomo' (undergraduate) degree, but few university departments have well defined lines research and there is little training in experimental design or scientific methodology. Limited funding has been available through a competitive funds scheme, but the response has been poor and less than half of the universities submitted projects in any area (including agriculture) in the latest round of applications. The proportion of university professors with higher degrees is generally very low, but as these are required by law, there has been a proliferation of Master's degree courses. Many of these are of doubtful value, although an accreditation process exists through the Consejo Nacional de Universidades y Politécnicas (CONESUP). CONESUP is actively pursuing options to obtain more funds for research from national (from confiscation of drug-related properties) and bilateral (e.g.: Japan) sources. CONESUP sees a major need for re-organization and consolidation of the universities, support to teaching staff through information, making materials available for curriculum modernization, providing opportunities for higher degrees, and drawing the universities effectively into research and extension, through project partnerships.

Funding

External funding in the sector is relatively limited (e.g. about 20% of that supplied to Bolivia), and is declining as donors (e.g. Holland, Germany) direct more attention to Africa. Agriculture in general and research in particular have been neglected traditionally by the national government. Some relief was provided through PROMSA, a competitive funding scheme for research financed by IBD, and for technology transfer by the World Bank, but this was discontinued in 2004. There is reasonable optimism that the present government may assign funds from oil income to science and technology and that INIAP would receive a stable income of aboutUS$4-5 million/annually from that source. At present INIAP's current income barely covers (very low) salaries, and only 3% comes from projects

Advantages of CGIAR training. The comparative advantage of the CGIAR in training most often mentioned was the centers′ particular expertise. Examples cited were international leadership in the area of participatory research in developing countries, and unique expertise and working knowledge of accessions held in the gene banks. Second, trainees emphasised the advantage of practical experience and ′learning by doing′. This occurred under realistic conditions such as they would meet at home and was reinforced by the center scientists′ first hand knowledge of local conditions and language. Third, trainees underlined the advantage of the centers′ holistic vision of research and development problems, and having access to multidisciplinary problem-oriented research teams at the centers. This was difficult to match in other institutions. Fourthly, they drew attention to CGIAR training as facilitating worldwide professional contacts, donor contacts and as a gateway to funding through collaborative projects. A fifth consideration referred to the cost of training. Perhaps cultural reasons restrained interviewees from mentioning this at the outset, since, as indicated above, funding opportunities have been the overriding determinant of the training undertaken.

Training strategy. The centers′ training strategies were perceived to be defined by their research projects and the center-led networks. This would be expected in the absence of a training policy on the part of the national institutions and where the availability of funding determined what kind of training was carried out. The main concentration of training at INIAP was not seen as part of an explicit institutional strengthening strategy towards them, but due to the reduced participation of other institutions in national research. This degree of concentration may be questionable given the centers′ mandate to generate international public goods. However, INIAP is the main Ecuadorean member of international networks, and technologies generated as a result of the training would potentially be shared more widely.

Training types. Information on the type of training carried out by the centers together is incomplete, but the samples taken from CIAT and CIMMYT records (Table 1) show a high proportion of individual trainees. The trends away from general, towards specialized, courses, and the cessation of long courses shown in the CIAT data are typical of trends in the CGIAR system as a whole.

2.2 Discussion of the effectiveness of different training types centerd on three aspects.

First, the insertion of training in collaborative research projects seems to have been the main – perhaps only- way to ensure the presence of the other inputs necessary for the training to be put to use. It is significant in this context that over 60% of the trainees (n=85) who responded to the survey carried out by this study, reported lack of operational resources as a factor limiting their ability to use their training.

The second aspect concerns continuity. Ecuador has been fortunate to have several projects of long term duration which have facilitated continuous human resource development (e.g. through training with progressive degrees of specialization in the subject matter, and continuous informal contacts with the centers). This latter is difficult to reconcile with the short term nature of most projects, and lack of continued contact and follow-up by the centers was one of the shortcomings most frequently cited in the trainee survey results. In the longer term projects (e.g. SDC-CIP-INIAP FORTIPAPA), formal training has been combined with continuous informal learning experiences maintained over time, to which the trainees interviewed attached very high value.

The third issue relates to the importance of practical training. This was perceived as an indispensable part of the learning process not only in the biological sciences (e.g. in the application of biotechnological methodologies) but also in the social sciences, and an outstanding case of the latter is described in Case study 3. This increases the time required on the part of the centers, but is essential for the trainees.

(Case Study 1). There is no budget for training so funding opportunities through projects are the main determinant of the training carried out.

2. Overview of the role of the CGIAR

2.1 Past contributions

Ecuador ranks third in Latin America in terms of the amount of training received from a sample of ten CGIAR Centers, and highest of all except Peru and Colombia which are host countries (SC Secretariat, 2004). The records available from all centers show 692 formal training activities/events, distributed as follows: CIAT: 372, CIFOR: 1; CIMMYT: 168, CIP: 90; ICARDA: 15, IPGRI 32; IRRI: 1 and ISNAR: 13. However, this underestimates the real contribution because some data bases are incomplete, especially for in-country training.

An outstanding feature is the heavy concentration of training activities on the national research institution. Taking records available from all centers, 59% of formal training activities concentrated on INIAP. No other institution exceeded 2%, except the Ministry of Agriculture and Livestock (10%). However, as shown in Case Study 1, 43% of the INIAP trainees are no longer there.

Training has typically consisted of a formal component complemented by informal training and learning, information, networking and also, in the case of the CGIAR mandate crops, by provision of germplasm. Much of the training and germplasm was provided free of charge. More recently, charges for overheads, services and germplasm (e.g. rice varieties through CIAT-led FLAR, which requires an annual subscription, including back payments) put these out of the reach of struggling organizations like INIAP. There was a perception that the days of these invaluable contributions of the CGIAR system were past, and that the centers´ need to fund their own research and demonstrate field-level impact had forced them to become competitors for funding rather than allies.

Formal training. Correspondence with NARS´ needs. Given the predominance of INIAP, there is no mechanism for the NARS system as a whole to identify its training needs. Some members of NGO´s and universities consulted felt they had been bypassed by the CGIAR Centers, yet this may be explained by their limited involvement in research. In general, it is fair to conclude that CGIAR training has reflected funding opportunities provided through the centers (e.g. Case Studies 2, 3), rather than stemming from clear local demand. However, successful outcomes and impact have been associated with training for which there was no explicit local demand (e.g. Case 3). Only one case was mentioned where training was perceived to have reflected the center´s needs, and did not fit well with the local institution´s long term interests. This refers to the policy of the bean network, PROFIZA, of training nationals in the evaluation of lines developed at CIAT, instead of training them to breed their own. The present shortage of bean breeders is attributed to this, and although it was rectified from 1997 onwards, an impression remains that the training carried out was to serve the interests of the center, rather than the trainees.

Reduction over time. All interviewees were seriously concerned about the reduction in CGIAR training. An example of the effect in Ecuador is illustrated in Table 1 from the records from CIMMYT and CIAT (which account for a major share of training and their records consistently include training dates). The data from CIAT are complete until 2005, but refer to activities at headquarters, and there be some missing records after 2000 from CIMMYT. Despite these limitations, the trends in reduced course attendance and individual training seem very clear. There has been no increase in higher degree candidates. These trends may have been somewhat set off by in-country events but information on these is too incomplete to provide an estimate.

Subject matter

Records on subject matter are incomplete for most centers, but Table 2 gives a sample of activities from CIAT and CIMMYT. These refer to all CIMMYT training types with available records, and all CIAT headquarters individual training plus short courses up to 2005. Of a total of 496 entries, 411 had the subject matter defined and these were grouped arbitrarily into the classes shown in the table. Allowing for some imprecision in the classifications, the table shows that the majority of training (85%) occurred in the area of biological sciences, as might be expected. Agronomy/production/systems, genetics/breeding and crop protection predominated, especially as applied to maize and wheat, beans, rice and cassava. Perhaps less expected is that the social sciences – where only participatory methods and economics were identified as such - accounted for so little (6% of activities). Post-harvest processing accounted for 5%, but the proportion might have been higher if CIP's records had been available. There are no records on training in Ecuador by IFPRI, and activities of ISNAR were very limited, so it appears that there was little or no training in policy, despite the clear weaknesses in that area. An interesting conclusion from the table is that the centers appear not to have engaged much in training in areas which would best be covered by other institutions. Only 4% of total activities were accounted for by classes shown at the bottom of the table which, it might be argued, fall in this category (e.g.: training/communications/information, experiment station management, data processing and project writing).

Training quality, delivery modes. The only quality issue brought in discussion was related to post-training contacts and follow-up which were generally considered insufficient. This would be a particular problem where training was part of a short term project. With respect to delivery modes, the most important issue concerned the future role of on-line materials and e-learning. Much of the value of traditional training was attributed to practical learning-by-doing and to enrichment of the learning experience through the face-to face exchanges with center staff and trainee colleagues. Structured e-learning would need to provide for practical work and tutor-trainee/trainee-trainee interactions. Its overuse would be likely to lead to deterioration in the quality of training, for the reasons given. Interviewees saw on-line depositories of learning materials as extremely valuable for researchers and universities, but these were perceived as complementary resources, and that increased investment on the part of the centers in preparing them should not be at the expense of traditional training. No single delivery mode was perceived as most useful for the future, and the effectiveness of training would depend on fitting modes appropriately to the needs of the trainees.

Inter-center synergies No evidence was found to suggest lack of coordination between centers in their training activities. In fact, several examples were cited of how their efforts had been complementary. CIMMYT's on-farm economic research, and associated training, in the 1980/90's, laid the foundation of what is now considered to be the on-farm research culture in the country. This was later developed and strengthened through CIAT's training and sustained collaboration in participative research, which is now a recognised feature of INIAP's overall agenda (Case study 3) and has been further built up and supported by CIP's collaborative work and training (e.g. in the FORTIPAPA project). A second example concerns product processing and producer-consumer chains, pioneered through CIAT's cassava processing research and associated training on the coast (Case study 2). It was strengthened through workshops run by ISNAR, and further developed through the CIP-led market chain potato network, PAPA ANDINA which has strong training/learning components. The producer-market-consumer chain concept is now well incorporated into INIAP's research policy for all crops. A third example relates to the collection, description, conservation and exploitation of native plant and forest species within INIAP, which has been supported through training and collaborative projects by IPGRI, CIP and CIAT. One feature of all these examples is that the Centers' policies and approaches to research and development are perceived to have been consistent and mutually supportive.

Informal training

The case studies included in this report give some indication of the major contribution of informal training and learning. An attempt to document what this entailed in one collaborative project is shown in Case study 1 (FORTIPAPA, CIP-INIAP-SDC). Center staff were involved on the directors' committee, as project advisers, and in continuous visits to the project, while INIAP staff visited the centers and other research partners for events such as annual meetings and international conferences, all of which provided important learning experiences. In general, the trainees and collaborative research partners interviewed rated these informal learning experiences very highly. They perceived that their value increased over time because of the close professional relationships which were established, and that this was one of the particular advantages of longer-term projects.

Networks

While CGIAR-led networks have been very successful as mechanisms for spreading new approaches to research (e.g. PAPA ANDINA), exchanging information and learning from other experiences, they have also provided some important lessons. The tropical pastures network (RIEPT) trained at least 20 Ecuadorean professionals, mainly from INIAP. But the outcome was limited because most emphasis was on pastures suited to acid tropical soils, which are not widely distributed in Ecuador, and INIAP's livestock program was later closed so trainees were unable to put skills acquired to use. Similarly, CIAT's attempt to form a CIAL network in Ecuador failed because of institutional instability (Case Study 3). In the case of the bean network, PROFIZA, training was mainly directed towards evaluation rather than breeding, a shortage of bean breeders followed and Ecuador has only recently acquired the capacity to produce its own commercial hybrids. These examples suggest, first, that networks cannot be relied upon necessarily to fill the needs of individual partners and, secondly, that they cannot contribute effectively unless the partners have stable institutions and policies.

2.3 Outcomes and impact

The case studies attached to this report were chosen because they represent major investments in training by the CGIAR. Case 1 concerns INIAP which, as shown above, received most of the training in Ecuador. It shows high proportions of ex-trainees in leadership positions, even in areas outside the CGIAR's mandate (e.g. cacao). Yet training and leadership has not been sufficient in itself to influence policy of the national government, and institutional capacity has remained quite limited, as judged by three indicators: the proportion of highly qualified staff, trained staff turnover rates and the availability of operational funds for research. As a reflection of this, 43% of INIAP's scientists trained by the CGIAR had left the institution by 2005. These findings highlight the problems which some national institutions on the continent face even today and raise the question of how best the CGIAR should adapt its training strategy to respond. Some INIAP staff would welcome stronger intervention by the CGIAR at the high policy level, although this may be ineffective where political instability is the norm. Collaborative projects with funds for operations and equipment may help, but in the long term are only a palliative. So there does seem to be a need for clearer messages to the NARS that their own, and the CGIAR's, investment in staff training can only be fully exploited where there is sufficient institutional support to ensure reasonable staff stability, human resource development, and basic operational facilities.

The other two cases describe combinations of different kinds of training and types of trainee, carried out over long periods of time in the context of specific programs. They both had funding, either through the centers involved or from mixed sources. Neither of them responded to direct local 'demands' for training. Outcomes attributed to training include changes in attitudes and culture (Cases 2, 3), improvements in institutional organization (Case 2), institutional policy (Case 3) and

inter-institutional cooperation (Case 2). Training stimulated further education (Case 2) and improved the relevance of the research of the trainees´ partner institutions (Cases 2, 3). Without training, the adoption of the technology (Case 2) or methodology (Case 3) would not have happened, according to those interviewed. Impacts associated with the training were documented in production and farm income (Case 2) and the opening of new markets (Cases 2, 3). Both cases provide insights into the long term benefits of training. Case 1 shows how market collapse suddenly made a new technology obsolete, but the training had social as well a technological elements, and the empowerment and institutional organization capacity was successfully applied to other areas afterwards. In Case 3, the participatory methodology, which was the subject of training and applied in a specific project, later spread to became an established part of the institutional culture.

Some additional information on outcomes and impact is given by the results of the trainee survey carried out as part of this study. With 86 responses from Ecuador, the results merit attention even though they would be biased towards trainees with positive experiences. At the personal level, respondents gave the highest rating to the effect of training on their ability in priority setting and research problem orientation (4.4 on a scale of 1-5). They perceived a quite high degree of improvement in their institution´s priority setting (4.03), but lesser effect on its ability to obtain project funding (3.54), and inadequate operational resources were reported by over 60% of respondents as the main limiting factor. Even so, quite high scores were assigned to the effect of training on scientific knowledge generated (4.27), new attitudes and technologies adopted (4.33), and farmers/consumers benefited (4.0).

Some examples of outcomes which respondents attributed directly to their CGIAR training are given below. Individually they are only isolated cases, but taken together they contribute to building a fuller picture of the effectiveness of training.

*Training from CIP in the use of molecular markers led to the systematization of the characterization of INIAP´s potato collection, and to adjusting the genetic resource data bases to international standards. IPGRI training led to the application of international standards is to collection, characterization and conservation of materials in INIAP´s genebanks.

*Training by various centers in crop genetic improvement led to the release and adoption of improved varieties of crops within the CGIAR´s mandate (e.g. cassava for starch and flour production, white and yellow maize, wheat, barley, beans, disease resistant potatoes) and also of crops outside the mandate (e.g. cacao).

*Training by CIP in soil pathogens and potato virus led to the establishment of a diagnostic service for potato viruses and bacteria at the Departmental level, as well as the services necessary to ensure clean seed production from the experiment station.

* Training by CIAT in bean breeding led to a change of vision in the national program from one which depended on evaluating lines acquired outside, to breeding their own. Now, beans are bred locally through hybridization and material is no longer received from the CIAT genebank. Training in molecular markers led to their incorporation in the program, and to sharing the technology so that it was also made use of in other crop breeding programs.

*Training in participatory methods by CIAT and CIP led to community-based research on crop varieties, management practices and integrated pest and disease control, followed by adoption of superior varieties and practices, and to the participatory assessment of the impact of these innovations.

2.3 Future directions

The greatest present need is for national policy which will give adequate, stable support to agricultural research and development, define the role of INIAP and, if the institution is to continue as such, provide it with the basic resources to carry out its mandate effectively. The CGIAR may be able to contribute through policy advice at the highest political level, and through policy training. Some INIAP authorities consider that the CGIAR would be justified in exercising more pressure in this area; otherwise capacity building efforts, including training, are opportunistic and incoherent.

Meanwhile, training should be inserted as far as possible into funded projects and programs. Collaborative research projects with training components are one option, but the disadvantages of short term projects in this regard have been pointed out. Newer institutions (e.g. NGO´s) with good research capacity and the ability to attract funding will be expected to participate more fully in CGIAR training activities.

There is a fundamental need to contribute to the strengthening of the universities, so that they may prepare students well enough to enter the fields of research and extension, and have the basic knowledge necessary to take full advantage of any further training (including that offered by the CGIAR). This should involve making didactic material available and helping the universities modernize their scientific information systems; collaborative research projects with training components for the professors which will, at the same time, enrich teaching; and inter-institutional arrangements for graduate training (e.g. national + foreign universities + CGIAR Center).

For active researchers and leaders in technology transfer, there seems to be consensus that a combination of training types fitted to their specific requirements will continue to be necessary. These are likely to concentrate on specialized short courses, specialized non-degree individual training and higher degrees. At the same time, evidence from Ecuador underlines the importance of informal training and learning experiences, and of long term contacts with the centers. The advantages of the networks should continue to be exploited fully, but their success depends on the stability of the members and the extent to which they meet the needs of individual partners, particularly the weaker ones, merits revision. A variety of training delivery modes will continue to be needed, with increasing use of on-line materials and e-learning, but this must not be at the expense of a deterioration in quality in areas where practical experience is essential.

Table 1: Time trends in training of Ecuadoreans by CIMMYT and CIAT, by training type (numbers of events/activities attended)

Type of training	1970-9	1980-9	1990-9	2000+
CIMMYT				
Trainees	25	33	14	-
Visiting scientists	20	33	21	4
Fellowships	8	5	3	-
CIAT				
Courses for trainers	-	-	4	0
Short production courses	8	15	5	0
Long production courses	42	-	-	-
Specialised courses	10	32	61	29[a]
Specialised courses + IT[b]	5	28	5	-
IT (non-degree)	31	35	42	12[c]
MSc	5	1	-	1
PhD	-	-	1	-

[a] Not after 2002, [b] Individual training, [c] Not after 2003

Table 2: Distribution of training activities (CIAT*, CIMMYT), according to subject matter (number of activities)**

	General	Crop-related				
	Undefined[a]	Beans[a]	Cassava[a]	Pastures	Rice[a]	Maize/wheat[b]
Agronomy/Production systems	1 (2)	12 (10)	3 (4)	5 (4)	10 (9)	33
Genetics/Breeding	14 (8)	8 (11)	4 (6)	---	7 (6)	28
Crop Protection	1 (16)	11 (2)	5 (2)	---	10 (2)	23
Soils	1 (-)	---	---	7 (1)	---	---
Seeds	7 (57)	3 (2)	---	-- (2)	-- (1)	---
Grain quality	---	---	---	---	---	7
Processing	-- (1)	---	16 (1)	---	---	3
Participatory Research	7 (9)	---	---	---	-- (1)	---
Economics	-- (3)	---	---	4 (-)	---	--- [c]
Training/Communication/ Information	4 (2)	---	---	---	---	1
Expt. Station management	---	---	---	---	---	7
Data processing	-- (2)	---	---	---	---	---
Project writing	---	---	-- (2)	---	---	---
Other/undefined	5 (1)	2 (1)	2 (-)	3 (-)	5 (1)	66

[a] CIAT individual training; numbers in brackets refer to short specialized courses

[b] CIMMYT all types of training

[c] There may be missing records from CIMMYT in this area, dating from their early on-farm economics research in Ecuador

Sources

Interviews with:

- Dr. César Chiriboga (Vice Minister) *Ministerio de Agricultura y Ganadería, Quito*
- Dr. Julio César Delgado (Director General), Ing. Victor Hugo Cardoso (Director) Ing. Fausto Merino (Director) *INIAP, Quito*
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ANNEX XVI
Case studies from Ecuador

CASE 1: INIAP

(Partner Institution: Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP); main CGIAR Centers: CIAT, CIMMYT, CIP, IPGRI)

INIAP has received more training from CGIAR Centers than all other Ecuadorean institutions together. This case was chosen to provide some information on the retention rate and leadership roles of the trainees, and the state of the institution at present.

Background

INIAP was set up as the national agricultural research institution under the Ministry of Agriculture in 1959. It became an independent organization in 1992. Its mission, as defined in 2005, is to "generate and provide appropriate technologies, products, services and specialized training to contribute to the sustainable development of the agricultural, forestry and agroindustrial sectors of the country". In 2005, INIAP had 215 researchers, and 178 administrative and service personnel. There are seven experiment stations and three experimental farms located in the three major agroecological zones: coast, highlands and Amazon basin, which work on a total of 42 agricultural and tree crops, as well as livestock and pastures. Research is structured round fourteen different crop and livestock programs and seven thematic areas (sustainability of natural resources and agrosystems, plant genetic resources, plant breeding, biotechnology, plant protection, crop nutrition and soil fertility, production technology). INIAP also has responsibility for the national germplasm banks with over 25,000 accessions.

Implementation

Taking available records from all centers, INIAP staff participated in 405 formal training activities, which is 59% of the total recorded for Ecuador. No other institution exceeded 2%, except the Ministry of Agriculture (10%). Many trainees participated more than once, up to as many as six times (a CIMMYT case). Overall, 178 INIAP professionals received at least one period of training, with an average of 2.3 periods each. These data are known to underestimate the real number of activities, because in-country training records are incomplete, but in any case it is clear that INIAP received a great deal of training, and the overwhelming share of the CGIAR´s effort in Ecuador.

Most of the formal training for which information is available was provided by CIAT (209 activities) CIMMYT (145), and CIP (41). Most activities were short courses and non-degree individual trainings, but included one PhD and seven Masters´ degrees candidates at CIAT alone. A very wide range of subjects were covered in terms of disciplines and the crops to which they were applied. At CIAT, which is best documented, over 30 different subject areas are recorded with agronomy, breeding and genetics, and crop protection predominating in the disciplinary areas, while in the crop areas, beans, rice, cassava and pastures all had over 25 activities each.

In an attempt to document the dimensions of informal training and learning, the case of a specific project, FORTIPAPA, was studied in more detail. This is a Swiss funded collaborative potato research project carried out with CIP. Table 1.1 shows some indicators of informal training/learning in the period 1992-98, when the project involved 26-36 INIAP scientists. The table shows the numbers of CIP staff who served on the project directors´ committee, and as advisers. Also shown are the numbers of scientists who visited CIP and CIAT for purposes other than formal training (e.g. to attend annual

meetings and workshops), and the numbers of Center staff who visited the project for periods of up to three days for informal exchanges on various topics. Apart from the scientific areas relevant to the project, the visits were to advise on subjects such as communications, computation, accounting and scientific writing. Taken together, the data suggest an extremely important learning contribution through leadership, advice and mentoring. Obviously the degree of informal exchange which usually takes place depends partly on the funding of the project and this case may be exceptional, but it is included here to provide some quantified information in an area where concrete evidence is scarce and difficult to obtain.

Outcomes and impact

This section is designed to give information on specific aspects of the state of the institution and the trainees, rather than a more complete coverage of outcomes and impact in the conventional sense.

Trainee retention: Overall, 43% of the INIAP staff known to have been trained by the CGIAR since the 1970´s, is no longer there. This is shown in Table 1.2, by year of training (using the last year in the case of trainees with multiple training activities). The apparent reduction in numbers after 2000 is partly due to incomplete records from the Centers, but also reflects a genuine tendency perceived by INIAP staff. Taking the group of 71 staff trained since 1990 who might reasonably be expected to be still active, the Table shows that 31% have left the institution.

Trainees in leadership roles: In spite of the loss described above, CGIAR trainees play a major role in leadership within the institution today. Table 1.3 refers to the 75 members of staff who have positions as directors or heads of programs, departments and units at the central level and in INIAP´s seven experiment stations in 2005. Overall, 49% of these are CGIAR trainees, and the proportion is highest at the level of directors (64%) and program leaders (61%). The Table also shows that the proportions of trainees acting as heads of programs, departments and units in areas outside the CGIAR´s mandate (e.g. coffee and cacao, fruit production, horticulture) is quite considerable. This suggests that trainees are valued as leaders whatever their original areas of training.

Staff qualifications, remuneration and dedication: In 2005, 3% of the 215 research staff holds doctorates, and 38% have Master´s degrees. This may mean that CGIAR training did not stimulate further academic preparation of trainees very effectively, but the more likely reason is that many of the most qualified trainees work elsewhere. Salaries are very low in relation to reasonable standards of living, especially given the costs of housing and education. Table 1.4 gives a comparison between INIAP salaries and three private research organizations in the country. One consequence is that most staff have other jobs. The Director General estimates that 80% have university posts as well, and that this erodes the time actually spent on research at INIAP.

Funding: Table 1.5 shows the sources of income in 2005. The outstanding feature is how little of the overall budget comes from research projects. This is despite the fact that INIAP reported having more than 85 national and international agreements and collaborative projects in 2002. It is possible that high staff turnover rates, coupled with the low proportion of scientists with advanced academic qualifications, has limited the ability of the institution to generate fundable projects. The government´s contribution is unpredictable and often arrives well after the start of the fiscal year. Taken together, the institution´s income is barely enough to cover salaries, and the need to generate income from goods and services reduces time available for research.

Field results: Despite the difficulties, INIAP has solid achievements in the areas where CGIAR training was most intensive. For example, INIAP varieties are responsible for 65-85% of the area sown to rice, corn, wheat and potatoes. The internal rates of return to research on these crops were estimated by

INIAP to be in the range 29% (wheat) to 54% (corn). CGIAR training was perceived by the scientists involved to have played a major role in the achievement of these results, especially through collaborative projects such as FORTIPAPA (INIAP-CIP-SDC).

Conclusions

This case documents some of the characteristics of the institution to which the CGIAR dedicated its major training effort in Ecuador. Besides formal training, the scope of informal training and learning within specific projects was of major importance. The case illustrates the extremely difficult conditions under which some NARI´s in Latin America are operating even today. CGIAR trainees play an important role in leadership within the institution, but have not been able to overcome the chronic problems of high staff turnover rates, low academic qualifications, low salaries and very limited project funding. The case raises questions about what the CGIAR can best do to contribute to institutional strengthening under these conditions, and how to target training activities in future. Perhaps the first step is to bring to the attention of authorities at the highest political level that investments in training cannot be effective without proper institutional support and a stable agricultural development policy. Until these are in place, collaborative projects with training components may be the best option, but in the longer term are only a palliative.

Table 1.1 Indicators of informal training/learning in the INIAP-CIP project FORTIPAPA, for the years 1992-8

	1992-3	1994	1995	1996	1997	1998
CIP staff on D.C.	3	3	2	2	5	3
CIP Advisers	6	5	3	3	3	3
Visits to Centers[a]	1	11	2	4	2	4
Visits from Center staff	2	6	5	1	7	4

[a] Committee of Directors

[b] For purposes other than formal training e.g. workshops, annual meetings

Table 1.2 Retention rate of CGIAR-trained staff of INIAP, according to last year of training undertaken

Period	Numbers trained	Active (%[a])	Inactive (%)
1970-79	29	34	66
1981-89	40	50	50
1990-99	62	66	34
2000+	9	89	11
No date	38	58	42
Total	**178**	**57**	**43**

[a]As reported in 2005

Table 1.3 CGIAR trainees in positions of leadership within INIAP

Type of position	Total number	CGIAR trainees (%)
Director General	1	100
Directors [a]	3	67
Directors of Expt. Stations	7	57
Sub-total - Directors	**11**	**64**
Heads of Program[b]		
All	28	61
CGIAR mandate areas	17	71

Type of position	Total number	CGIAR trainees (%)
Non-CGIAR areas	11	45
Heads of Depts/Units[b]		
All	36	36
CGIAR mandate areas	26	35
Non-CGIAR areas	10	40
Total	**75**	**49**

[a] Directorship of Research presently vacant

[b] In experiment stations and at central level

Table 1.4 Salary structure for INIAP, compared with three other research institutions (US$/month in 2003-2005)

Qualification/Position	INIAP	Others
PhD	805	2200-4800
MSc	562	1300-3200
Ingeniero	486	800-2000
Director	1103	
Researcher (Grade 6)	976	
Researcher (Grade 1)	560	

Table 1.5 Sources of INIAP´s income (2005)

Source	Percentage of total
National government	60
Self-generated	37
Research projects	3

Sources

- Interviews with Dr. Julio Delgado, Director General; Dr. Leonardo Corral, Ings. Victor Hugo Cardoso, Fausto Merino, Directors; Ings. Ivan Reinoso, Eduardo Peralta, Program Leaders and other members of staff. Salary data provided by the Planning Section.
- INIAP 2002 Fuente de Conocimiento y Tecnologías Agropecuarias para la Competividad. Quito 36 pp
- FORTIPAPA Annual Reports, EE Santa Catalina, Quito.

CASE 2: CASSAVA PROCESSING IN MANABI PROVINCE

(Partner Institutions: Asociaciones de Productores y Procesadores de Yuca (APPY´s) and others; CGIAR Center involved: CIAT)

This case was chosen because a) it represents a major training effort on the part of CIAT and b) because it concerns two fairly uncommon disciplinary fields: post-harvest processing and anthropology.

Background

CIAT´s post harvest technology (sun drying, processing into chips or flour) had been used successfully to add value to cassava in coastal Colombia since 1980. The objective of the program in Ecuador was to determine the possibility of transferring the technology to a larger number of small farmers, but under different institutional arrangements which would reduce the cost and be more sustainable. The program started in Manabí Province in 1985, working as much as possible through existing institutions, and using farmer-to-farmer training to reduce extension costs. The national research institution (INIAP), the Ministry of Agriculture and Livestock (MAG), other government offices, the local university, voluntary organizations and private producers all participated. Most institutions provided their own staff and budget, but additional funds came from US AID and a national foundation, FUNDAGRO which, among other contributions, financed a CIAT anthropologist who was based in Manabí. From 1985 to about 1990, there was a growing demand for cassava chips and flour for the animal feed and shrimp industries. By the 90' s, Thailand had dominated the international market for cassava products, wheat flour became cheaper than cassava and Ecuador´s shrimp industry had collapsed. FUNDAGRO terminated its support in 1993, so the CIAT anthropologist left, and budget restrictions at CIAT reduced the support from the rest of their Cassava Program. Furthermore, INIAP shut its cassava program in 1997 and very severe damage was inflicted on the whole area by flooding in 1997-8.

Implementation

To pave the way in 1985, CIAT staff organised numerous events (courses, field days and lectures) for various types of participant with the objective of presenting the new technology and mobilizing institutional support. In the same year, CIAT and MAG staff identified two existing groups of small farmers who were experiencing problems marketing raw cassava and agreed to experiment with the new process. The farmers provided some working capital and cassava on consignment, obtained short term loans and CIAT provided the chipping equipment. The cassava was sun dried and processed into chips for animal feed. The training of the farmers´ groups was carried out by an experienced Colombian producer/processor brought over by CIAT for a month, and a Colombian builder was brought to demonstrate the construction of a prototype drying floor. After the success of the initial trial, more producer/processor associations (APPY´s) were formed and adopted the technology. These in turn formed a union of associations (UAPPY) to provide services, and an inter-institutional committee which included CIAT, MAG, INIAP, FUNDAGRO and the UAPPY, was set up to support the program. The more highly educated members of the UAPPY (e.g. agronomist, mechanical engineer) were assigned strategic roles to increase the effectiveness of the organization. Farmer-to-farmer training continued with exchange visits between Ecuador and Colombia. UAPPY members also received international training. One member (an agronomist) was sent to CIAT headquarters in 1990 for training in seed multiplication, and in 1991 five others received individual training for a month in new processing methods for flour and starch. These formal training activities were reinforced by frequent visits to Manabí by members of CIAT´s Cassava Program (e.g. 13 visits in 1987). Their activities had formal and informal learning components e.g.: participating in courses,

workshops and seminars; designing of trials with INIAP and UAPPY; and the introduction new technologies (e.g. drying-tray) and germplasm (e.g. high dry matter varieties).

Training in the technical aspects of processing was complemented by support from CIAT in the social sciences, particularly from the anthropologist based in Manabí. Through leadership and mentoring, the inter-institutional committee, the individual APPY´s and the UAPPY were set up, their roles defined and their functioning was facilitated, based on participatory, democratic principles which were not strongly imbedded in the individualistic culture of the region. Aspects covered included all stages from planning to monitoring and evaluation of the groups´ activities. Particular attention was given to the incorporation of women, who formed 4 APPY´s themselves specializing in starch production. The importance of carrying out research in continuous support to the progamme was emphasized and participatory methods were introduced (e.g. for evaluating cassava varieties).

Outcomes and impact

For this study, members of 4 APPY's as well as technical staff from the university, INIAP, and others now employed elsewhere were interviewed.

There was agreement that the farmer-to-farmer training and exchange visits had been very successful initially. The technology was adopted increasingly, as shown by the growth of the APPY´s, production rose and members´ incomes exceeded those of other farmers from the start (Table 2.1). Some members were encouraged to continue their education, and five graduated from the university using the program´s data for their theses. However, when the program expanded, APPY presidents were trained with the expectation that they would transmit the knowledge to their respective members, but this was not always successful because of their lack of training skills. Later, extensionists were brought in to give courses directly to the APPY members. Thus the farmer-to- farmer training experience was partly successful, and certainly the Colombian producers who came to Ecuador would have been carefully chosen.

Apart from the technical aspects, all interviewees stressed the benefit to them personally of the learning experience that resulted from working in a highly participative, democratically-based organization which depended on each individual assuming specific responsibilities. The testimony of women leaders who described how the cassava project had built their self-esteem, and empowered them to fulfil crucial roles in the development of their own communities was extremely impressive. For the first time, they had income of their own which they most appreciated to improve their houses and care for the educational and health needs of their children.

At the institutional level, the APPY´s grew from two in 1985 to 17 in 1992 and production rose (Table 2.1). The area planted increased from about 5, 000 ha to about 16,000 ha. The union (UAPPY, later UATAPPY) took on an increasing number of services in response to the APPY´s needs. It acquired its own offices, transport and machinery department. It appointed a training coordinator (agronomist) and established a demonstration center. It advised on the formation of new APPY´s, was responsible for communications between members, provided loans and accounting services to the APPY´s, explored markets for new products, controlled quality of the products, and negotiated sales on behalf of the groups In collaboration with INIAP and the university, it carried out research, mainly on seed production, marketing and processing. Between 15-20 university theses were produced using the project results. Interviewees considered that many of the most successful aspects of the groups´ functioning were directly due to the principles of institutional organization and management which had been imparted by CIAT. These included the importance assigned to: inter-institutional cooperation, research combined with training, participatory democratic processes, and continuous planning monitoring and evaluation. On the other hand, some interviewees now see the democratic

organization of the groups and the union as excessive in that it a) slowed down management decisions and may have made them insufficiently agile to contend successfully with rapidly fluctuating market conditions, and b) made it more difficult to ensure strict quality standards. Some training in marketing was provided by CIAT but it came too late, and they found themselves incapable of exploring new international opportunities effectively once their normal markets collapsed.

At the inter-institutional level, CIAT's leadership was decisive in holding together the inter-institutional committee which supported the producers. The committeee's role developed from one of communication and coordination, to actively planning and evaluating the groups' activities. CIAT used international training partly as a strategy to promote collaboration between the institutions. For example, the UAPPY member who attended the seed course in Cali was accompanied by a university thesis student and a member of INIAP. On their return, they collectively designed, obtained funding and implemented a seed multiplication project. The UAPPY's collaboration with INIAP was considered by interviewees to have brought INIAP's research more into line with producers' needs, particularly in the areas of agronomic practices, seed multiplication and selection of high dry-matter varieties suitable for processing. At the field level, UAPPY members collaborated in extending drying technology to Esmeraldas Province, through exchange visits between farmers. From one group in 1986, the Esmeraldas APPY's grew to 15 with 190 members in 1987.

Despite their early success, most APPY's were not strong enough to overcome the combined adversities which occurred in the early and mid- nineties (described above). The quality of the products began to fall short of initial standards. The cassava growing area fell from about 16,000 ha to about 7, 000 ha today. Most of the groups were dissolved and their plants are now in ruins. Nevertheless, there is evidence ten years later of some lasting effects of the project. Four of the original associations have survived. They are among those which received most training (e.g. 4- 6 members each). They have now expanded into growing and processing five other crops besides cassava, and in one case are exporting coffee to Italy. They are exploring possibilities of exporting cassava in peeled, frozen pieces. One of them has opened a bank which lends money with no guarantee and at lower interest rates than the local banks. The young members interviewed all seemed enthusiastic about staying on their farms and making them successful, which contrasts with local trends of young people tending to leave the countryside. In addition, some of the members of the disbanded associations have leading positions in agricultural industries and other organizations, while others considered that their participation had empowered them to play active roles in community services.

Conclusions

This case refers to technology transfer within an innovative social and institutional framework, where training both in technical and social aspects played complementary roles. There was consensus among interviewees that the processing technology would not have been adopted without the training facilitated by CIAT. Some indication of the added value from the technical innovation and institutional framework is given by the up to four-fold increase in income obtained by members, compared with non-members (Table 2.1). All those interviewed attached as much, or more importance, to CIAT's leadership and mentoring in the building of the institutional structure, as to their contribution in technology training. After all its success, the program as a whole was not strong enough to survive the combined effects of market slumps and the withdrawal of external financial and institutional support. Nevertheless, some legacy is evident 10 years later in the surviving organizations which have diversified and expanded, and in the testimony of people who participated.

Table 2.1 Changes with time in numbers of farmer associations (APPY´s), production of processed cassava and members´ incomes

		Product (MT)[a]		Members'income/head/year	
	No. of APPY's	Starch	Chips	US$	% increase[b]
1985	2	0	142	---	--
1986	4	0	228	80	33
1987	6	0	1006	80	23
1988	10	90	2850	240	140
1989	16	30	2280	410	410
1990	16	162	5027	315	163
1991	17	--	--	240	118
1992	17	--	--	--	--

[a] Fresh equivalent

[b] % increase of members´ income over income of other producers

Sources:

Interviews: Dr Susan Poats, ex-CIAT anthropologist; Ing. Hernan Caballero (Technical University of Manabí), Ing. Carlos Eguez,(FUNDALGODON), Ing. Vicente Ruiz, Ing. Alma de Arroyave (INIAP) Ing. Gloria Cobena (INIAP); Ing. Duval Valeriano (President, Association in Jaboncillo) Sr. Colon Mendoza (Administrator Mixed Association) Sra Solanda Intriaga (Administrator, San Vicente Association), Sra. Leyda Vera (Member, San Vicente Association), Young farmers (Jaboncillo Assocation)

CIAT Cassava Program reports 1985-1992

CASE 3: PARTICIPATORY RESEARCH

(Partner Institution: Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP); main CGIAR Center: CIAT)

This case was chosen because training in participatory research in the Andean countries represented a major effort on the part of CIAT. It is parallel to a case in Bolivia, so the differences and similarities in outcomes could be informative and will be discussed in the regional summary.

Background

Agricultural research in Ecuador has been dominated for over forty years by the national institution, INIAP, which up to the 90´s operated with the traditional ´top-down´ approach typical of Latin American NARI´s of the time. There was little connection to the then existing extension service, which was later closed. Consequently, the relation between the national research agenda and farmers´ needs and was weak, especially in the case of the small farmers. CIMMYT´s training in farm-level diagnostics for economic studies from 1978 onwards contributed to an increasing recognition of the importance of on-farm work. This was also encouraged by the Swiss SDC which had been active in Ecuador since 1969 and favoured participatory approaches in their projects. Under these circumstances, there was a clear opportunity for improving the relevance of research to small farmers´ needs, when CIAT brought its Kellogg Foundation participatory research project to Ecuador in 1992. The approach was further supported through the Swiss funded CIP-INIAP project FORTIPAPA which, with a strongly participatory approach, provided scientific backstopping in genetic selection and disease control of potatoes.

Implementation

Five INIAP agronomists were invited by CIAT to a course in participatory research in 1992. The objective was to train them in the community based research committee (CIAL) methodology developed by CIAT, and evaluate its implementation in Ecuador. The training consisted of a 15-day phase at CIAT headquarters, combined with practical work in Ecuador which involved writing and executing a project to set up three CIAL's, including the training of the technical staff responsible. This took place with three supervisory visits from CIAT scientists in the course of a year. Farmers and technical staff also visited CIAT and the Colombian CIAL's which were already operating, to exchange experiences. A workshop on CIAL methodology was held by CIAT for professionals in Quito in 1996. Thereafter, CIAT staff continued to visit, with the objectives of further consolidating the 15 CIAL's which had been formed in the meantime by INIAP in Chimborazo, and promoting a national CIAL network. An international course on CIAL methodology was organized by CIAT in Quito in 2000, where experiences with the methodology were exchanged between representatives of about 20 Ecuadorean institutions and delegates from the other Andean countries. Support from CIAT ($5000/year) to INIAP for the implementation of CIAL´s was continued up to 2004.

Outcomes and impact

One of the original INIAP trainees was interviewed for this study. He recorded being highly critical of the CIAL methodology after initial training at CIAT, and that he proceeded with the practical work out of a sense of duty rather than conviction. During the course of it, he became convinced of its value and was stimulated by the CIAT training experience to undertake graduate studies in social science. He now leads the new area for technology transfer and participatory research established this year within INIAP. Another CIAT trainee, the Director of INIAP´s Santa Catalina Experiment Station,

returned from Cali convinced of the value of the methodology which he then implemented as routine procedure for all crop improvement programs of the Station.

The first three CIALs set up as part of the CIAT practical training, while perceived as successful, involved larger, more progressive farmers. Encouraged by the experience, INIAP extended the model to illiterate, small communities and a further 15 CIAL´s were set up in Chimborazo in 1994. The 1996 workshop run by CIAT in Quito was considered by interviewees as a ´turning point´ in the establishment of the methodology. New CIAL´s were established and their agenda extended to cover grains and legumes as well as potatoes, and with emphasis on processing and marketing as well as selection and production. They were introduced into other research projects such as FORTIPAPA (INIAP-CIP-SDC) and PRONALEG-GA, working on potatoes and Andean grains and legumes, respectively, where they participated in varietal selection and in the production of clean seed. INIAP´s Experiment Stations adopted the methodology to varying degrees, with less success on the coast but notable results in Santa Catalina (Quito) as mentioned above. This was attributed directly to the Director´s experience in Cali. By 2002, INIAP had explicitly adopted participatory methods as basic to their research programs in all areas, as set out in their handbook. There are presently about 50 CIAL´s working in 6 provinces in the country on native grains, legumes and potatoes. There was consensus among interviewees that CIAT training had been decisive in the adoption of participatory methodologies and in the change in INIAP´s approach to research.

At the inter-institutional level, there were various attempts to improve cooperation and exchange experiences. CIAT´s initiative to form a national network did not prosper at the time, due apparently to the lack of continuity caused by high turnover rates among the staff of the local institutions. However, most regional groups organized field days, exchange visits and meetings (e.g. in Chimborazo in 2000, and Cotopaxi in 2004). A national meeting of CIAL´s was organized by INIAP in 2004, about 50 professionals from 14 institutions, as well as about 50 farmers from 24 CIAL´s, attended. Presentations emphasized the principles of the methodology and organization, but were quite short on the results obtained from the research carried out.

Four farmer field schools and CIAL´s were visited in the course of this study. One CIAL set up to work on quinua had been discontinued. Another one had developed into a producers´ association with the main objective of marketing clean potato seed, for which there is a strong local demand. They had carried out trials to identify early varieties which could be harvested before the frost and demonstrated that the seeding rate could be reduced 66% by using clean seed. They now included additional crops (quinua and tarwi) in their selection trials and had set up a bank for the use of members. Their conviction about the importance of research was very clear. An interesting feature in all the visits was the predominance of women among the members. Some members have gone on from the CIAL to assuming major responsibilities in municipal affairs.

Conclusions

This case points to a close association between CGIAR training in a particular methodology and its application in the field, which occurred in the context of generous external funding for comprehensive, long-term training and for field implementation. Research results are reported, especially in varietal selection, although they are not abundant in the documentation and proceedings reports (e.g. the 2004 national meeting). Some of the applications, as in Chimborazo, have led to valuable developments for the communities. There are some doubts among INIAP authorities about whether the CIAL methodology will survive once the continuous technical assistance provided in each case, is withdrawn. However, there does appear to be consensus that training in the CIAL methodology and the experience of its application in the field was a decisive factor in changing attitudes of professionals in leadership positions in INIAP, and hence the institution´s policy in favour

of participatory research methods, even though the change was favoured at the same time by the policies of donors (e.g. SDC) and other international centers (e.g. CIP).

Sources

- Interviews with: Ing. Julio Cesar Delgado, Director General, INIAP; Ing. Fausto Merino (INIAP), Pedro Llangari, (INIAP-Chimborazo), Ing. Fausto Llumisaca (INIAP-Chimborazo), Members of the FORTIPAPA project at Santa Catalina Research Station; Farmer Members of the CIAL Flor Naciente, San Juan, Escuelas de Campo Amaguana and Calerito (Chimborazo).
- Convenio Plan-INIAP 2005 Investigación Participativa Agrícola Local en Comunidades de la Provincia de Cotopaxi. Quito 15 pp
- INIAP 2002 Fuente de Conocimiento y Tecnologías Agropecuarias para la Competitividad. Publicación Miscelánea. No. 103. Quito, 35 pp
- INIAP 2004 Encuentro Nacional de Comités de Investigación Agrícola Local (CIAL): Memoria. CD Rom. Quito, 2004.

ANNEX XVII
Thailand country report

Introduction

Thailand's economy has been traditionally dependent on the agricultural sector. Its main agriculture exports are such as rice, maize, rubber, and cassava. Currently it holds the highest rice market share in the world. In the last ten years slightly over 50% of agriculture land has been dedicated to growing rice.

Government structures also reflect the importance of this sector to the Thai people. The main public body responsible for agriculture is the Ministry of Agriculture and Cooperatives. The ministry is further divided into 14 departmental agencies. It includes the Department of Agriculture which oversees and conducts researches in the agriculture field. Within the department there is the Rice Research Institute, a governmental organization dedicated only to research on rice. The institute links with rice experimental stations throughout the country employing over 400 researchers.

Current issues and priorities

Current concerns for the country include competition among rice exporting countries; the debate on GMO technology; bio-technology; ways to reduce usage of pesticides and chemical fertilizers; promoting sustainable agricultural practices; organic crops; food safety; growing crops for energy replacement; and encouraging small farmers in vulnerable areas to grow sustainable small scale farms for family consumption.

The strategies of the Ministry of Agriculture and Cooperatives (MOAC) for 2005 demonstrate efforts to simultaneously increase productivity and maintain sustainable agricultural practices. Its vision statement is "The MOAC is a major organization to develop the quality of life of farmers, support an adequate food production and safe consumption, and be a world leader of food export under the continual environmental and natural resources management." There is a clear consciousness to move towards sustainable agriculture and environmental - friendly agricultural products.

The strategic plans for 2005-2008 of the Department of Agriculture (DOA) also reflect these concerns. According to the plan the department is committed to three large strategies. They are 1) increase the number of relevant research projects for agricultural related plants and machinery 2) set standards for agricultural production and products to prepare for international competition 3) develop farmers' knowledge and skills on plants and machinery to increase farmers' income. The third strategy has performance indicators such as the number of farmers trained in various areas such production technology; laws and regulations on fertilizers, hazardous substances, and endangered species.

The area of extension work is of vital importance to ensure effective linkages between scientific discoveries and the needs of the real world. The role of the Department of Agriculture Extension (DOAE) has evolved along four approaches: 1) transmitting knowledge through farmers' and youth groups on large demonstration plots (1967-1975); 2) increase rice production for export and local consumption thus promoting land use to obtain maximum yield (1975-1977); 3) sought loan from World Bank to expand the extension delivery system and implemented Training and Visiting System to cover all the provinces (1977-1992); 4) shifted from direct extension services to put emphasis on human resource development for extension personnel and farmers (1993-1999): and 5) emphasizes farmer's and community's participation in the learning process and formulation of their own development guidelines thus role of extension worker has become facilitator and coordinator among relevant organizations and farmers (1999-present).

Capacity constraints

In the present capacity issues for Thailand are more complex than earlier stages of development when capacity problems were mainly production technology and capacity at the individual level. Production technology would include selecting and breeding new varieties and laboratory work. Capacity problems at the individual level perhaps require direct training and transfer of know-how technology. These problems have come to pass for most areas especially of rice, cassava, rubber and other major crops. Remaining individual level capacity issue is such as the decline of number of young conventional breeders as more and more chooses to move into bio-technology.

From individual to institutional/system level
Currently capacity issues have shifted from the individual level towards more to the institutional level and the systems level. They are such as the capacity to organize and manage effectively across many government organizations involved such as between the department of agriculture, the department of agricultural extension, department of forestry, department of land development and non-governmental organizations in the area of natural resources management. These are institutional level capacities that would include project management skills and strategic planning. At the systems level Thailand faces difficulties in trying to make relevant and effective policies and marketing strategies for the agricultural sector. Information management, networking, socio-economic analytic skills all seem to be important capacity issues for public officials in the present.

Participation, farmers and natural resource management
Another important capacity issue at the immediate level is creating links between research and implementation by involving the grass-root farmers in all stages of the development. There is a clear movement in the Thai society to promote participatory approaches in all aspects of delivering public goods and services including the agricultural sector. The concern to promote participatory approaches has accompanied growing attention on complex issues of natural resources management. Many projects are experimenting with participatory approaches. Some CGIAR Centers such as IRRI, CIMMYT and CIAT has played roles in introducing participatory practices along with other international and domestic organizations.

National capacity for agricultural science and application

There are many organizations that are involved in trying to fulfil the above capacity needs of Thailand. Document sources show that there are a variety of training and research opportunities for empowering government researchers to have the competencies that meet demands of more complex capacity issues. For example officials in the Ministry are offered training on subjects that include: computer programs such as SPSS and project management; courses on English for negotiations; knowledge management; and development of warning systems. These trainings are offered both by in-house trainers and by experts outside. The government regularly gives out scholarships for graduate and doctoral level in the field of agriculture. The DOA produces a report compiling the country's best research projects annually.

Both DOA and DOAE have concrete human resources development plans. The plans include sending officials for both domestic and overseas training. The content varies from technical knowledge, participatory methods, ethics, IT skills, and research skills to sharing knowledge, creating new knowledge and managing knowledge. For the year 2005 alone DOA has plans for 45 training courses for its officials. In its plan for the next 5 years emphasis will be put on 7 areas of expertise: **production** (plant physiology, plant breeding); **plant protection** (ecology, insect taxonomy, plant pathology, integrated pest management, biological control, chemical control); **production process development**

(soil science, cropping system, seed technology, agriculture engineering); **basic research** (biotechnology, botany, chemistry, chemistry analysis); **project management** (accounting, public administration, public relations, project analysis, human resource management); **after harvest** (food science, agriculture engineering, storage, packaging); and **others** (remote sensing, data analysis, computer science, economics, product and marketing analysis).

Training capacity
An indicator of a country's capacity of agricultural science is the number of universities that offer agriculture as a field of study.

Type of Institution	Numbers
1. Public Institutes	
Limited Admission Universities	60
Open Universities	2
Autonomous Universities	4
2. Private Institutes	
Universities	29
Colleges	30
Total	**125**

Of the 66 public institutes we sampled 33 institutes, including all the leading ones we found that 26 offered agriculture as a field of study. On the other hand of the 59 private institutes, we sampled 20 and found that none offered agriculture as a field of study. Therefore the interests in agricultural studies are limited to public universities.

The lack of agricultural studies in private institutions could possibly mean that there is no capacity in the private sector for agricultural studies or it could also mean that there is no demand for agricultural studies from the students.

The leading public institution that is well-known for the field of agriculture is Kasetsart University, which is situated in Bangkok. The word 'kaset' itself means 'agriculture' and 'kasetsart' means 'the science of agriculture'. The university houses three out of four CGIAR Centers that have offices in Thailand. They are IRRI, CIAT, and IWMI. The fourth one is ICRAF, which has an office in Chiangmai University up in the North part of the country. Therefore the locations of all the CGIAR Centers are located in public universities. This is an indicator that there is a close relationship with CGIAR Centers and the capacity of these public universities in the field of agriculture.

Example 1: Data of CGIAR Trainings and Kasetsart University
There are 541 names of people on the Thailand ex-trainees list. Of the 541 names, 69 names were faculty members or students of Kasetsart University. Of the 69 names of people from Kasetsart University, 30 were trained by IRRI, 32 were trained by CIMMYT, 5 were trained by CIFOR, and 2 were trained by IWMI. The word 'trained by' here includes those that were sponsored by these CGIAR Centers to undergo trainings offered elsewhere or by collaborations with CGIAR Centers.

CGIAR Centers	Number of people	Type of Training
IRRI	30	Mixed of degrees and non-degrees
CIMMYT	32	All were non-degrees
CIFOR	5	All were non-degrees between 2002-03
IWMI	2	All were for PhD from 2000 onwards

Of the 30 people that were trained by IRRI, 17 were confirmed to have stayed in Kasetsart University after completion of the trainings. They are all associate professors or professors in one of the academic departments of the university. This shows that IRRI did have influence on building the capacity of Kasetsart University, which is one of the leading national partners in Thailand.

Example 2: Data of CGIAR Trainings and Department of Agriculture, Ministry of Agriculture
Of the 541 names, 48 names were researchers from the Department of Agriculture. Of the 48 names, 44 were trained by IRRI and 4 were trained by CIMMYT.

Department of Agriculture

CGIAR Centers	Number of people	Type of Training
IRRI	44	33 degrees and 11 non-degrees
CIMMYT	4	All were non-degrees

Of the 44 people that were trained by IRRI, 33 were trained for degrees. Of the 33 people trained for degrees, 24 stayed with the department. Some of whom have now high positions in the department, such as senior researchers and deputy directors of each research area. This is another example of the influences of IRRI that had on researchers in the most important public research institute on agriculture. Thus IRRI was a very important actor that helped shaped the capacities of national agriculture research institutes in Thailand.

From training recipient to training provider
Another indicator of improved capacity in the case of Thailand is that it has gradually transformed itself from being a recipient of training to become a facilitator of platforms for learning at the international level such the Agroforestry Management and rice breeding. Thailand offers direct training and facilitates learning for neighbouring countries in the region such as Laos and Cambodia and some outside the region such as India and Bangladesh as well. Universities have also provided scholarships for people in the region to come to study agriculture in Thailand. In Mae Jo University alone there are students from over 15 countries studying Agroforestry Management.

The contribution of CGIAR Centers

Relationships between the NARI the CGIAR Centers have changed through out the years. In most cases the relationship has evolved from the NARI being the recipient of training/learning activities, to being a partner of the CGIAR Centers in designing and implementing training/learning activities, and then to being the leader in the relationship. The NARI, particularly the Department of Agriculture, the Department of Agriculture Extension, and the Rice Research Institutes show tremendous leadership in setting their own agenda for research and goals for the organization and the advancement of agriculture sector as a whole. Partly this is due to general efforts of the Thai government to rely less on direct foreign assistant in all aspects. Also it is due to Thailand's own developmental stage that the people have become empowered to know where they want to go and how they want to get there. Another factor is the budgetary constraints of the CGIAR Centers. Interviews confirm that in the present most of the funding for collaborative projects come from the Thai government and that CGIAR Centers such as IRRI would work as the middle-man to bring people together.

The case of the Ubon Rice Research Center

At present Ubon, the leading rice research center in Thailand is involved in the CURE network facilitated by IRRI. The following is an extract from a fieldnote of discussions with four senior scientists all of whom had previously been trained by IRRI.

Thailand has moved production from domestic consumption to commercial purposes. Breeders need to try to reduce the risk for farmers. The rain fed lowland areas have unfavourable conditions such as draught, soil quality, and flood. Therefore newer varieties are needed to resist these conditions. They are also incorporating more farmer participatory methods such as in variety selection processes to test in the fields.

When asked what CURE did for them, they said "the objective is to facilitate sharing experiences among scientists. The researchers might be funded from elsewhere. The major source of funding actually came from the government. When we do collaborative projects we make sure that both sides benefit. The advantage is to exchange and learn from other countries. IRRI serves as the middle-man to bring people together. If we had to do it on our own we would not be able to do it as well. IRRI works as the coordinator. "

On the importance of training, the response was that IRRI's training is still very important for younger scientists. They are conventional breeders and that is not enough to train others when related fields such as socio-economic or bio-genetic issues are becoming more important. Currently IRRI has provided less training for Thais. Thais are giving more training to Laos. This is an indication of an increase of capacity in Thailand.

Usually they work through the DOAE to transfer the technology they've built but sometimes they also conduct preference analysis directly with the farmers together with DOAE. They see that there are problems of capacity in Thailand such as: the number of young conventional breeders because most are moving into bio-technology; there needs to be a stronger connection between basic research and applied research; researchers are doing well but policy-makers need to be educated; there is lack of knowledge and experience on project management (project leader, evaluation, budget). These are generic project management skills, but by working with IRRI "we have to practice project management, so we get the kind of training as well".

When asked about evidences of impact, they gave the experiences of 'farmer participatory variety selection' program (This is part of a series of projects spun off from experiments done under CURE). The program was originated by us under the Rockefeller funds. We used IRRI's program to incorporate it. CIMMYT began the participatory work. "We had farmer participatory method in mind already and we only went to IRRI for technical help". (However, after reviewing the documents and other interviews, the presence of IRRI for the participatory work was very limited).

Another direct evidence of impact was the breeding of varieties insensitive to day length. Now they can grow off season. This is the direct impact of germplasm bank. "We brought in the materials from IRRI and crossed them with the local variety. We would never bring in the direct germ because of the quality that does not meet the Thai standards." When asked if training was important in the process, the answer was "We cannot separate out between the germplasm bank and the training."

Currently 80% of the land uses the improved varieties. They are trying to work closely with IRRI to develop a new variety.

This case underlines:

- The changing role of what was the most significant IARC in Thailand;
- The continued importance of CGIAR links – but in new formats;
- The importance of training – as well as its indivisibility in the view of many interviewed from research and germplasm provision.

A reducing role?
The CGIAR Centers activities, thus, has changed both in terms of content and method of cooperation with the NARI. There has been a steady decline in the number of researchers the CGIAR Centers has trained in Thailand. The majority of the ex-trainees who are still working are now in their 50s. Most are very active in their fields and have become leading scientists and top-managers in key public organizations. Interviews reveal that ex-trainees especially the active scientists feel that the trainings they have received were very valuable for them. However, they also eluded that offers of training/learning has come from many channels not only the CGIAR Centers such as through governments of Australia, Swiss, and Japan; or through networks with domestic universities such as Kasetsart University, Chiangmai University, and Ubon Ratchathani University.

Aggregate contribution made by CGIAR
There were a total number was 541 names in the dbase of Thai ex trainees. Of these the total number traced was 249 (46%). The result of tracking is the following:

Found and still working in the same field with the same organization	148
Found to have moved to a different job or to a different field or to study abroad	6
Searched and asked but the names were not familiar or not heard of	55
Retired or have passed away while in the organization	40

Almost all of the ex-trainees belong or use to belong to either a government organization or a public university. If we add the number of people who are still with same organization or the same field (148) with the number of people who have retired or have died while in the organization (40), the total is 188 people. That is 75% of the number of people traced (188/249). It is reasonable to conclude that most people were trained by the CGIAR Centers remained in the field of agriculture and continued to work either for public organizations or public universities.

New forms of training and learning
As the role of the NARI shift from being the recipient to leading the relationship, the nature of training/learning activities has changed as well. Previously much of the relationship relied on personal ties between leaders of CGIAR Centers and departments. However, now as most of these people have retired the connection is fading rapidly. This is especially true for IRRI and other centers that are not directly involved in natural resource management type activities. Centers such as IWMI and ICRAF that work more towards general natural resource management are still active and have a growing presence in the country.

Instead of merely producing trained scientists or focusing on basic research, the NARI are looking for more exposure to learning in the areas of policy making, regulations, and market strategies. Also they are looking for a more interdisciplinary approach in training and learning. An example given is that: breeders of rice need to know about the environment and ecological aspects of the new type as well.

There is also a need to move more towards social sciences by blending more between economic, social, political knowledge with hard core sciences. Interviewees confirmed the important role that CGIAR Centers can play as facilitators of knowledge sharing platforms. It could be through conferences, consortiums, research, courses and so on. The value would be an international body that scientists and practitioners from different countries can share knowledge on an equal basis on the above capacity issues.

In addition there is now more activity that is conference/workshop/network based and a reduced level of individual training out of country as the table below suggests.

The people that were sent on these conferences and trainings were mostly from the Rice Research Institute of the Ministry of Agriculture and Cooperatives. Some of them are leading researchers in the country. By comparing the names of people who went on these conferences and trainings sponsored by IRRI more than once, and the data of ex-trainees that we tracked in June 2005, it is found that all of the people have stayed in the same organization, which is the Rice Research Institute.

Some observations:

- The number of people that were sent from IRRI -Thailand for the trainings show a steady decline.
- Overall more people have been sponsored for conferences rather than trainings. This could be an indicator of IRRI playing more role as a facilitator of knowledge sharing rather than being the sole knowledge provider.

IRRI - Thailand	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of conferences that IRRI - Thailand was affiliated (Conference site in Thailand)	22 (6)	23 (2)	17 (4)	16 (4)	26 (7)	21 (5)	0	19 (4)	16 (2)	18 (5)	n/a
Number of people that were sent from IRRI - Thailand for the conferences	53	61	43	25	77	71	0	47	76	141	n/a
Number of trainings that IRRI - Thailand was affiliated (Training in Thailand)	15 (3)	7 (1)	6 (1)	9 (2)	11(2)	9 (2)	2 (1)	7 (1)	8 (0)	5 (0)	1 (0)
Number of people that were sent from IRRI - Thailand for the trainings	54	18	26	13	24	33	17	22	9	9	1

* Source: This table was put together from the lists of conferences and trainings IRRI – Thailand had given to the research team in electronic files in June 2005.
* In the year 2001 because of the 9/11event most conferences were cancelled.

As the NARS become equal partners with the CGIAR Centers some conflicts have occurred and can escalate if not careful. The case of a retired IRRI scientist who crossed Thai Jasmine Rice with Indian Rice and tried to patent it, which caused mistrust of IRRI among Thai officials is a case in point.

Thailand is now creating its own germplasm bank in order to secure its own resources for competition.

Impact of the CGIAR Centers in Thailand can be clearly seen in rice and cassava. Currently 80% of the land that grows rice uses the improved varieties, which were developed from the germplasm bank. Cassava is purely produced for export and Thailand holds about 80% of the world market. Further discussion on impacts will be illustrated in case studies.

Sources:

- "Strategic Human Resource Development Plan 2001-2005". Department of Agriculture. Ministry of Agriculture and Cooperatives. Thailand.
- "Strategic Human Resource Development Plan 2005-2009". Department of Agriculture. Ministry of Agriculture and Cooperatives. Thailand.
- "Handbook for Human Resource Development". Department of Agriculture. Ministry of Agriculture and Cooperatives. 2005. Thailand.
- "Strategic Human Resource Development Plan 2005-2009". Department of Agriculture Extension. Ministry of Agriculture and Cooperatives. Thailand.
- Interviews with NARS and CGIAR Centers in Thailand.
- Newspaper articles.
- Websites:
    - Ministry of Agriculture and Cooperatives www.moac.go.th
    - Department of Agriculture www.doa.go.th
    - Department of Agriculture Extension www.doae.go.th
    - National Statistics Office www.nso.go.th
    - World Bank www.worldbank.org
    - CGIAR www.cgiar.org

ANNEX XVIII
Case studies from Thailand

1. COMPANION MODELING CASE STUDY
Center: IRRI, Theme: NRM, methods

Introduction

IRRI has had a long presence in Thailand. Its relationship was strong especially with the Rice Research Institute which is part of the Department of Agriculture (DOA). However, in the last few years due to several factors IRRI's role in the country has reduced dramatically. These factors are such as: IRRI's own budget crunch; the DOA's strong capacity in developing its own germplasm bank and funding researchers; the government's overall strategy to move from a receiver of foreign aid to be the provider of aid to neighbouring countries; and the maturation of the rice industry in the country.

The following case represents the decline of direct role of IRRI in Thailand but at the same time still play some vital role for enhancement of agriculture related technologies and knowledge in the region through networks and collaborations.

Companion Modeling Approach

Integrated natural resource management (INRM) is a complex issue which needs interdisciplinary knowledge. Modeling is increasingly seen as a suitable approach to examine complex resources management problems. Modeling should proceed iteratively from simple to more complex representations of the system dynamics. These iterative, applied, action-research-oriented modeling activities should be implemented in close interaction with field work and stakeholders in looking for solutions to the real-world problem under study. Stakeholders should play an important role in the construction and the validation of such models. This collective learning process for INRM is called "companion modeling" approach.[30]

The Beginning

In 1993, a team called GREEN (French acronym for "renewable resource management and environment") was created by Center for International Cooperation in Agricultural Research for Development (CIRAD) in France. The researchers of the team developed modeling activities to better understand the interactions between social and ecological dynamics. Their main research theme is the decision-making process. They adopted and developed a tool called 'multi-agent systems' (MAS) from the field of modeling. They further developed a 'companion modeling (ComMod) methodology for the use of MAS tools within the community of approaches dealing with participatory modeling for collective learning and action. The ComMod method uses role games to acquire knowledge, build a MAS model and validate it, and use it in the decision-making process dealing with collective resources management. [31] In 1995, researchers of GREEN began to propose training courses on MAS modeling for integrated natural resource management (INRM).

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[30] Bousquet and Trebuil. "Training on Multi-Agent Systems, Social Sciences, and Integrated Natural Resource Management: Lessons Form an Inter-University Project in Thailand". (2005 Draft, forthcoming) p.2.
[31] Bousquet and Trebuil. "Introduction to companion modeling and multi-agent systems for integrated natural resource management in Asia" (2005 Draft, forthcoming) p.1-3.

Meanwhile in Thailand in 1998, Dr. Benchaphun Ekasingh and her colleagues from the Multiple Cropping Center at the Faculty of Agriculture, Chiang Mai University (MCC-CMU) began to organize the first training course in Asia on MAS and INRM. In 1999 Dr. Benchaphun asked the GREEN team to organize a two-weeks training in MCC-CMU.

In the IRRI front, since 1995, it has been mandated by the CGIAR to convene the Ecoregional Initiative for the Humid and Subhumid Tropics of Asia, Ecor(I)Asia, which is one of eight ecoregional programs aimed at tackling complex natural resource management (NRM) issues at the regional scale. [32] As part of the effort to fulfil its tasks, in 2000 IRRI hosted a similar training by the same GREEN team in Los Baños Philippines. The key person from IRRI was DR. S.P. Kam who is an expert on MAS and GIS. From these starting points IRRI and CIRAD began a joint collaborative research project based in Bangkok. The project relied on funding from Asia IT & C initiative of the European Union (EU) for three years, and some from IRRI and CIRAD as well.

The Project – Training [33]

The objective of the EU project was to *train* Asian lecturers and researchers on MAS for social sciences and INRM by inviting 12 internationally renowned European researchers to deliver one-week courses in Thailand on different aspects of the subject. The training courses were held from October 2001 to April 2004. In total there were 12 courses. [34] The first course was a two-week training sessions and the eleven courses that followed were one-week sessions. The courses were conducted in three collaborating universities: Chulalongkorn University; Chiang Mai University; and Khon Kaen University.

The target size of the trainees per session was 16-20. The trainees are from 11 countries [35] and institutions including CIAT, ICRAF and other CGIAR Centers. Most of the trainees, however, were graduate and post-graduate students, young university researchers and some officials from the Ministry of Agriculture and Cooperatives in the case of Thailand. The trainees were from various backgrounds such as: economic & social sciences; agriculture sciences; land-use & GIS; ecology & biology; agriculture extension; computer sciences; and health sciences.[36] By the end of the project a core group of trainees were identified.

Different combinations of teaching methods and tools were used during each course. Generally, on each day, two 90-minute lectures alternate with presentations of case studies, group exercises, hands-on exercises, or personal work. The sessions used mainly visuals – video projections. Slides, key reference papers, CD-Rom with these files, software, and computer exercises were provided to the trainees.

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[32] Guy F. TREBUIL. "IRRI-Cirad Project Activities in Thailand for 2002 : Report to the Department of Technical and Economic Cooperation", International Rice Research Institute. 7 March 2003

[33] Bousquet and Trebuil. "Training on Multi-Agent Systems, Social Sciences, and Integrated Natural Resource Management: Lessons Form an Inter-University Project in Thailand". (2005 Draft, forthcoming) p.4

[34] Aside from the above forthcoming book chapter, I also used a poster "Interdisciplinary Training on Multi-Agent Systems (MAS), Social Sciences and Integrated Natural Resource Management (INRM) in Thailand". Produced by IRRI-CIRAD-DOA project.

[35] The trainees were from Thailand; Philippines; Vietnam; Indonesia; Malaysia; Bangladesh; Bhutan; India; Japan; France; and Germany.

[36] Bousquet and Trebuil. "Training on Multi-Agent Systems, Social Sciences, and Integrated Natural Resource Management: Lessons Form an Inter-University Project in Thailand". (2005 Draft, forthcoming) p.5

Networking, exchanges and group dynamics were sustained by the subscription of each trainee to a global electronic discussion list linked to a website designed for MAS users in INRM (http://cormas.cirad.fr). On the website trainees can find reference papers and tutorials, completed case studies, new version of software, opportunities for further training and a library of already developed MAS models.

Capacity Enhancement

To put in short this case demonstrates that training has transfer knowledge on MAS to Asian scientists. Some evidences are such as:

- Currently there are 14 applications being developed in five countries: 7 in Thailand; 2 in Philippines, Vietnam and Indonesia; and 1 in Bhutan. These are personal projects on INRM. This shows continuation of efforts on behalf of the trainees to improve skills in this approach.
- Four trainees have continued to take training course in France on MAS modeling using CORMAS.
- MAS approach has been integrated in 4 Master of Science theses in four countries.
- Seven trainees have made proposals for doctoral level in the field and have been accepted to universities in France, Japan, Canada, and Thailand.
- Some have presented their applications in papers for conferences.
- Some have begun to teach MAS for INRM modules in their universities, particularly in Thailand and Philippines.
- The trainees have become trainers when they run their own short courses and workshops for MSc students particularly in Ubon Ratchatani University, Chulalongkorn University and Khon Kaen University.
- Currently CIRAD is collaborating with Chulalongkorn University to establish an international graduate program in this field in Thailand.

The above are mainly contributions made possible through capacity enhancement at the individual level. However these training sessions have created a close link between trainers and trainees and among the trainees. The links have created a close network of individuals in Asia and Europe who are leaders in the field. There has been a starting effort to set up Asia Pacific Social Simulation Association (www.apssa.net) and organize a conference on MAS for INRM in Asia. Thus capacity at the network / institutional level is also enhanced but at the moment perhaps in the early stages. The trainees have become more interdisciplinary-minded. But the remaining question is how much would that translate into changes in their professional practices at their respective institutions. There is no evidence of impact at the policy level yet.

IRRI's Involvement

IRRI's actual role in the project is limited though critical at certain stages. Through Dr. S.P. Kam of IRRI, CIRAD researchers (one former IRRI official) agreed to set up an operation unit for the training courses in IRRI's office in Bangkok. The salaries of CIRAD researchers came from CIRAD, and the funding came from EU. IRRI provided the office space and some funding for the courses.

Dr. S.P. Kam was one of the trainers and taught one course of the total 12 courses. She also developed the MAS models in the beginning. According to an interview with CIRAD researcher, Dr. Kam was perhaps very different from other IRRI scientists. The interviewee said IRRI tends to have a very narrow focus "They look only at the roots of rice, not even the leaves". He said "Bit by bit, IRRI fell out of the project because they were not doing the systems approach". The end of 2005 Dr. Kam is leaving IRRI to go to another CGIAR Center in Penang. However this also reflects the shifting focus of IRRI's efforts which have downplayed Thailand in favour of other countries I the region.

As for other CGIAR Centers in Thailand, ICRAF and CIAT came for training but their interests did not continue. As for NARI, officials in Department of Agriculture (DOA) also attended some courses but because they were to mono their approach their interests also did not continue.

In the present CIRAD is moving ahead with its activities of further expanding the training / learning objectives, target groups, and collaborating projects in the region. IRRI's presence has completely disappeared, except for a few minor papers presented on the subject by Dr. Kam but they were not joint-papers with CIRAD.

Conclusion

In sum this case represents the reducing role of IRRI in Thailand. It collaborated with CIRAD on the project but learning and training activities were all managed by CIRAD. It participated briefly as one trainer led one training course, and provided office space for the project. However, it played a role in initiating the courses in Thailand to meet the demands of local researchers, especially those in Chiang Mai University. This case shows that IRRI has tried to follow CGIAR's shift of focus to IRNM with variable success.

References

Bousquet F, Trébuil G, and Hardy B (editors) "Companion modeling and multi-agent systems for integrated natural resource management in Southeast Asia" (forthcoming) This book will be published by IRRI. The chapters inside this book that were used for reference are:

- Bousquet F. & Trébuil G. "Introduction to companion modeling and multi-agent systems for integrated natural resource management in Asia"
- Bousquet F. & Trébuil G. "Training on Multi-Agent Systems, Social Sciences, and Integrated Natural Resource Management: Lessons From an Inter-University Project in Thailand"
- A poster. "Interdisciplinary Training on Multi-Agent Systems (MAS), Social Sciences and Integrated Natural Resource Management (INRM) in Thailand". Produced by IRRI-CIRAD-DOA project. 2004.
- Trebuil, Guy F., "IRRI-CIRAD Project Activities in Thailand for 2002 : Report to the Department of Technical and Economic Cooperation", International Rice Research Institute. 7 March 2003

Interviews

Dr. Guy Trebuil, GREEN Research Unit, TERA, CIRAD

Dr. Benchaphun Ekasingh of MCC, Chiang Mai University

Mr. Varong Naivinit, Chulalongkorn University PhD student who is in the core group of trainees. Dr. Guy Trebuil is his advisor.

2. INTEGRATED CASSAVA CROPPING
Center: CIAT Theme: NRM, Crop Protection

Introduction

CIAT has the world's largest collection of cassava germplasm. In Asia region the center has been active in Thailand, Vietnam, China and Indonesia. In the case of Thailand, CIAT collaborates closely with Department of Agriculture (for research), Department of Agriculture Extension (for extension work), and a private organization. Currently Thailand exports about 2 million tons to EU and 2 million tons to China annually.

The CIAT scientist in Thailand said in an interview "CGIAR keeps telling us to do basic research and give it to the national institutes to give to extension to give to farmers. Then they ask us about the impact! That is impossible if we don't go down to the farmers!" Thus CIAT's work is mainly with farmers and not at the policy level or coordination level.

The following case is based on CIAT's project called "Improving the Sustainability of Cassava-based Production Systems in Asia" funded by the Nippon Foundation. [37] The objective of CIAT's project is to enhance the adoption of more sustainable production practices by involving farmers directly in the development of site-specific most-appropriate practices through farmer participatory methods. Sustainable production practices would both help farmers increase their income and in protecting the soil resource base from degradation as a result of nutrient depletion and erosion. [38] Soil erosion was seen as one of the most important problems among farmers. [39]

The CIAT project is divided into two phases. The first phase (1994-1998) of the project developed and tested mainly a Farmer Participatory Research (FPR) methodology. This first phase included offering introductory course on FPR methodologies in Thailand for researchers and extension workers from the four countries. Also in 1997 and 1998, in-country Training-of-Trainers (TOT) courses in FPR were held in the four countries. A total of 127 researchers and extension workers were trained (35 Thais); and 155 farmers participated in the FPR trials (32 Thais). [40]

The second phase (1999-2003) aimed to use the methodology, implemented in a simplified version in many more sites, and further developed and used various farmer participatory extension (FPE) methods. [41] In phase two 338 FPR trials were conducted in Thailand and 584 were conducted in Vietnam. By 2003 the project was working in 33 sites in Thailand, 31 sites in China, and 34 sites in Vietnam. Originally the aim for Thailand was 15 sites and Vietnam was 16 sites. FPR in Indonesia did not continue.

Beginning of the Second Phase – On Training

By 1998 project staffs from the first phase had gained experience and were resource persons for TOT courses in the second phase. Also manuals on farmer participatory approaches were prepared in Thai, Vietnamese, and Chinese. The manuals include hardcopy manuals as well as videos and CDs.

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[37] End-of-Project Report, p.3
[38] End-of-Project Report, p. i
[39] End-of-Project Report, p.49
[40] End-of-Project Report, p.5
[41] Impact Assessment Report, p.6

After 1999, the training shifted from TOT courses for researchers and extensionists that focused on tools and methodologies used in participatory diagnoses to training of local extension workers and key farmers from each pilot site. [42]

The number of participants in the FPR training courses amounted to a total of 726 people, counting from 1994 to 2003 in the four countries. There were 244 Thais and 292 Vietnamese. And of the 726 about 200 were researchers and extensionists; and about 400 were farmers and local extension workers. Some participated more than once. [43]

The training would target one sub-district extension worker together with two farm leaders from a project site - the three people were to form a 'FPR team'. These team members often become leaders or coordinators of the FPR trials or committee members of the 'Cassava Development Villages'. The training courses helped create the cadre of people with knowledge and experience in farmer participatory methodologies and motivated them to extend the project to more sites. The courses also motivated and empowered local extension workers and key farmers to work as teams.

Some of the trainees were also sent to participate in three international / regional training courses: Farmer Participatory Research and Gender Analysis, Vietnam 1999 (2 Thais and 1 Vietnamese); Participatory Monitoring and Evaluation (PM&E) Training Course, Philippines 2000 (2 Thais); and Participatory Research and Development, Philippines 2002 (3 Thais and 1 Vietnamese). [44]

Content of the Project

At the start of the second phase villages were selected based on discussions with officials at different levels; a Rapid Rural Appraisal with the farmers; and willingness of local leaders to collaborate. The farmers from the selected pilot sites were then taken to visit the demonstration plots or visit other villages where farmers had already conducted the FPR trials and had adopted some selected practices. The farmers then evaluated the demonstration plots, score all the treatments and select a few of mot interest to try out in FPR trials on their own fields. The researchers and extension workers help farmers to select appropriate treatments, stake out plots and establish the selected treatments.

Aside from FPR erosion control trails, farmers could also tested other technology components such as: new varieties, fertilizer practices, intercropping, weed control and even pig feeding with cassava roots and leaves. During harvest time, a field day is organized so farmers from different villages could gather to evaluate and discuss the results of the various treatments. Farmers would then select the best treatments for either furthering testing or for adoption in their production fields.

After 2-3 years the farmers would by then decide on the most suitable practices. Project staff would help the farmers to find necessary varieties or other inputs such as fertilizers. The project also used various Farmer Participatory Extension methodologies such as: organizing cross-visits of farmers from one village to another; field days; FPR training courses for farmers and local extension workers; and setting up community-based self-help group called "Cassava Development Villages". So instead of working with individual farmers, they worked with organized groups.

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[42] End-of-Project Report, p.40-41
[43] End-of-Project Report, p.40-41
[44] End-of-Project Report, p.41

Results of the Project

Outputs of the project in Thailand are the following:

- By 2003 farmers in 24 villages had planted a total of 145 km of vetiver grass hedgerows.
- Almost all had adopted one or more recommended new varieties.
- CIAT and national researchers were able to design and develop a Farmer Participatory Model used for the development of sustainable cassava-based cropping systems in Asia.
- Some knowledge on cropping systems was formed such as: the reasons why intercropping technology is completely rejected by Thai farmers; the behaviour of farmers in using chemical or non chemical fertilizers. [45]

Outcomes are such as:

- According to FAO data, cassava yields in Thailand increased 3.74 t/ha (27%) with a total value of 86.4 million US dollars.
- Including China, Vietnam and Thailand it is estimated that for all of Asia yields increased 2.88 t/ha (22%) resulting in additional income for cassava farmers valued at 248 million US dollars per year.
- Land allocation to cassava production is expanding, and it is expanding at a faster rate on hillier terrain.
- More careful cassava production concerning soil erosion. Thus more sustainable agriculture practices.

Evidence of Capacity Enhancement

Based on the Impact Assessment Report

This case has two interventions: the NRM technologies that were introduced; and the participatory approached that was used to promote adoption of the new NRM technologies.

The outcome of the project can be divided in to two types: behaviour and productivity. The impact assessment report concluded that the project had significant impact on adoption of soil management technologies, and both project technologies and participation in the project influenced behaviour and productivity outcomes. [46] An indicator for behaviour change is the increased area of land used to grow cassava especially in Thailand in more hilly areas. Farmers have been able to do so because they have decided to adopt hedgerows such as vetiver grass. This shows that with new technologies the farmers can expand their crop to more environmentally sensitive areas. An indicator for productivity is the cassava yield. The report found that the increase in cassava yield of participants compared to non-participants was slightly higher. [47] According to the End-of-Project Report, the adoption of more balanced fertilization, of soil conservation practices and intercropping was significantly higher for participants compared to non-participants. The Impact Assessment study also showed that the adoption of the hedgerows was positively and significantly related to expansion of the total cropped area and cassava area.

The farmers' participatory approach helped increased adoption of technologies and also helped empowered the farmers. The report says that the participation is related to the enhance knowledge, experience and managerial capacity.

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[45] End-of-Project Report p. 45-46

[46] Impact Assessment Report p.16

[47] Impact Assessment Report p.13

Farmers' participation also had a reverse affect on the researchers/scientists. It enhanced the researchers' technical knowledge on ways to prevent soil erosion and it contributed to the researchers' appreciation for farmers' knowledge.

In the impact assessment study, the authors also discuss the benefits of participatory research for partner institutions. The main partners in Thailand can be divided into two groups: the researchers – Kasertsart University, Department of Agriculture, the Land Development Department (LDD), and the Thai Tapioca Development Institute (TTDI); and the extension workers from the Department of Agriculture Extension (DOAE).

The study found that researchers felt they benefited mostly from the new knowledge on soil fertilization that they learned from CIAT. Also they felt they were able to increase their understanding of farmers and their environments. Thus an impact of the FPR approach is providing feedback to research on end-users preferences.

As for extension workers, they felt they benefited most in terms of improved efficiency and motivation. Efficiency comes from easier work because of the clear goals, and cooperation from their supervisors, farmers and other officials. Motivation comes from the knowledge that living standards of farmers have improved and the feeling that farmers are motivated. [48]

Both the researchers and extension workers felt they benefited mostly from improved work management, which includes such as: the ability to apply FPR approaches to other crops, changing nature of the extension work from teaching to facilitation; and the Department of Agriculture's acceptance of FPR approach as new policy. Both researchers and extension workers were better able to identify the role of farmers in the research and technology transfer process. They learned the needs of farmers and thus are better able to propose solutions and target research more adequately.

The main constraint that the two groups feel they face is internal management as oppose to constraints from external economic and market conditions or lack of knowledge. Internal management consists of government policies and operating budgets.

Based on Interviews

Concrete evidences of new knowledge being generated are such as co-authored papers and single authored papers, international symposium posters by researchers in both Department of Agriculture and Department of Agriculture Extension. [49]

Another evidence of enhanced capacity is the fact that now DOA and DOAE has duplicated CIAT's participatory approach to use in cooperation with Laos and Cambodia. For Cambodia the crop is maize rather than cassava. The government also has bilateral ties with China and cassava related research is one of the areas of concern.

The interviewee said that public agencies in Thailand do not cooperate very well with each other. Sometimes DOA decides to also do extension work, while DOAE sometimes also does research work. CIAT has played the middle-man or referee to bring all the players together and assign clear roles for

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[48] Impact Assessment Report p. 23

[49] They are such as 1. "Effects of Methods of Land Preparation on the Yields of Four Cassava Varieties in Thailand" by W. Watananonta, S. Tangsakul, S.Katong, P. Phetprapi, S. Jantawat, N. Samuthong, R.H. Howeler, June 2005. The authors are from DOA, TTDI, Kasetsart University, and CIAT; 2. "Cassava in Thailand-Present Situation and Future Potential" by W. Watananonta. Paper prepared for workshop at Field Crops Research Institute, Dept. of Agriculture, Thailand, June 2005.

each agency. However, agencies have not been able to push cassava related concerns on to the national level. Different from other crops, there has never been a national conference on cassava.

CIAT has mainly contributed by being the knowledge generator and facilitator of participatory approach. It is also the channel for researcher to share knowledge. Thus, despite the fact that CIAT had very little contribution financially, its presence in the country is was very valuable.

Existing Capacities

It is important to take note the existing capacities in Thailand that helped CIAT's project to be successful. In Thailand both the government and the private sector namely, the TTDI have been very active in cassava research, extension, and training of cassava farmers. From 1993-2000 TTDI trained about 30,000 farmers and distributed about 40 million stems of new varieties free of charge to farmers. [50] Also from 1993 to 1998 the Thai government spent over US$1 million per year for the multiplication and distribution of new high-yielding cassava varieties. In 2002/03 the new varieties cover 98% of the total cassava area in the country. The End-of-project report states that, in Thailand many farmers in the pilot sites had already adopted new varieties before the Nippon Foundation project started; but they may have changed from one new variety to another as a result of FPR variety trials conducted as part of the project. However it is difficult to conclude the affects of the project on adoption of new varieties because new varieties were adopted by farmers all over the country.

Another existing capacity in Thailand is the strong contribution and dedication of the King and his Royal Projects. The result that the farmers that participated in the project adopted the practice of growing vetiver grass hedgerows is perhaps mainly because of the efforts of Royal projects to promote soil and water conservation. The government provided free vegetative planting materials and the LDD helped in setting out contour lines. It is one technology that CIAT learned together with the farmers from existing research rather than a technology that was introduced by CIAT.

Another point worth mentioning is the fact that now farmers grow vetiver hedgerows covering 580 ha in 24 project sites but that is only 0.1% of the total cassava growing area in Thailand. This is because not all cassava areas have erosion problems. [51]

Also regarding soil conservation practices, the End-of-Project made an observation that the adoption of more or better fertilizer use and closer plant spacing, almost universally adopted by farmers for economic reasons, may actually have contributed more to erosion control than any of the soil conservation practices adopted as a direct result of the project. [52]

Current Capacity Concerns

Due to high oil prices in the present (August 2005) the Thai government is searching for new alternatives. Cassava is one of the potential crops to make ethanol gas. Thus demands for cassava might dramatically rise in the near future. The DOA is involved in planning and researching on the subject.

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[50] End-of-Project Report, p. 45
[51] End-of-Project Report p. 49
[52] End-of-Project Report p. 51

CIAT – Thailand in the Future

Regarding CIAT, currently its activities are winding down. They will no longer hire internationally recruited staff because of budget constraints. All the work will be transferred to regional / domestic staff soon. According to the soon-to-retire scientist, who has been in CIAT for over 35 years, CIAT's focus seems to have shifted from traditional research to increase cassava yield to 'natural resource management' type of work. The activities of participatory approaches at the farmers' level are perhaps evidences of such shift.

Conclusion

This case would fall in the category of a 'closer to farm/extension' case that involves 4-5 partners. The problem CIAT sought to overcome dealt with cropping systems. They aimed to include farmers in developing better cassava production practices that would be sustainable: which means increasing farmers' income and protection of soil degradation. The main theme of the project is Farmer Participatory Research (FPR) approach.

In the first phase they trained researchers and extensionists of the central agencies in classroom settings on FPR and technologies to enhance sustainable cassava productions. In the second phase, together with those trained in the first phase, CIAT and partners of NARI, trained the local extension workers and leading farmers on FPR in villages and demonstration field settings. This second group would then implement the approach for enhancing adoption of new technologies to prevent soil erosion in the villages.

Learning occurred mainly for researchers in DOA (NARI) and extension worker both national and local levels (NARI); leading farmers; and the CIAT researchers as well. Through the project CIAT and partners were able to develop the appropriate model for FPR. The model is now being implemented by the Thai partners with other crops and with other countries nearby. The capacity results are evident mostly at the individual level: all the participants now know FPR approaches and have used it for supporting adoption of technologies to prevent soil erosion. At the institutional level: FPR techniques have gained importance and acceptance; through FPR approach researchers and extension workers are better able to work together; cassava cropping systems are more sustainable

In sum the NARES capacity that was developed are: the researchers' and extension workers' ability to conduct and lead participatory approaches; new knowledge on FPR that was generated; new tools to prevent soil reduction that was developed together by researchers, extension workers, and the farmers; and greater cooperation between NARS scientists, extension workers and farmers.

Regarding the 'Evolution Framework' this case would be mainly in the 2nd stage about *managing cropping systems and the beginnings of NRM.* The project's goal was to include farmers in developing technologies to prevent soil erosion while sustaining increase in yields. The project also supported using chemical fertilizers to maintain land quality, and high yields. CIAT in Thailand has slowly moved from focus on new varieties of stage 1 to sustainable practices. Although its focus is directly on the farmers and extension workers and participatory approach, it is not in the 3rd stage because it has not moved towards research on livelihoods, markets, agronomy nor it is focused on large areas of less favourable lands.

Last but not least, it would be interesting to discuss the appropriate role of CIAT in terms of scientific research. As this case demonstrates, CIAT was strong for participatory approaches to enhance extension work. Participatory approaches are not hard-core science research like developing new varieties that CIAT might have originally intended to focus on. Currently since the new 1997

Constitution that mandates participatory approaches in all public activities; participatory approaches are supported and developed by many institutions. Therefore the nature of CIAT's contribution will have to be revised if it were to have a distinct contribution to the Thai society in the future.

References

- "End-of-Project Report: Second Phase of the Nippon Foundation Cassava Project in Asia 1999-2003: Integrated Cassava-based Cropping Systems in Asia: Farming Practices to Enhance Sustainability" by Reinhardt Howeler, CIAT. April 2004. (End-of-Project Report)
- "Impact of Participatory Natural Resources Management Research in Cassava-Based Cropping Systems in Vietnam and Thailand" by N. Lilja, N. Johnson, T. Dalton, R. Howeler, and P. Calkins. April 7th 2005. (Impact Assessment Report)
- Power point presentation by Reinhardt Howeler of CIAT: Summary of the Nippon Foundation funded project.
- An internal meeting report of Department of Agriculture. Prepared by Watana Watana nonta. July 24, 2001.
- http://www.ciat.cgiar.org/asia_cassava/index.htm as of July 2005

Interviews

Reinhardt Howeler of CIAT. May 2005
Watana Watananonta of Department of Agriculture. July 2005

3. AGROFORESTRY LANDSCAPE
Center: World Agroforestry
Theme: Agroforestry, NRM

Introduction

World Agroforestry Center (referred to here by acronym ICRAF) has a country office in Chiangmai University, in the Northern region of Thailand. The office was set around 1996, since then ICRAF has been active in projects on Landscape Agroforestry focusing mainly in the Mae Cheam Watershed area. All of the projects are under the overall direction of the global CGAIR system-wide "Alternatives to Slash and Burn" (ASB) Initiative.

Capacity Issues

In the past 10 years capacity issues[53] for Thailand in the area of Agroforestry in the upland area were such as:

- The lack of basic data to analyze and plan for land use in the upland areas; this includes detail maps both for official use and for villagers' use. Without proper scientific maps, disputes could not be resolved. Disputes about land use occurs between groups such as: upstream and downstream villages; side-by-side villages; and villagers and Department of National Parks officials
- At the individual level there is lack of expertise among local administrators and regional government officials in using common knowledge and computer software to analyze data to produce information for decision-making in the area of land use, which includes; which crops to grow where; boundaries of conservation forest, national parks, community forests, villages; the changes and patterns of land use among the villagers; river flows and soil

[53] According to interviews with NARI scientist, ICRAF staffs, professors and partners

erosion problems and so on. At the NARI level there are only 3 people in the country with PhDs in Agroforestry.

- At the structural level, the government structure does not enhance the field of agroforestry because forest matters are responsibilities of the Ministry of Natural Resources and Environment. On the other hand agricultural issues are responsibilities of the Ministry of Agriculture and Cooperatives. Like other areas of public services, team-work and integration among public agencies is the exception rather than rule in Thailand. Currently there is still ambiguity as to which organization is the official liaison with ICRAF, the Ministry of Agriculture and Cooperatives or the Ministry of Natural Resources and Environment.
- The above capacity issues also relates to the lack of university curriculum on agroforestry and the lack of integrated national policies.

Despite the above issues there were also capacity strengths [54] :

- On the technical side - prior projects by other organizations had begun to experiment with "participatory land use planning" (PLP) methods in the area. Maps and models proved to be useful tools for discussions and negotiations about land use zones. Villagers were to develop their own maps, and their own rules for land usage.
- At the structural level - prior projects by other organizations had already shaped the Watershed Management Networks – a multi-village, multi-ethnic group to coordinate land use management across larger sub-watershed landscapes in the area.
- At the policy level - The 1997 Constitution has provisions; on local participation in natural resource management; and on decentralization. Also a Community Forestry Legislation is under consideration.

ICRAF's Project

Realizing the above issues, throughout the years, ICRAF has worked on various sub-projects that can roughly be divided into three phases (superficially divided for simplicity, in reality phase one and two, time-wise, overlapped considerably). [55] In the first phase ICRAF concentrated on researching and developing scientific-knowledge of local land use. The second phase involved applying scientific knowledge to enhance villagers' participation in watershed management in the Mae Cheam area. The third phase focuses on bringing the acquired knowledge to the regional level and also to affect the national policy level. This case study will focus on activities of the first and second phases.

In 1996 the Royal Forest Department (RFD) [56] of Thailand established a projected called "the Northern Mountain Region Agroforestry Research and Development Project", which became the official framework for ASB – Thailand consortium. This marked the first phase of ICRAF's activities. The Thai partners initiated the interest to collaborate. The activities were to build from previous and on-going pilot research and development projects. The goals of the project were: 1) to understand processes & dynamics of land use change in Northern Thailand that is important for Montane Mainland Southeast Asia (MMSEA); 2) help develop technologies and policies that can improve land use management in the region. The hypothesis in the beginning of the activities was: understanding and better managing land use change in the mountains of northern Thailand would help both the local area and other areas of MMSEA. Funding came from mainly Asian Development Bank, Ford Foundation, and Rockefeller Foundation. A concrete result of the first phase is a comprehensive report. The report focuses on

[54] Synthesis Report (p.31-32)

[55] According to an interview with senior policy analysts of ICRAF – Thailand in May 2005

[56] Key actors in The Royal Forest Department later on moved to the Department of National Parks, Wildlife & Plant Conservation after restructure of government agencies in 2003.

trends in mosaic patterns of land use in the Mae Cheam region, especially land use practices of mountain minority communities and their impact on environmental services of upper tributary watersheds. [57]

The First Phase

During the first phase training/learning activities occurred mainly between researchers of the center in collaboration with Chiangmai University professors including graduate students and the Royal Forestry Department (RFD). The RFD supplied maps of watersheds; maps of forests; knowledge on natural resource management; and knowledge on existing and previous projects in the area. Chiangmai University professors used connections with the military to obtain district and sub-district maps; analyzed the socio-economic aspects; environmental aspects; and national policies and local government. ICRAF staff provided knowledge on GIS and modeling; managed the data collection efforts; exchanged information at the national through symposiums organized by the Thai government; and exchanged information at the international level such as with World Resources Institutes (WRI) and SE Asia Network for Agroforestry Education (SEANAFE). Thus ICRAF supplied both technical scientific skills and acted as a broker to transfer ideas to-and-from the international level.

The scientific research consists of collecting quantitative data on various topics about the area to produce GIS analyses such as: population; living standards; land use; crops grown; movement of people; river flows; villages; roads; level above sea water and etc. During the process of data collection and analysis, training occurred for graduate students of the university who helped with the project under the supervision of Chiangmai University professors. This could be considered indirect training, however. By far, most direct learning opportunities occurred between ICRAF staff, professors, and RFD scientists under a 'peer-to-peer learning through joint research' mode.

During this first phase there were some direct training involved as well. ICRAF staff trained central government officials in the RFD and local government officials in the region on topics such as: computer programs to draw maps (ArcView, ArcGIS); and how to make a GIS data-base. The trainings were conducted through a 'learning by doing' mode, usually with one or two computers for the trainees to try. However, this was not the focus of the first phase; ICRAF would conduct training when it was requested. These trainings did, however, help ICRAF to have a known presence in the area and helped build networks with the local government officials, which were important for phases two and three to follow. Also the trainings helped local authorities to have basic knowledge to further sustain map making activities in the area.

According to the Synthesis Report, an important component of ASB in Thailand is the issue of 'farmers in the forest' or ethnic minorities in the Mae Cheam area that faces land use problems such as opium production, shifting cultivation, rural poverty and the impact of their land use on protected forest areas and environmental services. The second phase of ICRAF's activities moved much closer to this group of farmers.

[57] "Landscape Agroforestry in Northern Thailand: Impacts of Changing Land Use in an Upper Tributary Watershed of Montane Mainland Southeast Asia. Synthesis Report: 1996-2004." David Thomas, Pornchai Preechapanya, Pornwilai Saipothong. (p.10) I will refer this as the "Synthesis Report".

The Second Phase

In the second phase, ICRAF received a grant from the Rockefeller Foundation to continue the center's efforts in developing science-based tools that can help improve local participatory watershed management and facilitate its integration into higher-level natural resource management policies and programs. [58] The science-based tools constituted two projects: participatory mapping; and monitoring water quality and rain levels with basic scientific tools. Following are the details of the two projects.

Participatory mapping activity is an extension to scientific research conducted in the first phase. ICRAF has chosen to work in 8 sub-districts with close collaborations with CARE-Thailand, who have been active in the area for over 20 years, under the Collaborative Natural Resources Management Project. The project aims to strengthen village conservation committees, watershed management networks, sub-district governments to manage local natural resources. [59]

The process of participatory mapping is the following: needs assessment with the villagers; ICRAF staff prepare a simple map of the village; have villagers/farmers help identify land use, types of forests, names of streams/rivers according to local language, and landmarks; ICRAF staff return to office computer to make digital printout, compare with other maps and make a comprehensive map; return to village for verification; prepare common maps for government official use; hold meetings with village networks and officials to solve land usage disputes; and update maps as necessary. [60]

The other activity is promoting the use of basic scientific tools to monitor water quality and rainfall in the villages situated in the Mae Cheam region. These tools are such as plastic bottles to measure rain levels; using simple thermometers to measure humidity; and observing aquatic insects to determine water quality. These tools were developed from elsewhere such as PhD dissertations and the Green World Foundation – a Thai NGO. They were introduced to the project by a key scientist of RFD who is an active partner with ICRAF. The villagers participate by regularly collecting data on rainfall, stream temperature, soil erosion, water quality, humidity and so on. Then ICRAF compiles the collected data annually to make a report and give back to the villagers. The report is used by the villagers to understand their environment and to monitor any changes.

The major mode of training/learning for this phase is direct training to villagers on how to use the simple measurement tools, how to read results, and regularly record results. Also there is direct training/learning about how to make maps, read maps, and make use of maps for natural resources management in the village and between villages. The villagers 'learn by doing' and those trained have become confident to the extent that they can teach others in the village and also in other villages through the watershed management network. [61] Training occurred in 78 villages for a total of about 312 villagers and 20-30 local government officials and other NGO staffs.

Other modes of training/learning includes supervised degrees to masters and PhD students both from Thailand and from the U.S; learning by doing with partners such as CARE-Thailand, village organizations, and ICRAF local staffs themselves (two Thais and one Karen); mentoring or peer learning with Chiangmai University professors and specialists from RFD. Thus the target of training/learning in the second phase includes: villagers and villagers' organizations; NARI scientists,

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[58] "Developing Science-Based Tools for Participatory Watershed Management in Montane Mainland Southeast Asia" Final Report to the Rockefeller Foundation. David Thomas, Pornchai Preeshapanya, Pornwilai Saipothong. ICRAF. 2004.

[59] Synthesis Report (p. 28)

[60] Interview with ICRAF staff July 2005.

[61] Interview with two villagers July 2005.

university professors and graduate students; The settings were workshops, seminars; laboratories for computer work; research partnerships; and networks with other groups engaged in the Mae Cheam Watershed area.

Summary of Learning/Training

In sum, this case study includes both formal training and informal learning. The formal training is ICRAF staff training NARES (local administrators, villagers, partner NGO, RFD officials) on computer software for map making, map reading, participatory map making methods, monitoring the environment techniques. The settings are usually in local government small buildings or in the villages that is being demonstrated. The informal learning is ICRAF scientists collaborating with Chiangmai University professors doing joint research on GIS analysis or an ICRAF scientist is an advisor to graduate students working on their theses. There were a total of 13 PhD students (7 Americans, 1 Canadian, and 5 Thais) and 13 Master level students (11 Thais, 1 Japanese, and 1 Laotian) that were involved at some point in the activities of phase one and two from 1998-2005. All of their researches contributed one way or another to natural resources management in the Mae Cheam area. Also informal learning occurred through research, meetings, seminars, with scientists from the RFD and other Universities such as Mae Joe University working on Agroforestry.

Results / Impact

Results/contribution of the training/learning would include:

- The fact that villagers now have and can use simple and acceptable tools to monitor the environment and land use (individual level). One village upstream was able to warn villages downstream of dangers of landslide and flood in advance when they realized that the rainfall was very high consecutively for days in their area. This helped prevented serious damages.
- There is participatory map making that helps articulate local land use zoning for use in negotiating and working towards localized land use agreements. Maps are used as scientific tool to negotiate with officials on various land use disputes. (individual and community level)
- The above results help empower villagers to have knowledge and confidence in their own NRM strengths. (community and network level)

Evidence of impact at the organizational levels and policy levels are such as:

- In collaborations with partners, ICRAF is currently beginning to test/apply Mae Cheam's ASB findings in other watershed sites with financial support from the Thai government. Also ICRAF is extending its activities to the whole Mekong Region.
- The Mae Cheam Watershed Management Network is becoming stronger. It is the first watershed network to receive funding from the government of 1.3 million baht this year (2005) under the national program to Restore the Ping River Basin. Within the Network there are 25 sub-watershed groups. The 8 sub-watershed villagers that participated with the participatory methods are now planning to train representatives from other sub-watersheds with little official help from ICRAF.
- According to interview, ICRAF's presence fills in the gap in Thailand's government structure that does not facilitate Agroforestry. ICRAF's ideals and goals support integration of agricultural, forestry, natural resource management and community building. This approach is very much needed in Thailand as the country is moving from relying on one-land one-crop mentality to more sustainable and diverse natural resources management practices.

There are negative/weak points to be considered as well:

- Some of the villagers were paid to collect data for both map-making and monitoring the environment. Now after the project is complete some villagers are not continuing the process. Therefore the maps are not updated regularly and the data analysis for environmental monitoring is not complete.

- The maps ICRAF made uses 'words' to label the various land use. But some villagers cannot read. CARE –Thailand has developed a new way by using the actual crop seed as symbol for villagers to know what is planted where. So they can see and feel the real corn seeds, rice, tea leafs and other crops on the map.

Existing Capacities

However, having stated the above, prior to ICRAF's presence in the region, other players such as the Royal Forest Department, Queen Sirikit Forest Development Projects, The Royal Project Foundation, and Raks Thai Foundation (or CARE-Thailand) were already active in the region. Most of the knowledge used in ICRAF related projects could be traced back to those existing projects. Among them was the Sam Mun Highland Development Project (1987-94) – a large scale project focusing on opium crop substitution, which pioneered 'participatory land use planning (PLP)' methods and 3-dimensional land use models (i.e. mapping). This influenced the participatory approach of using simple scientific tools to monitor water quality and participatory mapping by ICRAF. Although, ICRAF has integrated new knowledge, developed it further, and has created platforms for learning for people from various groups that were involved such as: policy makers, scientists, professors, volunteers, villagers, neighbouring watersheds, and the international community. Nevertheless the impact made by ICRAF should not be overemphasized, especially without making credit to other organizations.

An interview with RFD official confirmed the above when he said ICRAF's contribution is only about 1% of all the research and funding the Royal Forest Department is doing. Major partners for the Ministry of Natural Resources and Environment are the Australian government, CIDA, JICA, and International Tropical Timber Organization (ITTO). Also an official from CARE said ICRAF is valuable for specific research assistance such as GIS analysis and modeling but CARE is directly in the 'development' field and has the expertise on improvement of livelihoods. CARE has been making simple maps with villagers for a long time but just has not used computer technology.

Learning / Training Analysis

This case represents mixture between a 'collaborative research case' and a 'closer to farm/extension case'. Referring to the tentative framework of 'Evolution of Agricultural Systems and the Role of CG" this case study demonstrates that there is a rough linear movement from stage two to stage three in the first and second phase of ICRAF's activities. Also the third phase from 2004 onwards ICRAF is moving towards more regional research and collaborations, at the same time showing more influence at the policy-making levels through partnering with the NARI. Evidence are such as: ICRAF's international staff becoming an active consultant for the Ministry of Natural Resources and Environment at the policy level for participatory watershed management; a proposal to Rockefeller June 2004 to conduct similar research in the Greater Mekong Region (Vietnam, Lao PDR, Yunnan).

Future of ICRAF

Currently as ICRAF plans for new activities that are extensions of phases one and two, there is evidence that priority setting is led by the NARI because ICRAF now makes proposals to the Thai government to undertake research projects and consult in Agroforestry according to the needs of the government. Therefore, this confirms that as agriculture evolves the role of the center in setting priorities diminishes. However, ICRAF would still be considered a strong partner in the subject for the Thai government especially for Agroforestry. This is so because of the ICRAF's own capacity on specific scientific knowledge on GIS analysis, and strong networks with Chiangmai University professors and other university and research centers in the region such as Vietnam, Laos, and China.

Conclusion

The case demonstrates ICRAF's activities in Thailand and the region. ICRAF is an important partner for research projects for universities. This is clear in the first phase. In research projects, learning occurs for all participants. University researchers learn as much as ICRAF's scientists themselves. There was no direct training but rather a peer-to-peer learning mode. The research relied equally on expertise from all sides. The intention to develop capacity for a particular group was not clear. It was rather to enhance the 'knowledge' on Agroforestry itself.

In the first phase there was minor direct training to the local government officials on computer and mapping skills. This was not the major aspect of the project. But it did help lay the foundation of knowledge for local administrators on the subject in order to prepare them to the second phase.

In the second phase there was direct contact with the villagers, NGOS, local administrators in the field under studied. The training / learning occurred through the activities of making maps and implementing tools to monitor the environment together with the villagers. The intention was to develop the villagers' and the communities' capacity in natural resources management. ICRAF had a distinct role in putting together existing knowledge from partners, including the Department of Forestry and Chiang Mai University to develop and implement these tools.

Evidence of capacity enhancement for the villagers is such as some usage of maps to resolve land-use disputes. However the question still remains as how long the activities of environment monitoring will continue once ICRAF has stopped its interventions. Also it is nearly impossible to assess its contribution to great goals such as poverty reduction or sustainable agriculture. But the concept of having a map for decision-making of land use should somehow contribute to finding solutions to slash and burn practices in Thailand.

However, overall ICRAF's activities are seen as positive and successful. This is due to the existing strong capacity of the NARS and the potential of villagers' networks to take on large scale IRNM projects. ICRAF shows efforts to shift its focus to the region and to the policy-levels in Thailand. One last observation is the fact that this case relies largely on the leadership of the long serving ICRAF scientist in Thailand. ICRAF's role is expected to diminish when he retires. The table below summarizes this case for both phases.

	NARS Capacity	Outcomes	Results
Productivity, intensification and yields	-	-	-
Managing farming systems	More graduate students know scientific knowledge for GIS analyses and modeling, socio-economic analyses, environmental impact studies. (esp. phase 1)	More research generated. More experts in the field of Agroforestry.	Better research on specific practices of agroforestry and NRM for upland Thailand.
Bridging the 'adoption gap'	• Participatory Mapping • Participatory monitoring of environment by using simple tools • Village organizations strengthen *(esp. phase 2)*	Greater uptake of innovative technologies. Updated maps to use in natural resources management disputes: upstream and downstream villages; community forest boundaries and national parks.	Solving disputes, cooperating-strong network in managing the watershed area. Sustainable, planned land use. Monitoring environment and capacity building/empowering villagers
Policy, national level impact	Scientific research to support tools for participatory NRM and pilot projects to make/advocate policies *(future phases)*	Enhance new initiatives to expand participatory practices of NRM to other watershed areas of the country	Other watershed areas can learn from Mae Cheam area. Hopefully resulting in sustainable NRM schemes. National policies moving in the same direction.

References

"Developing Science-Based Tools for Participatory Watershed Management in Montane Mainland Southeast Asia" Final Report to the Rockefeller Foundation. David Thomas, Pornchai Preeshapanya, Pornwilai Saipothong. ICRAF 2004.

"Landscape Agroforestry in Northern Thailand: Impacts of Changing Land Use in an Upper Tributary Watershed of Montane Mainland Southeast Asia. Synthesis Report: 1996-2004." David Thomas, Pornchai Preechapanya, Pornwilai Saipothong.

Interviews

1. ICRAF staff
- Mr. David Thomas (CM office) – International Scientist
- Ms. Anantika Ratnamhin (CM office)
- Mr. Sonat Natee (Mae Chaem office)
- Mr. Sunthorn Sepan (Mae Chaem office)
- Mr. Thanat Promduang (former project staff)

2. Partner staff
- Dr. Pornchai Preechapanya, the Royal Forestry Dept.

- Mr. Wuthikorn Khojornrungrot (CARE Thailand)

3. Volunteer villagers involved
- Mr. Somyos Chokskullert
- Mr. Sudee (Village Head)

ANNEX XIX
Vietnam country report

Introduction

Vietnam is a country with agricultural based economy. The agriculture sector has achieved a high and stable growth which has turned Vietnam from a food deficit country into the world's second-largest rice exporter. This achievement thanks to the change from centralize economy to market oriented one of macro-policies, besides, the rapid changes in science and technology in agriculture has played a crucial role to these achievements.

Despite these high successes, Vietnam still is a poor country with low agricultural productivity. In order to become a strong country, the state has increase investment in agricultural research for rapid change in science and technology.

Important policies on science and technology in agriculture

According to the Master Plan for Agricultural Research in Vietnam, the Government intends to increase investments in science and technology, focusing on the seed sector and on technical procedures for higher economic efficiency besides maintaining the activities of existing research institutions (UNDP/FAO VIE 98/019.08, 2001).

Agricultural Research system

Information and new technology in agriculture can transfer to farmer via several ways: agricultural research system and agricultural extension under the management of Ministry of Agriculture and Rural Development, Agricultural Universities (under the management of Ministry of Education & Training and Ministry of Science & Technology).

Agricultural research system
Vietnam has 32 agricultural research institutes and centers, of which 22 are under the Ministry of Agriculture and Rural Development (MARD). Coordinator for Research fund is granted through Ministry of Science and Technology, but research institutes are under MARD's control. Some projects and programs are managed by Ministry of Science and Technology, some are managed by MARD. Agricultural Research institutes are classified into 3 kinds: the specific research institutes specializing in technologies, soil and fertilizers, plant protection, post-harvest technology, etc. The others are regional research institutes such as Vietnam Agricultural Science Institute (VASI, Northern), Southern Agricultural Science Institute, Mekong River Delta Rice Research Institute, etc. Some specific research institutes such as National Tea Research Institute, Coffee Research Institute, Sugarcane Research Institute etc are under the management of enterprises.

Agricultural Colleges
Research from Agricultural Colleges can be funded from Ministry of Education and Training or Ministry of Science and Technology. Their findings can contribute directly to farmers/farmer clubs or via co-operatives as well as extension system by short training courses. There are joint research among agricultural institutes, agricultural colleges, extension agencies, international non government organizations or even national non government organizations. However, this integrated information system link is weak. (Chart 1)

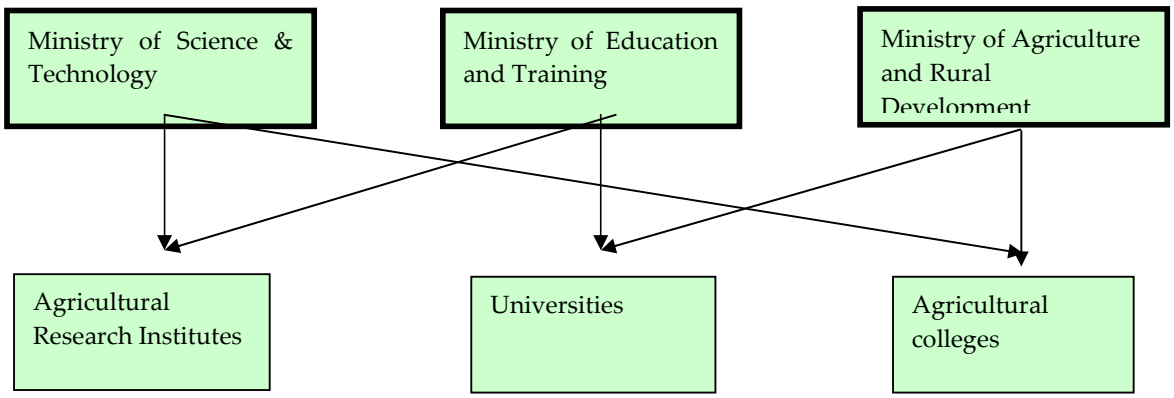


Chart 1: Agricultural research organization

Agricultural Extension System

The official extension system was established in 1993, under the management The Department of Agriculture and Forestry Extension of Ministry of Agriculture and Rural Development (MARD). The system ranges from the central to the grassroots. It has organized on four levels: The national (central) department, the provincial (Extension Center), the district level (Extension Station), and the village (extension agencies/ or Farmers Clubs).

Information and new agricultural technology can deliver to farmers by official extension system via many channels. (i) Companies (private/public) have provided farm inputs and others service units. They also play an important role in agricultural extension when they deliver their products directly to farmers or advertise their products via mass-media. The other organizations (i.e. Youth groups, Women's organizations, Farmer associations) play an intermediate role in providing information and supporting technology transfer to farmers, either directly or in cooperation with the official extension system. In provincial level, Extension Center plays a main duty in addressing extension program from Agricultural and Forestry Extension Department of the MARD and link other organizations that has worked in agriculture. At district level, extension station is the one to put into the practice extension programs. There is also the joint among agricultural organization to carry out extension activities. At village level, extension agents joint with agricultural organization (agricultural colleges) address directly to farmers or farmer groups for transferring technology (Chart 2)

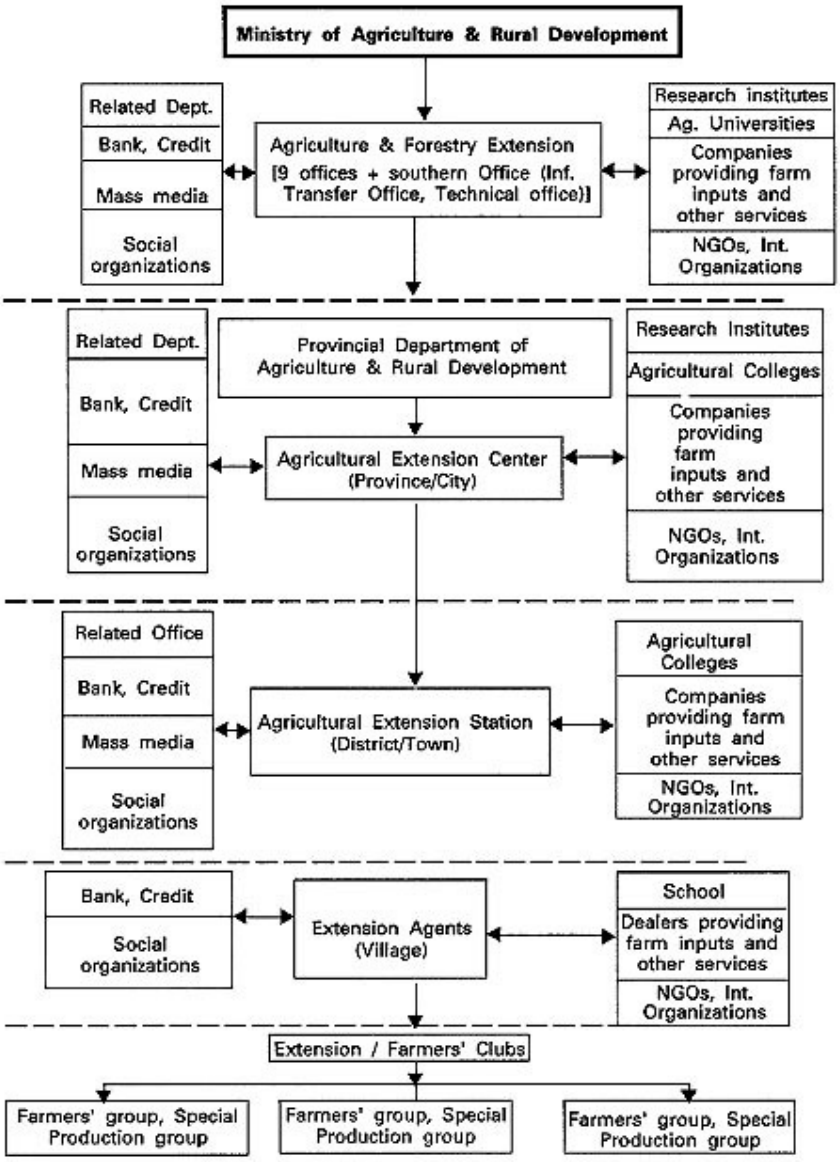


Chart 2. Agricultural extension system

Source: Food –Fertilizer Technology Center (FFTC). The flow of information in the national extension system and current information needs in Vietnam

CGIAR and Vietnam collaboration

Vietnam has collaborated with many International Agriculture Organizations in order to develop its agriculture and rural development in which Consultative Group in International Agricultural Research (CGIAR) is one of them.

The International Rice Research Institute (IRRI)

IRRI was established in 1960 to conduct research that helped developing countries grow more rice . Its financial support came through the Consultative Group on International Agricultural Research

(CGIAR). The Institute's interdisciplinary approach was based on close collaboration with national agricultural research system and advanced laboratories worldwide. Vietnam and IRRI have enjoyed a long, fruitful history of collaboration by adoption of IR8 in 1968. After reunification of the country in 1975, IRRI and Vietnam has re-established contact. Planting modern rice varieties of short duration, improved management of resources, and appropriate government policies in agriculture had planed with the help of IRRI. These activities included:

Improvement of rice varieties

Exchange of germplasm between Vietnam and IRRI had been established from 1968, since then, a total of 42 breeding lines had been released. Since 1983, IRRI had helped Cuu Long Rice Research Institute for developing hybrid rice technology for farmers in Mekong Delta provinces. In 1992, CLRRI released IRRI hybrids IR6461H and IR6416H as URL1 and UTL2 in demonstration field. Hybrid Rice Center, Vietnam Agriculture Science Institute, Northern Vietnam has continued to do this research for releasing hybrid rice verities in Northern and Central Vietnam.

Vietnam also participated on the International Network for Genetic Evaluation of Rice (INGER) coordinating by IRRI for exchanging and evaluating of promising breeding lines among rice –growing countries.

Germplasm conservation

Vietnam's participation in IRRI's germplasm conservation program had resulted in 1,895 registered accession and 10 samples of three wild rice species. Since 1995, IRRI had collaborated with Vietnamese institutions to carry out research using on- farm conservation of the gene pools (Fact about Cooperation-Vietnam and IRRI).

Biotechnology.

Vietnam is a member of ARBN (Asia Rice Biotechnology Network), via this activity, IRRI helped CLRRI in variety selection strategy via photon marker. This method helped in rice variety selection which resistance to brown plant hoper (BPH), Blast, tolerance to acid sulfate soil and diseases. With this program IRRI has trained for CLRRI one Post Doctor, 1 Ph.D. The collaboration IRRI-CLRRI on "Micro Nutrition Dense Grain Quality in Gene Transformation and Golden Rice project has done. Besides, CLRRI is one member of Consortium of Eco-tilling Functional Genomic, when ever they need, they can take the material with them go to IRRI for analyzing.

Sustainable rice farming systems

Research in integrated pest management (IPM), integrated nutrient management,"3 reductions 3 gains" for improving farmer benefit in rice production, improved water management and rice based farming system was new dimensions for sustainable intensive agriculture in Vietnam.

Social Sciences an economic researches

IRRI has collaborated with several Vietnamese institutes for conducting social sciences and economics research in the country: The Impact of adoption modern rice technology, the experience in hybrid rice adoption, and gender issues in rice based farming system.

Training of Vietnamese scientists

Human resource development had been emphasized in Vietnam-IRRI collaboration. From the beginning up to 2004, there was 639 scientists have trained at IRRI of which 28% are female. Almost of them has followed group training. Many of them held key position in Vietnam agricultural Institutions. (Table 1)

Table 1 Vietnamese scientists have been trained at IRRI 1964- 2004

Period	MSc	Ph.D	Research Fellow	Non-degree	Group training	Total	Female	% female
1964-1975	2	2	2	8	16	30	7	23.33
1976-1994	25	7	5	82	222	341	76	22.29
1995-2004	19	17	0	97	135	268	98	36.57
Total	46	26	7	187	373	639	181	28.34

Sources: Vietnam-IRRI partnership and IRRI 's Training Center

CIMMYT in Vietnam: Collaboration between NMRI and CIMMYT in 2001- 2005 period

Activities	Duration	No. of participants	Fund (US$)	Results
Project: ***Asian maize biotechnology network***				
1. Genetic Diversity Analysis 2. MAS for quality protein maize 3. Mapping of drought tolerance in maize	2002- 2004	20	30,000	Enhanced capacities in applying Biotechnology in maize breeding
Project: ***Improving farmer's income through enhanced maize productivities in drought prone environments in East and Southeast Asia***				
1. Evaluating and selecting germplasm from both CIMMYT and Vietnam for drought tolerance 2.Developing new varieties from selected Germplasm 3. Disseminating new varieties into productions	2005- 2007	30	13,300	Beginning from July, 2005
Other cooperation				
1. Conducting testing new varieties which are developed by CIMMYT in 2 locations of Vietnam 2.Visits, workshops: annual, there are about more than 10 NMRI staff attending short training course or study tour, which organization by CIMMYT. There also are about 5- 10 visits Vietnam of CIMMYT experts for training, Scientific workshop, meeting 3. Change information: CIMMYT usually send NMRI new publications and annually, NMRI send reports to CIMMYT	annual	6		

The activities of the first project:

- Offering a training course on biotechnology in selecting maize varieties in Vietnam for 20 persons
- Equipping a biotechnological lab. With the value US$ 10,000
- Analyzing genetic diversity of 300 seed's sources from CYMMYT and NMRI

It is difficult to evaluate the impact of the collaboration between CYMMYT and Vietnam because it was continuing from years long ago. However, we can say that the help from CYMMYT has contributed to the maize development in Vietnam via the training and material.

CIP-Vietnam

A. General Background

CIP has collaborated continuously with Vietnam since 1981 up to the present. The CIP-Vietnam relationship is very useful in root crop development. Its activities in Vietnam can be classified into five categories:

1. Consultancy

CIP's scientists have visited Vietnam via consultancy activity. It helped Vietnam in enhancing capacity of NRIs via training activities even during the time Vietnam was under USA's embargo. Eight CIP scientists have contributed as long term consultants between1982 and 2005. In addition, Vietnam's government offered the Friendship Decoration to CIP's Director General, in 1993 for the acknowledgement the good collaboration between Vietnam and CIP in R&D in cassava, sweet potatoes and other root crops in Vietnam.

2. The role of catalyst in looking for funding for Vietnam

Since 1981 up to now, CIP has played a catalyst role to help Vietnam in getting fund for many international projects to undertake research in root crops.

i) IDRC, Singapore has funded for Vietnam in the Genetic Selection root crop project.
ii) The R&D in planting potatoes by hybrid potatoes seed. This project is divided by two phases:
    Phase 1: 1994 – 1997
    Phase 2: 1997 – 2000

The program included Vietnam, Philippines, Indonesia and Sri Lanka. Thanks to it Vietnam has planted 4000 hectares potatoes by hybrid potatoes seed every year at that time. From 1997 to 2000, Vietnam was granted a project: Hybrid True Potatoes Seeds by ADB via the catalyst of CIP. This program helped VN planting 4000 hectare potatoes per year. The program integrated crop and livestock: sweet potatoes-Pigs run by Ms. Nguyen Thi Tinh.

3. Material supplied

Since 1982 up to the present, CIP is continuously offer root crop seed for VN:

- Potatoes seed by HYB-TPS (Hybrid true potatoes seeds);
- Germplasm Potatoes distribution. This program has helped Center for Root Crop at VASI created a lot of good potatoes varieties such as: KT-2(1995), KT-3 (2000) and VC-3806 (2002);
- The program of HyB-TPS with many seeds have sent to Vietnam from CIP such as HPS II/67 (Hong Ha 2 in Vietnam name), HPS 7/67 (Hong Ha 7).

In the present time, CIP has given for VN the two seed sets:

- -Late Blight (*Phytopthora infestans* Mont. Der Bary);
- -Potatoes seed with virus resistant .

Regarding R&D in sweet potatoes, Dr. Peter Van Dezags, the CIP's scientist and Dr. Mackey, IDRC's scientist has established a group in looking for fund to do research in sweet potatoes in Vietnam. Later, in 1989 the three Vietnamese scientists : Dr. Hoang Kim, Dr. Nguyen Van Quang and Dr. Mai Thach Hoanh left for the Philippines to attend a short training course in selection PTC of root crop via the advisory of Dr. Per Van Dezags. Due to the successful of this program, in 1991, IDRC approved a project to establish root crop program for all the three regions of Vietnam.

4. Scientific document

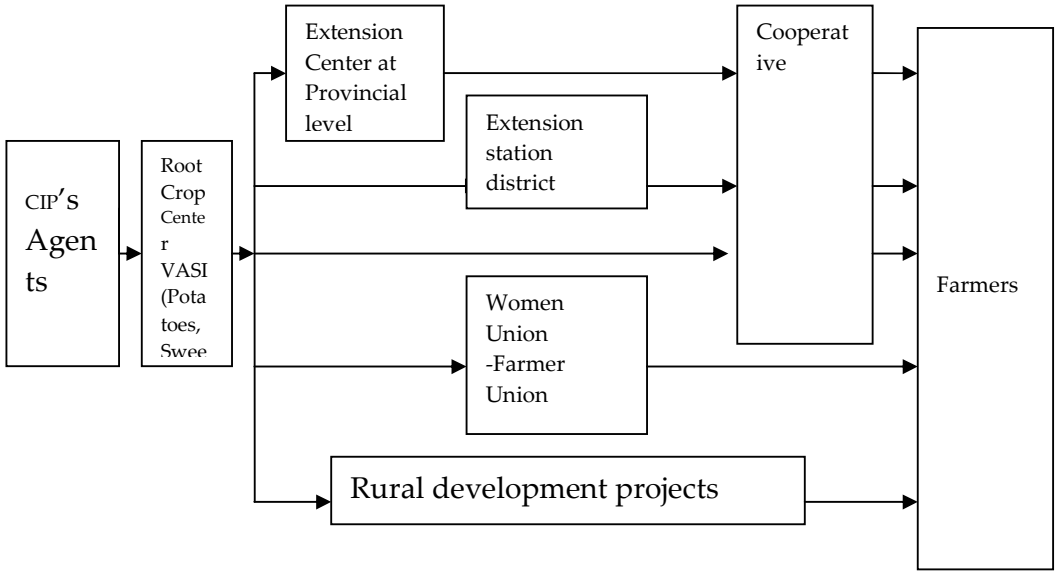
CIP has sent a lot of valuable scientific document in method of research and other valuable scientific document. This has improved research capacity in potatoes and sweet potatoes of Vietnamese scientists.

5. Training

CIP has helped Vietnam in enhancing NRI capacity by funding to Vietnamese instructors and researcher to pursuit degree course as well as non-degree course. There are at list three instructors to gain Doctor of Philosophy [62]and approximate 10 persons who have gotten master degree via CIP's scholarship[63] . It was around 150 person times going to CIP's locations in the Philippines, Indonesia or other CIP's locations in the world for attending short training course in root crop (please see the list of ex-trainees, VASI).

CIP's methodology in training and approaching to farmers via scientific agents, extension workers, short training course, classroom, laboratories practice. (Germplasm Management, Seed selection, etc.) As well as on farm research through cooperatives or women and farmer union via method of learning by doing. The network has approached farmers in divers channel as presenting in the figure below.

Figure 1 Network in Root Crop development in North and Center, Vietnam



Nowadays, there are several programs from VASI in connecting with CIP's locations:

1. Program of integrated between Cropping and Livestock in Sweet potatoes-Pigs.
2. Research on Potatoes seed selection.
3. Scientific material, visiting scientists, consultancy.
4. Collaboration with Root crop Center in the Northern Philippines via CIP

CIP's Scientists visit VASI twice a year.

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[62] Dr. Pham Hong Duc Phuoc (Former Head, Department of International relationship, Nong Lam University, HCM City)
Dr. Pham Xuan Tung (Deputy Director, Institute of Agricultural Science of South Vietnam)
Dr. Vu Dinh Hoa (Head, International Relationship, Hanoi Agricultural University)

[63] Mr. Dao Huy Chien, Director, Root Crop Center, VASI

CIP direct managed the program in seed root crop selection. This is collaboration among CIP-VASI- and Department of Agriculture and Rural Development- Da Nang province (Center Vietnam).

ICRISAT in Vietnam

The Legume Research and Dev. Center (LRDC) at Vietnam Agricultural Science Institute (VASI) has collaborated ICRISAT for years. Almost of its staff were trained at this center, besides the increasing of knowledge on their major field, they have improved their capacity in research methodology and a scientific report. Furthermore they knew how to collaborate with international scientists and doing international projects. Since 1988 up to the present, ICRISAT has continued to help this center with many activities:

- 1988-1993 Project on farm research network. This is a Cereal Legume Asian Network (CLAN).
- 1995-2005: A project on Improving Watershed management. There are several countries participated in this project such as China, India, Thailand and Vietnam. The ICRISAT played a crucial role on this project. It is divided into 2 phases: the first phase was in principal research (1995-2000) and the second phase was expanded to the extension activity for farmer involving (2000-2005). The main theme of this project is improving the natural resources management of sloping land in Northern Vietnam. In this context, soil is protected and increasing its fertility via rotating peanut with maize seasonal during a year. Via this project, there were 4 staffs to be trained in short time and 2 staffs with Master degree by the ADB's scholarship.
- - The "Program for Farmer Participatory Improvement of Legume Grain in Rainfed Asia" (IFAD Technical Assistant Grant No. 532 ICRISAT 2002-2005) included Vietnam, China, India and Nepal. In Vietnam, there were several National Agricultural Research Institutes that involved to this activity including (i) National Institute for Plant Protection, (ii) The Legume Research and Dev. Center (VASI), (iii) Institute for Vegetable Oils; Aromas and Cosmetics Ho Chi Minh City; (iv) Vietnam and Plant Genetic Department (VASI). One international workshop was held on 12-17 May, 2005 in Vietnam for exchanging the research findings. It also offered for 2 Vietnamese scientists visited China via the exchanged scientist program among the participated countries. Poor farmers gained from this program in improving their crop productivity via the following activities:
    - Transferring new technology
    - Giving new varieties,
    - Multiplying variety training

In this activity, the Legume Research and Dev. Center at VASI invested variety, fertilizer and pesticide for farmers with free of charge in the first time, and later, farmers can multiply themselves. The activities of this program followed these steps:

- Training farmers at Cooperatives' offices;
- On farm training practice, especially for minor people farm (Tuyen Quang province, Northern Vietnam);
- It was evaluated the results on the first season at the harvest time by the evaluation team including government officials at Provincial and District level : the Department of Agriculture and Rural development, Extension staffs and commune's officials. On this occasion, there were also many other farmers invited as observers. Farmers who involved on this program selected suitable varieties themselves for the second season on harvesting time with the consultancy of VASI's scientists. Since the third season, farmers multiplied varieties and trained themselves with the technical support from LRDC, VASI. By good evaluated results, Department of Agriculture and Rural Development at provincial level would expand this activity for whole the province.

The network among the following institutes has established for legume crop extension:

- The Plant Protection Institute in charge an IPM issue;

- The Legume Research Development Center supplying variety;
- The Institute for Vegetable Oils (Department of Industrial crop);
- Extension agencies at all levels;
- Private seed company;
- Private Fertilizer company.

Via TOT (Training of Trainers), they have trained farmers to be extension agents directly; farmers exchanged their knowledge, experience, and used technologies themselves. In every workshop, farmers have presented their activities in seed production. This activity has expanded to whole area in province.

Since 1988 up to the present, ICRISAT has continued to help the Legume Research Development, VASI, to focus on peanut study. With this collaboration, it would help farmers to enhance their capacity in peanut production, scientific knowledge, increasing productivity and improving farmer income and their livelihood.

Conclusion

The collaboration among several International Agriculture Research Institutes of CGIAR has helped Vietnam in developing agricultural research and technology transfer as well as staff training. There are several top leaders of Vietnamese agriculture sectors were trained at IRRI (Dr. Bui Ba Bong, Deputy Minister, Ministry of Agriculture and Rural Development, Dr. Bui Chi Buu, Director, CLRRI…). This suggests that the collaboration has enhanced human resource development in Vietnam. Besides, the help of these institutes will be useful for NARIs of Vietnam especially in future; trade liberalization will create many challenges for Vietnam on the competitiveness among the world agricultural products.

References

Ministry of Agriculture and Rural Development and Food and Agriculture Organization of the United Nation. 2001. Master Plan for Agricultural Research in Vietnam

ANNEX XX
Case studies from Vietnam

CASE STUDY 1: SWEET POTATO AS PIG-FEED

Center: CIP
Theme: livestock, crop breeding

CIP R&D of Potatoes in Vietnam and the program of crop livestock integrated: the case of Sweet potatoes-Pig rising

CIP has helped Vietnam in development of sweet potatoes since 1997. At that time CIP and UPWARD's organization has developed a poor regions in Northern and Center Vietnam by root crop .Ms. Dai Hung Peter, CIP's scientist, introduced the program of improved integrated crop-livestock system by the case of Sweet potatoes –Pigs. Based on the needs of farmers, who did not know how to reserve sweet potatoes after harvesting .The program has supported farmers new sweet potatoes varieties, with high vine and root yield and method in processing sweet potatoes in reserving for longer use to feed pigs. There are three groups of researchers to participate to this program:

1. Agronomy group: Associate professor Mai Thach Hoanh, VASI: Dr. Nguyen the Yen (food crop);
2. Animal husbandry: Ms. Nguyen Thi Tinh;
3. Veterinarian: Dr. Nguyen Van Thach, Hanoi Agricultural University.

Regarding sweet potatoes varieties, VASI would give it to farmers with free of charge. However, they have to pay a half of cost of pig and the other half of cost to buy pig was given by CIP and UPWARD. All related document instructs how to plant sweet potatoes and process them for pig-feed was given free of charge too.

Selecting and growing sweet potatoes

In 1997, Helela, name of sweet potatoes variety was introduced to VASI with characteristics of high vine and root yield as well as high protein. It can be eaten raw by pigs. Helela was multiplied into the new variety namely H12. Its vine yield was about 25- 30 tons and its root yield was approximately at 10 tons per hectare. H12 variety can plant in drought area, it resists to dry leaf disease. Areas under this variety were about 1000 hectares and accepted as national variety. The other variety : TV1 (TQ1) was developed 1995 when Associate Professor Mai Thach Hoanh worked two months at Xuchau Institute, China. TV1 variety with a characteristic of short maturation can grow in winter season after harvesting rice. They were evaluated and planted in the area of more than 3500 hectares in Quang Xuong and Cam Thuy which are mountainous districts, belong to Thanh Hoa province. Since 2004, these varieties have expanded for planting in several provinces such as Thai Nguyen (Pho Yen districts), Ha Tay (Hoai Duc, Phuc Tho district), and BAC Giang (Hiep Hoa and Viet Yen district). The other popular sweet potatoes are K51 and KB1 with high yield in vine and root were developed at VASI can be seen in a large area in North-West Vietnam. Developing sweet potatoes returns benefit for farmers in the three aspects:

1) Farmer have green leaves for pig rising;
2) Reducing percent of fallowed land in drought area because this land covered by sweet potatoes;
3) Integrated planting sweet potatoes in annual trees area, wild weed can not grow, and protecting soil from erosion.

Processing of vine and root for pig-feeds

There are 3 formulas for processing pig-feed:

1- Fermenting fresh chopped vine and root of sweet potato plus 5% of salt;
2- Pre-wilting chopped vine and root of sweet potatoes under the sunshine for one day and plus 5% salt;
3- Using the first formula and adding 10 kg rice bran, chicken manure and 5% of salt.

Farmers can apply one of the three above formula; however, the third one was evaluated as the best. All of material is ensiled for fermenting. It requires an anaerobic environment. So the pre-requisite condition for fermentation is to eliminate as much as the air from the fermenting material. After 20 to 25 days fermenting, it can be eaten by pigs. This kind of feed can reserve for pigs to eat for 6 months.

The program of seed potatoes –pig rising has applied to 6 provinces: Ha Tinh, Nghe An, Thanh Hoa, Ha Tay, Bac Giang, Thai Nguyen where they have a large area with SP and rising pigs. Initially, they collaborated with the extension centers/stations of provinces/districts to conduct the training, but these activities failed because they could not approached farmers who are pig- rising and interested with the program. Finally, the program has conducted by the way training of trainers (TOT) and farmer to farmer (FTF) since May 2002. By this way, the program can approach the target groups with low cost. They has selected the appropriate communes and chosen 3 participants for each side to open the course training to trainer (TOT). The 2 participants should be leaders of the commune such as Head of Farmer, Women Veteran…etc Unions. The third person has to be a farmer, who is planting sweet potatoes and rising pigs. With this way, after attending the course, participants would open the course for farmer to farmer (FTF).

- The course lasts 4 days with the contents as following;
- 2 days for organization and method of processing,
- 1 day for sweet potatoes planting technique and
- 1 day for veterinary aspect.

Using LCD and Over head projectors, Ms. Nguyen Thi Tinh has given them a lot of pictures on the SP planting and feed processing as well as the way for pig rising at the course .All the material were supplied to farmers by the organizer with free of charge.

The program in practice: 6 farmers were interviewed in Aug.8, 2005 in Hong Tien village, Phu Yen district, and Thai Nguyen province:

1) Ms. Nguyen Thi Dung , Head, Farmer union
She attended TOT training course in May, 2002. There were 30 participants from 7 provinces[64] in Northern and North southern coast attended this course.

After attending this course, Ms. Dung organized 4 farmers to farmers training courses (FTF) with the same contents for 120 participants during 3 years from 2002 to 2004. The first course was organized at her house and the rests at the Cultural House of the communes. In comparison with the traditional way with the new method in pig rising, farmers can save a lot of money and time because of not to buy much vegetable and cooking feed for pig. Besides, the quality of pigs is good, it has not much fat and fast growth. Income from pig rising has increased from 20 % in 2002 to 30% in 2004. This program has benefit to farmers in many ways, women labour force is released from cooking for cultural

[64] Name of 7 provinces: Hung Yen, Hai Duong, Ha Tay, Thai Binh , Thai Nguyen, (Northern) , Nghe An, , Thanh Hoa (North Central Coast)

activities. (Ms. Nguyen Thi Dung, Aug.8, 2005). However, there were approximately 10% of participants failed because they did not follow the technique in feed processing exactly. Besides, due to the low educated, they do not know much the names of medicines and how to take care pigs when they were gotten disease. Ms. Nguyen Thi Dung suggested that the time for learning veterinary and how to take care pigs should last longer in stead of lasting only a haft day.

2) Mr. Duong Van Ho

He has trained via the FTF course from Ms. Nguyen Thi Dung in 2002. Due to good pig rising in practice, he became a trainer in TOT training course in the second course at the commune.
Mr. Ho attended the first FTF course at Ms. Dung house with the other 28 persons from the same commune. The contents of the course covered how to plant SP and feed processing as well to prevent disease from pig. After the course, he has applied the method of feed fermenting right away. Material for processing can be SP vine, cassava leaves…. Before attending the course, he used to raise only 4 to 6 pigs for each batch, but from the time he has learnt the new way in pig rising, he raises more than 30 pigs per batch.

After the first course at Ms. Dung house, Mr. Ho accompanied Ms. Dung as a role in veterinary to open the FTF training course with 40 participants. However, there were only 55% of them (22 persons) who has applied a new method, the rest 45 % refused to do because they did not believe the new method as well status quo situation they did not like to change their old habit in pig rising. According to Mr. Ho, his income increased 20 millions VND per year after applying the new method in pig rising. Beside, almost of his land is planting SP in stead of let it to be fallowed in the winter season after harvesting rice as before. He is now doing not need hire his labor. The quality of meal every day is improved with meat more than four times as before with vegetable only. With income increased, he has bought more land for his son, motor bicycle, a truck and built a new house. His life is changed from the time to attend the training course in SP-pig rising.
Suggestions from Mr. Duong Van Ho:

- This program should expand as must as it can to help farmer changing their life
- Should introduce new SP to farmers
- Should maintain the training course every year for farmers
- Should synthesis the Ex and Proof the program and multiply the success case in the commune

3) Ms. Dam Thi Thao, Head, Nong Dan Union in Hong Tien commune:
In 2002, when Ms. Thao did not participated to the program yet, she learnt how to ferment pig feed via the other farmer in the commune. She wished she would be participated to the training course. In 2003, she has participated to the training course at the Cultural House, Dong Xinh hamlet, Hong Tien commune, Phu Yen district, Thai Nguyen province. There were 30 participants, all of them from the same commune. They have learnt the new way in planting SP, fermenting pig- feed and veterinary. The most benefit for farmers is do not need to cook feed for pigs or to get vegetable every time. She has used cassava leaves, peanut leaves and other vegetable in fermenting pig- feed. Profit from rising pig has increased 3 times in comparison with the traditional method due to saving a lot of wood in cooking, not to buy much rice bran and saving time , labour force because of not to cook pig feed.

Among the 30 participants of the course, there were several persons who did not apply this method because they do not have land for planting SP, or did not apply exactly the formula in fermenting feed-pigs so pigs refused to eat. As Mr. Duong van Ho, Ms. Thao also suggested this program should maintain and expand due to more benefit to farmers.

4). Mr. Do Hong Nhi,
Mr. NHI has participated to the SP-Pig rising via the course organized by Ms. Nguyen Thi Dung. It is the first training course via FTF (farmer to farmer), all the three instructors has learnt the method of SP planting and Feed processing from Ms. Dung (Mr. Dai. Mr. Toan and Ms. Dung). This time, they were supplied a chopping machine the total participants were 30 but there was only 10 persons has applied this method in because farmers like to plant more valuated vegetable with fast in getting returns. However, they like the new SP variety, K51 because of the good eating quality and high yield of vine as well as the roots. From the time participating to the training course, Mr. Nhi has saved much more money because he did not buy much rice bran or instant mixed bran as before. According to him, the cost in pig production by the new method has reduced 40 %. He suggested the program should pay more attention on veterinary.

On that time, we have visited the other two participants of this program: Mr. Nguyen Van Thang and Mr. Hoang van Cu. All of them still rising pig with the method of fermenting pig feeds. Everybody is happy due to the large benefit of the program has brought to them.

CASE 2: THREE REDUCTIONS-THREE GAINS

Center IRRI,
Themes: NRM, Crop Protection Socio-economics

Introduction

With the introduction of policy reforms market orientation under Doi Moi in the late 1980s, rice production in Vietnam increased dramatically. Since then, Vietnam emerged from a country of near famine to become the world's third largest rice net exporter after Thailand and the United State (Vo Tong Xuan, 1995). Almost of exported rice is produced from Mekong River Delta. In the Delta , farmers grow 2-3 rice crops a year with highly amount of seed (200-300 kg/ha) because of direct seeding technique . Nitrogen applications are also high, about 150-200kg/ha. In addition, for protecting crops, farmers apply more pesticides than considered necessary.

Research findings from scientists have shown that crops enriched with nitrogen can make insect pests produce more eggs, survive better, live longer and are ecologically more fit (Lu et al., 2003). Dense crops from high seed rates and high fertilizer rates are more disease generating (Webster and Gunnell, 1992). Facing this problem, there are many programs aim to reduce pesticide use such as the project starting in Long An province (Mekong Delta) in 1994 to motivate farmers to reduce early season insecticide use (Escalada et al.,). The IPM program also motivates farmers not to use much pesticide. These programs did not emphasize the use of seed and nitrogen higher than they are needed.

At the workshop on integrated nutrient and pest management organized in IRRI on May 2002, considering the problem in rice production in Mekong River Delta, Vietnamese scientist included Dr. Pham Van Du[65], Dr. Pham Si Tan[66] and Mr. Nguyen Huu Huan[67] generated the ideas how to help Vietnamese farmers not to use much seed rate, fertilizer and pesticide as before. IRRI scientists included Dr. Heong , Dr. Pala and Dr. Roland, helped to develop this ideas became an initiative "Three Reductions, Three Gains" to help farmers easier remembering the reduction of seed rate, fertilizer and pesticide use in the context of maintaining the high yield for increasing their profit. The

[65] Head, Department of Plant Pathology, Cuu Long Rice Research Institute (CLRRI)
[66] Vice Director, Cuu Long Rice Research Institute (CLRRI)
[67] Vice-Head, Department of Plant Protection, Southern Vietnam, MARD

program namely "Three reduction, three gains" was established and first implemented in Can Tho province and then, Tien Giang province with financial support from IRRI. The objective of the program in the short run is to replace farmers' habit in using much more inputs than it needs. This objective in the long run is reducing the cost, increasing quality of rice for sustainable agriculture. A local steering committee was established to manage the program . Now a day, this program expands to 12 provinces in a whole Mekong delta.

Methods

On March 6, 2003, the program of "3 reduction, three gains was officially launched by the Vice Chairman of the Peoples' Committee of Can Tho, Mekong Delta with the present of Dr. Heong and Dr. Escalada from IRRI and the leaders of 12 provinces in Mekong River Delta . The program developed motivational media material via Radio, TV systems and leaflets to reach a large audience of farmer in the Mekong Delta.

Initially, two districts in Can Tho province were selected to implement the communication strategy with another district maintained as the control. Farmers participatory research method was applied . A participatory planning process involving multi stakeholder as employed to build local ownership. Focus group discussion, farmer surveys, multi media campaign planning and monitoring to assess campaign implementation. For each demonstration site, 30 volunteer farmers conduct farmer participatory research (FPR) on integrated nutrient and pest management . Every selected farm was practiced on the area of 1.000 square meters with the "three reduction method", the remainder as a control. For the experimental area, farmers were given guidelines for adjusting seed and fertilizer. For the control area, farmers applied as their practice as a routine. For "Seed reduction", farmers were encouraged to use drum seeder to eliminate the amount of seed from 8-10 kg per 1000 square meter. For "fertilizer reduction" farmers were trained to fertilize only when paddy rice need by comparing the colour of rice leaves with the leaf colour chart to know when they need to fertilizer. For the purpose of helping farmer in "insecticide reduction", they were advised not to use insecticides during the first 40 days after sowing.

The report showing that in Wet Season 2001-2002 the FPR was expand to 920 farmers in Tan Tap Village, Tan Thanh district, Long An province. In the same season farmers conducted 520 demonstration fields in 8 provinces in the Mekong Delata. At that time, a further 30 demonstrations field were initiated in the Central region and another 446 set up in 10 provinces in the Mekong Delta. (Nguyen Huu Huan, 2004).

Table 1: Areas under three reductions, three gains, Tien Giang province Mekong Delta, Dry Season 2004-2005 (hectares)

	District	Area
1	Cai Be	9000
2	Cai Lay	12000
3	Chau Thanh	12
4	Tan Phuoc	1599
5	Cho Gao	1000
6	Go Cong Tay	2000
7	Go Cong Dong	11000
8	Go cong City	140
9	My THo City	100
	Total	36854

Sources. Department of Agriculture and Rural Development, Tien Giang province

Table 1 shows that area under "3 reductions , 3 gains ", has enlarged.

The result from the Three Reduction , three gains campaign.

On the post –test surveys of 910 farmers in Can Tho province , for 12 months after the launching of the "three reductions, 3 gains" project showed significant reductions in farmers' seed rates, nitrogen fertilizer and insecticide use. Seed rates dropped from 243.7 kg/ha , nitrogen fertilizer use from 103 kg/ha to 95.2 kg/ha and insecticide spray frequencies from 1.15 to 0.84 (Nguyen Huu Huan, 2004). However, potassium application increase as well as fungicide and herbicide use may be from the increase in blast incidence during the wet season.

In the other hand, the result of B.A thesis of Mr. Nguyen Anh Tuan under adviser of Dr. Tran Thi Ut, Economic Faculty, Nong Lam University in last July 2005, in total of 90 farmers in post-test, in which 45 farmers participated in the program "3 reduction 3 gains" and the reminder as a control group. The results of is present in Table 2 .

Table 2. Results from "Threes reduction, three gains, Tan Phuoc District, Tien Giang province (n1=45; control with n=30)

Items	Farmers with 3 reductions, 3 gains (n1=45)	The control (n2=45)	Differences (%)
Seed rates (kg/ha)	105 kg	130kg	
Seed cost	21.9	26.6	-21.4612
Fertilizers (US$/ha)	102.4	109.6	-7.03125
Pesticides	38.8	42	-8.24742
Labor cost	91.5	94.8	-3.60656
Others	15.2	16.3	
			-7.23684
Total cost (US$/ha)	269.8	289.3	-7.22758
Yield (tons/ha)	5.98	5.99	-0.17

Source. Evaluation "Three Reductions, three gains", BS thesis, June, 2005

We can see from the results that, rice yield was almost the same between the group with "three reduction, three gains" and the control. This situation happened due to farmers in uses rice seed by reserving form the previous season, they did not select or used the suggested seed from the program.

Table 3. The results from the interview on August 19, 2005 with 7 farmers applying the "three reductions. Three gains", in …. Cailay district , Tien Giang province

Items	Farmers with 3 reductions, 3 gains (n1=45)	The control (n2=45)	Differences (%)
Yield (tons/ha)	7.88	7.6	3.5
Total cost (US$/ha)	256	292	14%

Source, Survey of households, August 19,2005

In the area with paying more attention in changing seed for farmers, the program has significant in reducing cost, and increasing in rice yield.

Lesson learnt: The program success when farmer can be support by the good rice seed.

Multiplier effects by using mass media in communication and FPR method, the program of "three reductions, 3 gains can be multiplied to large area in whole Mekong delta. This program has accredited by MARD as the scientific method for achieving sustainable agriculture in Vietnam.

Excerpt from Swiss Development Corporation Report on "Three Reductions, Three Gains"

The program, locally referred to as *Ba Giảm, Ba Tăng*, focuses on motivating farmers to reduce seed rates, fertilizer rates, and pesticide sprays. Research started in 2001 under the Irrigated Rice Research Consortium (IRRC) phase II supported by SDC. Launched in 2003 the project captured the enthusiasm and imaginations of farmers, extension workers, provincial government, the media as well as the central government officials and is spreading rapidly throughout the whole country.

The Approach

The project used a multi stakeholder planning process that involves research, extension, local governments, mass media, radio and TV stations. This process helps cultivate local ownerships and quality partnerships. It began with a farmer participatory research involving 951 volunteer farmers in 11 provinces who evaluated the effects of three reductions on their yields and incomes. These results together with focus group interviews and baseline surveys were then used in a "Message design Workshop" of all stakeholders, where they participated in creating the slogan, messages, media materials and campaign plans. When the materials pre tested and mass-produced, a highly publicized launching ceremony was conducted. Two months later a monitoring survey was conducted to determine if the materials had been well distributed. A year later focus group interviews were conducted and a post campaign survey was carried out to determine effects of the program.

Impact

The 951 farmers who participated in the evaluation found that using three reductions, they can gain higher incomes of about US$58 and US$35 per ha in the dry and wet seasons, respectively, thus can potentially make ~US$93 more per year. This is equivalent to two months income of a typical household. Farmers found that the main incentive to reduce seed and fertilizer rates was the potential to reduce insecticides, since lower seed and fertilizer rates resulted in lower pest pressures. With fertilizer cost on the increase, the potentials for more savings further motivated the farmers.

The farmer experiments were repeated in three more provinces with similar results. The next challenge then was to develop a communication strategy to motivate millions of rice farmers to adopt these three reduction practices. The "Message Design Workshop" was held in December 2002, where stakeholders developed a series of motivational materials, posters, leaflets, billboards, a radio, a TV drama and an advertising plug for TV. These materials were pre tested and mass produced for distribution and broadcasting. The campaign was launched on March 8, 2002 by the Deputy Director of Agriculture of Cantho province. Launching on 8 March 2002 485,000 leaflets were distributed.

CASE 3: ENHANCING GENDER EQUALITY

Center: IRRI
Theme: Social Science

In 1992, a young Vietnamese entomologist at the Cuu Long Rice Research Institute attended a workshop in "Gender and Rice Pest" in Thailand and met an IRRI social scientist. This was her first contact with social scientist, since then she has changed her focus on farming system research to focus on gender equality.

Her work has had a number of consequences:

- It has raised awareness of gender issues in the CLRRI and had major impacts for staffing, human resource and training of Institute Staff
- It has generated a stream of gender-related studies both by the woman scientist and immediate colleagues and has led to gender being inserted into the work of other CLRRI scientists
- It has led to the inclusion of more women in the activities of the Institute, including the training it offers.

Example of training provision:

There has been a change in the regular practice of district and local training for women extension workers and farmers. Now women constitute ten percent of participants in training courses. It made a difference because women have not attended any training course before.

The themes of training course:
- Animal raising (pig, fish)
- Rice production IPM for women
- Gender in rice pest
- Plant protection

There has been continuing collaborative research with IRRI and mentoring by IRRI's scientists. This has largely occurred within study on impact of male out migration on women in farming system. It has been assumed that male out migrants make money and send it back to their family to invest on their farm. However, money was sent back from male out migrant for home consumption only. This was because they are unskilled, their salary was not high. The lead scientist concerned has published several papers about this issue and made presentations it in several national as well as international workshops.

Another female scientist from CLRRI has now obtained a scholarship and is pursuing a Master degree in Rural development in the Philippines under IRRI supervision. She is also focusing on gender.

In addition the scientist concerned has obtained a Masters degree at IRRI and had two brief study visits to attend workshops and work alongside IRRI scientists. She has published 22 articles in journals or in conference proceedings since 1995.

The main capacity effect of this ongoing research relationship has been to change attitudes and practice in CLRRI. This has involved extensive awareness raising, feedback and discussions within the Institute. As a result, the management of CLRRI now pays far more attention to gender studies and gender equality in the practices of the Institute.

Specific outcomes and impacts related to NARI capacity:

- CLRRI had very few female staffs selected who go on to higher training or education , and none of them held leadership positions previously. Now, following trip reports, staff seminars, the preparation of papers, discussions with management and the leader of Labor Union in the institute, young female staffs are being sent to study aboard.
- Seven female staffs now hold the position of team leaders, alongside the 15 male leaders in the institute.
- The head of Agronomy department who is responsible for the NRM project, said that he included the gender issues in his project and routinely includes questions related to gender in his survey forms.
- The extension officer in the institute also reported that the local authorities having been encouraged by CLRRI now send women farmers to attend the technical training when he organized the training. The number of female farmers participating in agricultural training in local areas is also improved.
- The recruitment in the CLRRI recently also shows that more female youths are selected to work in different departments in the institute (for staffs from 30 years old or below we have 22 male and 24 female in the year of 2005).

Evaluations are also being planned to study the effects of these changes in all Provinces where the CLRRI conducts research and projects.