OVERCOMING POVERTY IN COCONUT GROWING COMMUNITIES: Coconut Genetic Resources for Sustainable Livelihoods

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Grant Completion Report

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1 Executive Summary

Like many poor farmers in developing countries, smallholder coconut farmers – the backbone of the coconut industry – face limited landholding, declining productivity and low, unstable price of coconut. They live in poverty, are food-insecure and have a low nutritional status. The project entitled *Overcoming poverty in coconut-growing communities: Coconut genetic resources for sustainable livelihoods* was implemented by Bioversity International through the International Coconut Genetic Resources Network (COGENT) to develop and test strategies for income-generation in coconut-growing communities. The overall goal of the project was to help developing countries overcome poverty among marginalized coconut farmers through improved coconut-based farming systems and the diversification of coconut products.

This study's research hypothesis was that coconut farmers can overcome poverty through coconut-based interventions that generate income and improve the food security and nutrition status of their households, which, in turn, will motivate them to conserve coconut genetic resources. To test the hypothesis, the project focused on three major components (1) Community empowerment, relying on collective action through community-based organizations (CBOs) to integrate physical, natural, financial, social and human capital; (2) Income-generating interventions; and (3) Knowledge dissemination and networking. The interventions consisted of the production of intercrops, livestock and fodder and high-value products from all parts of the coconut. These interventions were supported by a microcredit system through a revolving fund and technical training (including CBO and microcredit management) provided through the CBOs.

The study involved communities in 10 countries across Africa, Asia and Latin America which were surveyed to assess the socio-economic status of individual households at the start and at the end of the project, and to assess the effects of the project interventions on the households' food security and nutrition status. At the global level, the mean annual income per capita was 795 international dollars[1] before the project. Out of 14 communities, more than half (8) had less than 2 international dollars per capita per day and of those, three had less than 1 international dollar per day. In none of communities did the average income per capita reach 5 international dollars per day. On average, farm households had 2.19 hectares of farmland with means per community ranging from 0.08 hectares (Thodiyoor, India) to 9.88 hectares (Mexico) before the project.

For both income and food security, clearest impact has been reached at the global level and in India and the Philippines at the individual country level. Impact on food security of poor households was also clear, showing significant improvement in their ability to cope with food security shocks. At the global level, the results show a decrease in the number of short-term strategies used and an increase in number of long-term strategies which are similar to the project interventions, such as the use of home gardens, livestock, poultry and fisheries, and food processing. These long-term strategies are those that lead to more structural improvement.

Income diversification positively influenced household income in most countries. At the global level and in four out of seven countries, food security also improved. The project positively influenced expected annual household income at the global level, increasing it by 1778 international dollars, and at the national level, in four out of seven countries, with increases ranging from 836 (Philippines) to 1996 (Thailand) international dollars. A comparison of means of income diversification by country and community before and after the project shows that six out of 14 communities saw a significant diversification of their income while one community became more specialized. A significant diversification of income was seen at the global level. Three out of seven countries and seven out of 14 communities saw a significantly positive change in income derived from intercrops. At the global level the project has helped increase the income derived from intercrops by 192 international dollars per annum. Two out of four countries showed that the production of coconut high-value products had a positive influence on off-farm income.

[1] Financial data were converted into international dollars using the Purchasing Power Parity conversion factors

Of the farmers who participated in trainings on intercrop production, livestock rearing, high value product production and marketing, nursery establishment and plant breeding, and CBO management, 55% was female. Participation of women in total training was highest in India at 72% and lowest in Indonesia at 13%. At global level, lowest female participation was found for training on nursery management at 41%, and highest for high value products at 64%.

The nurseries served as models for efficient and effective production of planting materials, supporting on farm conservation of coconut genetic resources. By identifying, characterizing, and documenting local, varieties, and by improving access to high-quality planting materials, on-farm conservation of coconut genetic resources was improved. A total of 48 coconut varieties were identified in ten countries through participatory processes, characterized and documented in this project.

2 Background

Numerous poor communities in developing countries depend for their livelihoods on coconut. About 96% of coconuts in the world are grown by farmers tending small farms. Yet, smallholder coconut farmers – the backbone of the coconut industry – belong to the rural poor. They produce and sell a product with little or no added value, a low-priced undifferentiated product (copra or dried kernel) whose price has been trending downwards with international market forces. On average, coconut farmers earn a net income of about US$50 per ha per year on farms of 4 ha or less. For those families without off-farm income sources, an annual income of US$200 puts them well below the poverty line.

Like many poor farmers in developing countries, these farmers often face limited landholding, declining productivity and an unstable price of coconut, resulting in poverty, food-insecurity and a low nutritional status. Bioversity International, through its 38-member-country International Coconut Genetic Resources Network (COGENT), has been developing strategies to reduce poverty and improve livelihoods in poor coconut-growing communities through more effective use of coconut diversity—which is thus conserved at the same time.

The project entitled *Overcoming poverty in coconut-growing communities: Coconut genetic resources for sustainable livelihoods* (TA Grant No. 705–IPGRI, 2005–2008) was implemented by COGENT to identify and promote income-generating interventions in coconut-growing communities and to incorporate the needed physical, financial, social, natural and human capital to make them sustainable. This project builds on the progress made in the IFAD-funded project entitled *Sustainable Use of Coconut Genetic Resources to Enhance Incomes and Nutrition of Coconut Smallholders in the Asia-Pacific Region* (TA Grant No: 361– IPGRI, 1997 – 2000)

IFAD funded the implementation of the project in 10 countries, including 6 from Asia (China, India, Indonesia, Malaysia, the Philippines and Thailand), two in Latin America (Jamaica[2] and Mexico), and two in Africa (Ghana and Tanzania). An 11th country, Vietnam, was included in the project with support from Bioversity counterpart and national in-kind contributions. COGENT partnered with the following national institutions in implementing this project:

1. Coconut Research Institute, Chinese Academy of Tropical Agriculture Sciences (CRI-CATAS), China
2. Oil Palm Research Institute (OPRI), Ghana
3. Central Plantation Crops Research Institute (CPCRI), India
4. Indonesia Centre for Estate Crops Research and Development (ICECRD), Indonesia
5. Coconut Industry Board (CIB), Jamaica
6. Department of Agriculture (DOA), Sabah, Malaysia
7. Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP), Mexico
8. Philippine Coconut Authority (PCA), Philippines
9. Ministry of Agriculture and Food Security (MAFS), Tanzania
10. Department of Agriculture (DOA), Thailand
11. Oil Plant Institute (OPI), Vietnam

[2] The Coconut Industry Board of Jamaica was unable to implement the project activities after the first year due to personnel constraints owing to the disease 'lethal yellowing' which demanded critical human resources.

The overall goal of the project was to help developing countries overcome poverty among marginalized coconut farmers through improved coconut-based farming systems and the diversification of coconut products and by-products.

The four main objectives were:

1. Build the capacity of community-based organizations (CBOs), national agricultural research and extension systems, through collaborative research, training and institutional development and enable the development of sustainable livelihood intervention models for coconut-growing communities

2. Promote farmer participatory activities in *in-situ* and on-farm conservation and to enhance coconut genetic resources

3. Develop viable community-based income-generating technologies in support of sustainable livelihoods that directly benefit resource-poor coconut farmers and socio-economically disadvantaged women

4. To collaborate with development organizations in mobilizing additional resources for scaling up and replicating sustainable livelihood interventions nationally and internationally, including funding of the microcredit system.

3 Approach and Methodology

3.1 Hypothesis

The research hypothesis was that coconut farmers can overcome poverty through coconut-based interventions that generate income and improve the food security and nutrition of farming households, which, in turn, will motivate them to conserve their own coconut genetic resources.

3.2 Project components

To test the hypothesis, the project focused on three major components:

1. Community empowerment
   The project approach relies heavily on collective action through community-based organizations (CBOs) to integrate physical, natural, financial, social and human capital. These organizations were established or strengthened, with emphasis on ensuring broad access and participation of several categories of stakeholders, including women.

2. Income-generating interventions
   The inventions were based on a four-pronged strategy consisting of the following:
   - Introduction of cash and food security intercrops
   - Rearing of livestock and production of fodder
   - Production and marketing of high-value products from all parts of the coconut
   - Establishment of coconut nurseries and selling high-quality seedlings

3. Knowledge dissemination and networking
   This included the promotion of the use of research results through field days, the establishment of collaborative linkages with other development organizations and the publication of technical guides and bulletins, articles in local dailies, scientific papers, and catalogues of food recipes, high value products and coconut varieties.

3.3 Socio-economic study

The study involved a survey for assessing the socio-economic status and resources of individual households at the start and at the end of the project. Data collection was carried out in each country using a standardized questionnaire template (**Annex 1**) which was adapted by

some countries to suit their particular situations. The survey, its implementation and related activities were discussed during the project inception meeting in 2005. Baseline data was collected by individual countries in late 2005 or early 2006 and the post-project data in late 2007 or early 2008. The sampling strategies used by each country and the data collection dates are compiled in **Annex 2**. At the end of the project, each country consolidated the baseline and post-project data, and multi-country data was compiled into a single dataset and analyzed to assess the effects of the interventions. Country leaders and socioeconomics experts participated in a data analysis workshop held at the end of the project in 2008 for this purpose. The consolidated dataset of the project is safely stored in the COGENT website (restricted access to project leaders, available on request) and is available for further analysis and use in future publications.

3.4 Food security and nutrition study

A study to assess the effects of the project interventions on the food security and nutrition status of households was done. Data was collected before and after the project using a standard questionnaire which was modified by some countries to suit their particular situations. Unfortunately, the survey was conducted with a different group of households from the socio-economic survey and hence, it was not possible to link the data of the two surveys. Only the food security part of the study could be analyzed as there was considerable missing data in the nutrition dataset, which, in its current form, could not be analyzed. This highlights the importance of ensuring that project leaders have a clear idea and common understanding of the study and methodology at the start of the project. This is especially important considering that many of the project leaders do not have socioeconomic background, coupled with the fact that the project required them to be knowledgeable and multitask in various areas such as local project administration, production, processing, networking, public awareness, etc.

4 Activities carried-out

4.1 Identification of project sites

The project sites in 10 countries Asia, Latin America and the Caribbean and Africa were selected based on the following criteria:

- Socio-economic status of the community
- Presence of opportunities for sustainable livelihoods
- Willingness to adopt and share technologies
- Accessibility
- Local government support

Participatory rural appraisals were conducted at the start of the project to assess the community resources, cropping patterns, crop seasonality, occurrence of pests and diseases of crops and livestock, infrastructure availability and socio-economic situation of the selected areas.

4.2 Target group

The target group of the project is poor coconut farmers. The intervention is implemented through community-based organizations (CBOs), thus all are members of a CBO. At the global level the mean annual income per capita was 795 international dollars before implementation of the project. Out of 14 communities, more than half (8) had less than 2 international dollars per capita per day and of those, three had less than 1 international dollar per day. In none of communities did the average income per capita reach 5 international dollars per day. On average, farm households had 2.19 hectares of farmland with means per community ranging from 0.08 hectares (Thodiyoor, India) to 9.88 hectares (Mexico) before the project.

4.3 Implementation

The project was implemented on the ground though CBOs which developed an action plan for implementing the income-generating activities. The action plans were supported by appropriate technologies, household and village level equipment, training, capacity building and access to markets. The CBOs managed the revolving funds and provided microcredit to farmers for building their small enterprises. Guidance and coordination was provided by a team (consisting of technical experts and extension agents) led by the country leader, via a community coordinator for each of the sites.

5 Overall Progress: Objectives and Outputs

Table 1 Achievements against activities and outputs.

Activities	Outputs	Comments
Objective 1: Community empowerment		
1. Establishment of CBOs	A total of 24 CBOs established and participated in the project.	The CBOs, envisioned to continue the activities after the end of the project and serve as a model for other communities, were the vehicles that carried out the project interventions. Farmers in the communities were organized (or already existing organizations were reactivated), established their own governing body and registered their organization with the government authorities. The CBOs articulated their own vision, mission and goal statements, and developed their membership guidelines. **Annex 3** presents a summary of the information about the CBOs established in the project.
2. Establishment of a microcredit system and initial revolving fund	CBO-managed microcredit system and initial revolving funds established.	The project allocated funds to the CBOs for use as a community revolving fund which was meant to enable CBO members who are without access to formal lending institutions to borrow small amounts of cash to invest in income-generating ventures. The project released a total of USD64296 for the revolving fund (amount released as microcredit by the communities ranged from USD1855 to USD9228). The funds were released to the designated implementing agency in the participating country, which then transferred the funds to the CBOs to dispense as microcredit. The revolving fund of the CBO was augmented by membership fees and income from the interest of the loans. The CBOs decided their own interest rates. The CBOs provided cash or in-kind loans, such as equipment and supplies for making high value products or seeds and other planting materials for intercropping.

Activities	Outputs	Comments
		For livestock, in-kind loans were in the form of small animals (chicken, ducks) or bigger animals which were passed on from one member to the next after a period of time (the offspring remained with the farmer). Training on revolving fund/microcredit management was provided to the CBOs. The revolving fund was managed by the CBO officers. The CBO members developed their own guidelines for repayment (interest rates, loan conditions) and for ensuring responsible financial management. **Annex 4** presents a summary of the information about the revolving-fund based microcredit systems implemented in the project countries.
3. Development and implementation of farmers and women's action plans for income-generating activities.	Farmers' and women's groups' action plans for income generation developed and implemented.	The action plans were supported by microcredit, training and technical support from the project team, extension workers, and collaborators from other agencies, and coursed through the CBO.
4. Development of training manuals on income-generating technologies and instruments for analysis and promotion of viable technologies.	At least 80 training manuals and extension bulletins disseminated and used in training.	To support the training courses, manuals, technical guides and extension bulletins, already developed by the research or extension agencies in the countries were distributed to the members. The project served as an avenue for disseminating already existing technologies and technical manuals from government extension services. In cases where the technologies were new, the project teams produced training materials which were disseminated and used in training activities. The training materials on various topics (CBO and microcredit, intercrops, livestock, high value products, coconut nursery and cultivation) are listed in **Annex 5**.
5. Training of coconut farmers, women and village-level entrepreneurs on income generating technologies.	Trained CBO members and leaders capable of managing their own microenterprises	A total of 7146 (55% women) participants benefitted from training activities conducted in the communities on CBO and microcredit management (58% women), intercrops (51% women), livestock (47% women), high value products (64% women) and nursery management (41% women). The capacity development aspect of the project was strengthened by the inclusion of training activities related to CBO and microcredit management in addition to technical topics. The technical topics were handled by scientific and extension workers of the implementing agency or a related agency.

Objective 2. On-farm conservation		
6. Development of community-managed income-generating coconut seedling nurseries; and documentation, enhancement, characterization and conservation of promising selected local and introduced coconut varieties	Trained farmers capable of identifying, characterizing, conserving and managing coconut genetic diversity and profitable community-managed seedling nurseries	The local varieties were identified, characterized and documented. Farmers identified high yielding and healthy mother palms which served as sources of seednuts sown in nurseries. The seedling nursery microenterprises were operated either at the CBO or household level. A total of 941 CBO members trained on nursery management and selection of mother palms, and 226 members engaged in this activity. A total of 36 nurseries were established which together distributed 12,265 seedlings. A policy brief (Technical Advisory Note, **Annex 6**) summarizes the project findings on on-farm conservation of high value and high yielding coconut varieties.
Objective 3: Sustainable livelihoods		
7. Evaluation of inexpensive village-level oil-mills and equipment for producing high-value coconut products.	Village-level machinery and equipment for producing high-value products tested and adapted for local use	Small- and medium-sized village level machineries were purchased for use in the production of coconut high value products. These were used for processing at the household or community level. **Annex 7** is a list of the equipment purchased for processing various coconut part into high value products.
8. Market surveys to identify marketable products and development of market channels to make these markets sustainable.	Farmers trained to conduct market surveys and surveys conducted	The decision to engage in specific income generation activities was based on the results of farmer participatory market surveys. Farmers were given training to identify suitable crops, livestock and high value products, and then guided on how to make simple market surveys, feasibility and pre-profitability studies of these products. This enabled them to make informed decisions on the investment of their resources. Farmers were also given training on production, packaging and labelling, and marketing strategies to enable them to target bigger markets. The value of this capacity building exercise was seen more in the training of the farmers to use decision making tools and to do them in a simple way.
9. Production and marketing of marketable high-value coconut products from the kernel, husk, shell, water, wood and leaves and promotion of varieties suitable for these products	New viable income-generating on-farm and off-farm technologies utilizing various parts of the coconut from the kernel, husk, shell, wood, water and leaves disseminated and adopted	The project promoted extension service-to-CBO, CBO-to-CBO, and farmer-to-farmer exchange of knowledge and technology. This activity was supported by the provision of machines for processing husk, shell, kernel, and water parts of the coconut (**Annex 7**).

10. Pilot production and marketing of coconut high-value products from different parts of the coconut	Coconut high-value products from the kernel, husk, shell, wood, water and leaves produced and marketed on a pilot scale	A policy brief (Technical Advisory Note, **Annex 8**) summarizes the project findings on the production and marketing of coconut high value products for enhancing household incomes.
11. Development and viability testing of coconut-based intercropping technologies for enhancing incomes and food security; and of livestock and fodder production for enhancing farm productivity and nutrition	Viable intercropping and livestock/fodder production techniques that could enhance total farm productivity, food security and nutrition disseminated and adopted	A policy brief (Technical Advisory Note, **Annex 9**) summarizes the project findings on intercropping for income generation and food security. A policy brief (Technical Advisory Note, **Annex 10**) summarizes the project findings on diversification of economic activities for increasing income.
Objective 4: Mobilising resources for sustainability		
12. Promoting the use of research results through field days and the replication and adoption of resulting viable development interventions by national governments, development organizations and non-governmental organizations	Farmer and extension field days organized; extension materials and public awareness materials in English and in national languages and dialects of participating countries published, disseminated and used	Farmers' meetings, biodiversity fairs and farmer field days were used to enable farmers to identify local high yielding and high value coconut varieties. The project used a participatory approach which involved the farmers and an expert (a coconut breeder) in the selection of suitable varieties and mother palms. Some communities conducted diversity fairs wherein farmers brought seed nuts of their favourite variety, and they voted on which seed nut represented their most preferred variety. Then, the mother palm was identified to serve as the source of seed nuts for the nurseries. Research outputs of the project are documented in the form of a catalogue of coconut varieties in which the characteristics of selected varieties are described. Scientific papers (5), posters (8) and presentations to reach the scientific community; extension materials (28) that communicate the interventions to extension workers and the general media were produced in this project. A total of 15 articles about the project were published in the newspapers. Nine DVD's about the project and the income generating interventions were produced (**Annex 11**). Four policy briefs in the form of Technical Advisory Notes were produced to reach policy makers and loan portfolio managers of development agencies such as IFAD (**Annexes 6, 8, 9 and 10**).

13. Strengthening the CBOs and coconut growing communities in ten countries to ensure sustainability	At least 24 coconut-growing communities established in ten countries that can serve as models for replication nationwide by national programmes and bilateral investment projects of international development organizations	A special linkage with previously established CBOs (supported by previous COGENT projects) was fostered. These CBOs are from four countries, which are Indonesia (Huntu and Nonapan); the Philippines (San Antonio, Sanchez Mira and Balingasag); Vietnam (Tam Quan Nam, Hung Phong and Phong Nam) and Sri Lanka (Hettipola and Dodanduwa). The linkage helped to sustain the CBOs through the sharing of knowledge, experiences and technologies. Visibility of the project resulting from public awareness and networking efforts resulted in additional funding support from local governments and in some cases from development organizations. In the case of the Philippines, for example, additional site were established with funds from the government and from the United Nations Development Program.
14. Establish collaborative linkages with IFAD country portfolio managers, project managers of the Asian Development Bank, Global Environmental Facility – Small Grants Programme and Common Fund for Commodities and other development organizations in planning, implementation, monitoring, evaluation and impact assessment.	Linkages established with research and development organizations operating in the participating countries	The project engaged various organizations, including the local government and non government organizations, universities, media, as well as the private sector to mobilize complementary expertise and resources. These partnerships augmented the project resources in providing training, planting materials, technical advice and support as well as visibility to the project and generate greater impact. More importantly, the partnerships cemented the linkages with national and local institutions and national and international development agencies which are necessary to sustain the activities of the communities beyond the project. The linkages established in the project countries are listed in **Annex 12**.
15. Publish techno-guides and bulletins, articles in local dailies, scientific papers, and catalogues of food recipes, high value products and coconut varieties	A total of 96 technical and public awareness materials published locally and internationally	Informational materials produced in the project are listed in **Annex 11**.

6 Impact on Target Group

6.1 Socio-economic study

The socio-economic study was intended to assess whether the project had achieved the expected changes and whether these changes were due to the interventions. To ascertain the causal relationships between the intervention and the outcome, it is necessary to establish the counterfactual (the change that would have occurred without the intervention). However, due to the design of the survey, there was no data on a control non-participant group. Thus, the analytical approach used in this study was based on a 'before-after' estimator, which uses pre- and post-project data to attribute the missing counterfactual outcomes for project participants

(Todd, 2008[3]). Secondary data was used to construct statistical controls that can form the counterfactual (as suggested in World Bank (2006[4]) to overcome the drawback of the lack of a control group.

Baseline and post-project data are available from nine countries (post-project data is missing in one community in the Philippines) of the 11 countries that participated in the project. However, of these nine countries, only seven countries (Ghana, India, Malaysia, Mexico, Philippines, Thailand and Vietnam) had data that could be included in the analysis. Data from two of the nine countries was excluded because the sample size was too small in the case of China and the questionnaire was too simplified in the case of Indonesia. Two countries (Jamaica and Tanzania) have incomplete datasets as they only conducted either baseline or post-project surveys. Table 2 shows a summary of the sample sizes of the baseline and post-project surveys in the project countries.

Table 2 Sample size for baseline and post project socio-economic data.

Country	No of communities	Sample size (No of households per community)		Remarks
		baseline	post-project	
China	1	20	20	excluded, sample size too small
Ghana	1	106	41	
India	3	50-50-50	50-50-50	
Indonesia	2	20-30	20-30	excluded, too simplified questionnaire
Jamaica	1	43	N/A	excluded, limited project activities carried out
Malaysia	1	57	35	
Mexico	1	32	29	
Philippines	2	53-52	35-50	
Tanzania	2	N/A	23-32	excluded, conducted PRA for baseline instead of questionnaire
Thailand	3	54-53-43	52-56-57	
Vietnam	3	21-21-21	19-30-27	

The socio-economic data of the seven countries that contained all common variables was assembled in one dataset. The dataset contained variables on household composition and education, landholding, coconut production, income variables in various categories, expenditure in various categories, skills development, living indicators, loans, organization and gender aspects. Because most countries have used a less detailed version of the questionnaire, some variables have missing data for some of the countries. To enable comparison between countries, all financial data were converted into international dollars, using the Purchasing Power Parity conversion factors of 2005[5]. To enable a comparison between the baseline and post-project data, the 2005 conversion factors for the post-project were also used and corrected for the respective national inflation rates[6]. The descriptive statistics of the project indicators are compared in Table 3.

[3] Todd P.E. 2008. Evaluating Social Programs with Endogenous Program Placement and Selection of the Treated. In: Schultz T.P. and J. Strauss (Eds.) Handbook of Development Economics Vol 4. North Holland.. Ch.14.

[4] World Bank 2006. Conducting quality impact evaluations under budget, time and data constraints. Poverty Analysis, Monitoring and Impact Evaluation Thematic Group, PREM Network, World Bank, Washington D.C.

[5] The Purchasing Power Parity (PPP) is the long-run equilibrium condition for the exchange rate of a country, i.e. the adjustment of the exchange rate that allows for the comparison of the same goods among countries. The conversion factors for 2005 have been released by the International Comparison Program of World bank. See: http://siteresources.worldbank.org/ICPINT/Resources/ICP_final-results.pdf.

[6] National inflation rates for 2005-2007 were derived from the CIA World factbooks 2006, 2007 and 2008. See: https://www.cia.gov/library/publications/the-world-factbook.

Table 3 Comparison of descriptive statistics of indicators by baseline and post-project.

Country	Baseline			Post-project			Sign.
	N	Mean	SD	N	Mean	SD	
Income from intercrops							
Ghana	41	78.73	226.25	41	128.69	155.75	
India	150	60.52	126.35	150	254.88	429.43	***
Malaysia	57	132.82	282.79	35	27.79	96.98	**
Mexico	32	61.01	92.90	29	58.49	81.80	
Philippines	87	64.98	135.45	85	916.86	1099.81	***
Thailand	138	45.22	201.99	163	55.05	223.28	
Vietnam	63	94.30	184.43	76	113.75	274.83	
Total	568	68.83	182.17	579	244.78	577.98	***
Income from livestock							
Ghana	41	85.35	224.03	41	303.92	534.38	**
India	150	141.96	462.59	150	622.06	1221.94	***
Malaysia	57	48.96	123.12	35	204.51	415.42	**
Mexico	32	385.87	676.26	29	332.57	730.19	
Philippines	87	564.45	849.98	85	568.73	937.13	
Thailand	140	717.35	1611.44	163	437.89	1309.02	*
Vietnam	63	249.59	308.21	76	386.61	800.24	
Total	570	368.39	961.68	579	469.21	1071.19	
Off-farm income							
Ghana	41	1.31	8.39	41	0.00	0.00	
India	150	5.45	66.79	150	163.06	427.38	***
Malaysia	57	37.72	184.49	35	351.46	962.62	*
Mexico	32	0.00	0.00	29	0.00	0.00	
Philippines	87	135.01	320.71	85	144.10	411.72	
Thailand	138	1140.86	1909.13	163	1558.95	2488.69	
Vietnam	63	173.19	280.11	76	916.92	1292.03	***
Total	568	322.39	1062.23	579	643.87	1573.79	***
Total income							
Ghana	41	1316.93	1056.65	41	1276.18	1110.76	
India	150	1749.93	847.44	150	3952.55	2071.70	***
Malaysia	57	3907.85	2919.68	35	5267.70	4663.74	
Mexico	32	3462.42	2010.12	29	3826.65	1619.67	
Philippines	87	2325.56	2235.58	84	3887.26	3618.33	***
Thailand	138	5561.01	4854.08	163	9893.87	9339.01	***
Vietnam	63	1773.34	824.69	76	3705.60	1759.32	***
Total	**568**	**3048.40**	**3224.90**	**578**	**5469.56**	**6137.24**	*******

*Notes: *Significant at the 0.10 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.*

6.1.1 Income from intercrops

Planting cash crops in spaces between coconut trees which are suitably spaced is one way to extract more income from the farmer's land. The intercropping intervention was intended to increase income from crops planted between coconut trees and to improve the food security and nutritional situation of the households involved.

When the intercrops are managed appropriately, the coconut trees benefit as well, contributing to a healthier soil. Management of the intercrops, including regular fertilization and good agronomic practices, contribute to the development of a better microclimate in the coconut-based farming systems. This provides additional benefits, which potentially translate to the improvement of coconut yield. Recycling of coconut and other crop wastes through vermi-composting was implemented in some communities to improve production and reduce waste.

Farmers selected the most suitable intercrops (both cash and food crops) based on the climatic, agronomic and market conditions in their localities. The project assisted in the selection of crops and facilitated access to planting materials through linkages with appropriate organizations. Plant materials were sourced from government agencies as well as private seed companies and then provided to the CBO members (as in-kind microcredit). Table 4 shows the crops introduced in the 10 countries. Crops like tubers served to enhance the food security of the CBO-members, whereas vegetables and fruits served to improve their nutritional status. Other crops such as cacao and watermelon were introduced to enhance

income. In a number of cases, crops were destroyed by drought, waterlogging, typhoons or pests and diseases.

Table 4 Overview of intercrop intervention.

Country	Crops introduced	Comments
China	banana, papaya, arecanut, peanuts, cassava, sweet potato, vegetables	-
Ghana	eggplant, cassava, plantain, pepper	Poor soils, small areas planted
India	tuber, banana, mushroom, vegetables	Some damage due to water stagnation in 2007
Indonesia	banana, cacao, pandanus	-
Malaysia	tapioca, maize, pineapple, banana, tuber, fruit trees, vegetables	Problems with pests and diseases and seed germination
Mexico	watermelon, chillies, papaya, banana, cassava	Winds and rain destroyed crops in 2007
Philippines	corn vegetables banana, watermelon, fruit trees	Drought and strong winds affected production. Typhoon destroyed crops in 1 community in 2006.
Tanzania	legumes cassava sweet potato maize, groundnut pineapple	Lack of rain limited production
Thailand	sweet potato, vegetables, banana papaya, lemon grass, arecanut, taro	-
Vietnam	banana, cacao, mango, sugarcane, orange, papaya, pomelo, sweet potato	Problems with salt water intrusion

Source: Country project reports.

Table 5 presents an overview of the number of participants in the intercropping intervention in each country and the crops introduced in the ten countries, respectively. A variety of intercrops was tested by the farmers. The project provided technical trainings on intercropping for the farmers in the various sites. More or less equal number of men and women participated in the training and engaged in the intercropping activity. India had the highest participation of women in the training and intercropping activities while Indonesia, the lowest.

Table 5 Participants in intercrop activity and people trained by gender.

Country	People participating in intercrop activity					People trained*				
	Male		Female		Total No.	Male		Female		Total No.
	No.	%	No.	%		No.	%	No.	%	
China	18	62%	11	38%	29	59	57%	45	43%	104
Ghana	14	61%	9	39%	23	13	65%	7	35%	20
India	26	27%	71	73%	97	147	33%	293	67%	440
Indonesia	70	97%	2	3%	72	70	97%	2	3%	72
Malaysia	30	39%	47	61%	77	0	-	0	-	0
Mexico	11	69%	5	31%	16	24	100%	0	0%	24
Philippines	72	52%	66	48%	138	139	53%	124	47%	263
Tanzania	20	51%	19	49%	39	31	54%	26	46%	57
Thailand	48	38%	77	62%	125	35	40%	52	60%	87
Vietnam	182	47%	202	53%	384	152	51%	148	49%	300
Total	**491**	**49%**	**509**	**51%**	**1000**	**670**	**49%**	**697**	**51%**	**1367**

*Note: *The number indicates total number trained, some individuals have been trained more than once, thus the total number of people trained can be higher than the total number participating.*

Analysis of the data from 14 communities in seven countries showed that at the national level, three out of seven countries (India, Malaysia and Philippines) have a significant difference in mean income derived from intercrops before and after the project (see Table 2). In these three countries, the project had good linkage with providers of good planting materials. However, while the coefficients of India and Philippines were positive, indicating a positive effect, the coefficient of Malaysia was negative. Participation in the project positively

influenced expected intercrop income by 106 international dollars in India and 841 international dollars in the Philippines. In Malaysia, however, the project negatively influenced the expected income from intercrop by 130 international dollars. Of the three communities in Vietnam, one saw a significant decrease and one a significant increase in mean income. For Thailand, only one community showed a significant difference. The mean difference of the total sample is significant and positive. At the global level, the project had helped increase the income derived from intercrops by 192 international dollars per annum.

Differences between communities affected the income derived from intercrop. Infrastructure (roads, had a significant relationship with income. It seems likely that those communities that were most remote benefitted relatively more from the intervention as previously they had higher transaction costs to market their products while now they can benefit from the collective action created by the project intervention. The variables for the occurrence of diseases and natural calamity also had a significant coefficient. The presence of plant and livestock diseases negatively influenced expected intercrop income by 106 and 602 international dollars respectively.

The results for India show that socio-economic variables such as household size, gender of the household head, and farm size have a significant relationship with intercrop income. Those households that are larger, have a male head and have more farm area are more likely to have a higher income from intercrops. For the Philippines, the relationship with farm size was also positive. In seven out of 11 communities, the project significantly influenced expected intercrop income. This is the case in Pathiyoor and Devikulangara of India (152 and 145 international dollars respectively), San Miguel and Tungkalan of the Philippines (1280 and 629 international dollars respectively), Khog Wauw in Thailand and Duc My in Vietnam (60 and 191 international dollars respectively). The project negatively influenced expected intercrop income in Chau Binh in Vietnam by 178 international dollars.

A Technical Advisory Note entitled *Intercropping for income generation and food security* summarizes the findings, including the statistical analyses, about this intervention (**Annex 9).**

6.1.2 Income from livestock

The livestock strategy was meant to enhance the income and food security of poor coconut farmers. The project provided, through the CBOs, training for livestock and fodder production, and microcredit to farmers to purchase livestock. Livestock rotation was practised in some communities, wherein the CBO purchased the animals which were given to individual farmers for a certain period of time. The farmers take care of the animal and get to keep the offspring, while the animal is passed on the next farmer. These activities were expected to improve income by providing farmers access to cash or in-kind investment capital, technical knowledge and skills, and as well, more effective use of coconut by-products for feed.

This intervention increased the knowledge base and technical skills of farmers in animal husbandry practices, feeding, records keeping and marketing of their produce. Table 6 is a summary of participation of farmers in training on livestock and feed production. A total of 961 farmers were trained in livestock and feed production techniques. In Indonesia, all the participants were men while in Mexico, all were women.

The results show that four out of seven countries (Ghana, India, Malaysia and Thailand) have a significant difference in mean livestock income. Although the difference in mean livestock income is not significant for the Philippines as a whole, one of its communities (San Miguel) shows a significant difference. The data at global level also show a significant difference in income derived from livestock. A positive influence on expected income derived from livestock was seen in only one out of four countries. In Malaysia, the project positively influenced expected livestock income by 156 international dollars. At the global level, the project did not have a significant influence. However, in almost all estimations, a significant influence of income diversification on expected livestock income was seen. This is shown by the Herfindahl index which indicates the diversity in income generating activities. A lower value of this index indicates a higher level of diversity in activities. The negative sign of the coefficient

thus indicates that diversifying by 1% positively influences expected livestock income by 11 international dollars at the global level, and by 185, 3, and 11 international dollars for India, Malaysia and Thailand respectively.

Table 6 Participation in training courses on livestock and feed production by country

Country	Male		Female		Total
	No	%	No	%	No
China	59	57%	45	43%	104
Ghana	16	64%	9	36%	25
India	87	41%	124	59%	211
Indonesia	45	100%	0	0%	45
Malaysia	18	55%	15	45%	33
Mexico	0	0%	19	100%	19
Philippines	50	48%	54	52%	104
Tanzania	42	58%	30	42%	72
Thailand	15	42%	21	58%	36
Vietnam	177	57%	135	43%	312
Total	**509**	**53%**	**452**	**47%**	**961**

Source: Annual project reports

A Technical Advisory Note entitled *Diversification of economic activities to increase income among coconut farmers* summarizes the findings, including the statistical analyses, about this intervention (**Annex 10**).

6.1.3 Income from high value coconut products

The production of high value products from coconut was aimed at increasing income from all parts of the coconut palm, a plant well known for its multifarious uses. Value addition was achieved by processing various parts of the coconut palm into products including:

- Husk-based products such as rope, geotextile and doormats
- Shell-based products such as handicrafts (bowls, bags etc.)
- Oil-based products such as virgin coconut oil (VCO) both for food and cosmetic uses
- Kernel- or meat-based products such as candy, pastries
- Leaf midrib-based products such as baskets
- Coconut water-based products such as vinegar
- Sap-based product such as sugar

The products differed from country to country and from community to community. The project provided machines such as oil expellers to extract oil from the kernel, beating and decorticating machines to process the husk into coir and small equipment for making ropes and doormats (**Annex 7**). Support in the operation of some machines was provided to selected countries through an international group training course on coconut shell handicraft making in Sri Lanka. A consultant engineer provided on-site technical backstopping to some teams to initiate the pilot production of the HVPs.

Table 7 is a summary of the number of people trained the production of high value products. There were more women participants (64%) than men (36%). Among the countries, India had the highest participation by women.

Table 7 Number of people trained on HVPs by country.

Country	High value products				Total No.
	Male		Female		
	No.	%	No.	%	
China	29	41%	42	59%	71
Ghana	11	29%	27	71%	38
India	56	10%	482	90%	538
Indonesia	75	64%	42	36%	117
Malaysia	152	56%	118	44%	270
Mexico	23	27%	62	73%	85
Philippines	158	42%	215	58%	373
Tanzania	111	53%	97	47%	208
Thailand	88	34%	172	66%	260
Vietnam	97	40%	148	60%	245
Total	**800**	**36%**	**1405**	**64%**	**2205**

Source: Country annual reports.

The activities included training of CBO-members on the establishment and utilization of the appropriate equipment for production at the household and village level as well as on enterprise management and market channel development. Rapid market surveys and profitability analyses were conducted for each type of product produced to assess its potential in the market.

Analysis of the impact of this intervention was constrained because it was not applied uniformly across all countries. In some communities, the activity was carried out at the CBO level and incomes accrued to the CBO, while in others, individual households carried out the activity. Furthermore, the data was not collected uniformly in all countries. In some cases income derived from high value products was included in coconut income, while it was included in off-farm income in others. It was also not possible to differentiate between income derived from coconut high value products and income from other off-farm activities.

Thus, only data from countries that have added high value products to off-farm income (India, Philippines, Thailand and Vietnam) were included in the analysis. Analysis of the income derived from off-farm activities shows that the four countries together saw a significant difference in mean off-farm income between baseline and after the project. Two of the four countries (India and Vietnam) show this significant difference at country-level, and six out of eleven communities show a difference at community-level (of which one difference is negative).

Taking the four countries together, the project did not have a significant influence of income derived from off-farm activities. Other factors did significantly influence off-farm income, such as government assistance in the project (+ 596 international dollars annually), the occurrence of plant disease (– 701 international dollars), the size of the household (having one additional household member – 70 international dollars) and the gender of the household head (female head of household – 196 international dollars).

The results show that for two (India and Vietnam) out of four countries, the project positively influenced off-farm income, by 71 and 656 international dollars respectively. For India, an increase in farm size by one hectare negatively influenced off-farm income by 1172 international dollars. Average farm size in the sample from India was 0.11 hectare and it seems likely that a land constraint is pushing farm households into off-farm activities. At the community level, the contribution of farm size is positive in Pathiyoor and negative in Thodiyoor. Another contributing factor to off-farm income in India is the level of education of the head of household. The project positively influenced off-farm income in Pathiyoor and Thodiyoor in India and Binh Khanh and Duc My in Vietnam, by 94, 136, 1672, and 613 international dollars respectively.

The high value product intervention was not successful in all countries. This had different causes related to the marketability of the products, limited access to markets and market information, poor quality of products produced, limited volumes for larger scale marketing, and competition of substitute products. The success of the production and marketing of the

high value coconut products was also constrained by a lack of managerial skills at CBO-level and for the microcredit system.

Technical limitations constrained the implementation of this intervention. In some countries, processing equipment was not available, and their importation caused consideration delay. Other problems included the lack of a community facility to house the machines and the malfunctioning of equipment. The difficulty of obtaining spare parts caused some activities to stop for a considerable length of time in some communities. In a few cases, the farmers stopped production because their profit margin was too low (Indonesia) or there was, as yet, no demand for VCO which was a new product in Mexico (unlike in Asia), hence sales were too slow for the farmers' interest to be sustained. Also in a few cases, farmers found the processing work tedious and fraught with technical difficulties that they preferred to look for alternative activities that are more profitable. External factors that constrained this intervention were the occurrence of natural calamities.

A Technical Advisory Note entitled *High value coconut products to enhance income of the poor in coconut growing communities* summarizes the findings, including the statistical analyses, about this intervention (**Annex 8**).

6.1.4 Income from coconut nurseries

This intervention has two purposes: (1) to enable farmers to realize additional income through the sale of seedlings of coconut and other high value trees and (2) to provide a source of farmer preferred, locally adapted coconut planting materials and thus, contribute to the on-farm conservation of coconut genetic resources.

This intervention enabled farmers to identify and characterize local high yielding and high value coconut varieties, to improve access to high quality planting material, to raise awareness of the value of their coconut varieties and to promote the use of coconut genetic resources on-farm. An important activity was the characterization and documentation of the local varieties in order to make the information useful to farmers, breeders and researchers. Community- or household-managed nurseries were then established where these farmer-preferred varieties were propagated to provide communities access to good quality coconut germplasm. At the same time, the nurseries provide an important step towards on-farm conservation of coconut, through building capacity for management of these resources at the community level.

This intervention had four main outputs:

- Identification and characterization of local coconut varieties
- Training of farmers in selection and nursery management
- Nurseries as source of planting materials for the community
- Planting materials disseminated and conserved on-farm

At the same time, the nurseries were intended to be money-making businesses for the CBO through the buying of seednuts (from owners of mother palms) and selling of seedlings.

Coconut farmers were trained and became involved in the management of the nurseries by participating in seednut selection and nursery establishment activities such as fencing and maintenance activities such as weeding, watering, selling of seedlings and collection of payments. Table 8 presents the participant profile of the nursery intervention. A total of 941 CBO members were trained on nursery management and selection of mother palms and 226 were involved in nursery management operations. There were more men than women who were trained (59%) and got involved with nursery management (70%).

Table 8 Participation in nursery management activities by country.

Country	Participants in training on nursery management and selection of mother palms					Involvement in nursery management				
	Male		Female		Total	Male		Female		Total
	No.	%	No.	%	No.	No.	%	No.	%	No.
China	59	57%	45	43%	104	3	100%	0	0%	3
Ghana	5	100%	0	0%	5	10	91%	1	9%	11
India	55	49%	58	51%	113	5	100%	0	0%	5
Indonesia	68	99%	1	1%	69	68	99%	1	1%	69
Malaysia	0	-	0	-	0	14	64%	8	36%	22
Mexico	8	50%	8	50%	16	3	75%	1	25%	4
Philippines	84	54%	73	46%	157	13	62%	8	38%	21
Tanzania	63	66%	32	34%	95	17	57%	13	43%	30
Thailand	32	39%	50	61%	82	4	57%	3	43%	7
Vietnam	178	59%	122	41%	300	22	41%	32	59%	54
Total	**552**	**59%**	**389**	**41%**	**941**	**159**	**70%**	**67**	**30%**	**226**

Source: Country project reports.

A comparison of the mean land area under coconut, the total number of coconut trees and the number of trees per hectare of coconut area, by baseline and post-project shows that the mean area under coconut has remained constant in all communities but one (Saeng Arun in Thailand). However, there is a significant difference in mean number of coconut trees before and after the project in four communities and at the global level. For two communities in Vietnam, this is a reduction of number of coconut trees. The change in number of trees per hectare, however, is not significant. Number of trees per hectare is only significantly higher for one community, Khog Wauw in Thailand. This is due to the scarcity of available land in this community, as evidenced by the fact that farmers have been planting coconut trees in public areas, such as along the sides of the roads.

Six communities and all countries together show significant differences in the mean absolute number of coconut varieties before and after the project, which is again a reduction in the case of the community Chau Binh in Vietnam. Mean number of varieties per hectare however, only shows a significant change at the global level and for one of the communities in Thailand. It is possible that the significant difference is related to the improved ability of farmers to recognize and name varieties instead of an actual increase in number of varieties planted on farm.

There is a significant negative correlation between the area under coconut and the number of trees per hectare (correlation coefficient= – 0.128, significance level= 0.01), implying that the plant density is higher at farms with smaller plots. There is also a significant negative correlation between the total area planted with coconut and the number of varieties per hectare (correlation coefficient= – 0.180, significance level= 0.01) while there is a significant positive correlation between the total area planted with coconut and the total number of varieties planted (correlation coefficient= 0.138, significance level= 0.01). These two findings together imply that although an increase in coconut area is likely to lead to an increase in number of coconut varieties planted, there is decrease in marginal returns, which means that with each unit of land expansion, the increase in number of varieties becomes less.

Documentation of the local varieties and their characteristics was done to ensure their continued use by farmers and breeders. Methods of identifying and promoting these varieties included farmers' meetings, biodiversity fairs, field days, and catalogues.

Local coconut varieties, which were high yielding and possess traits that the communities considered important, were selected through a farmer participatory approach. A total of 48 coconut varieties were identified in ten countries through participatory processes, then characterized and documented. The ten countries established 36 nurseries (16 individual, 20 at CBO level) which together distributed 12265 seedlings to both CBO members and non-

members in the communities. Most nurseries were run by the CBO and income derived from the nurseries has therefore not been measured at the household level.

Table 9 shows an overview of the number and names of coconut varieties that were identified and characterized with the assistance of a coconut expert provided by the project, the number of nurseries established, the manner in which they are managed (individual vs. CBO), and the number of seedlings that were distributed to the farmers in the communities.

Table 9 Coconut varieties identified, nurseries established and seedlings distributed.

Country	No of varieties	High yielding and high value varieties	Nursery implementation		No of seedlings planted
			Individual	CBO	
China	4	Hainan Green Tall, Hainan Yellow Dwarf, Hainan Red Dwarf, Aromatic Dwarf	5	0	180
Ghana	5	Kukue Anyele-high yielding variety, Kukue Mbole big nut variety, Kukue Mbole sweet variety, Kukue Mbole thick shell variety, Kukue Mbole thick husk variety	0	1	200
India	6	West Coast Tall, Chowghat Orange Dwarf, Chowghat Green Dwarf, Other local varieties	0	3	1600
Indonesia	7	Sindangjaya 1 (yellowish-coastal), Sindangjaya 2 (greenish-coastal), Sindangjaya 3 (yellowish-mountainous), Sindangjaya 4 (greenish-mountainous), Sei Ara 1 (greenish), Sei Ara 2 (reddish), Sei Ara 3 (yellowish)	2	0	670
Malaysia	2	Malayan Red Dwarf, Sabah Local Tall	0	4	480
Mexico	4	San Rafael Tall, El Pailebot Tall, Sanchez Magallanes Tall, San Luis – San Pedro Tall	2	0	340
Philippines	7	Laguna Tall, Laguna Dwarf, Catigan dwarf, Tacunan Dwarf, Makapuno	0	3	2350
Tanzania	2	East African Tall, Pemba Red Dwarf	5	3	200
Thailand	5	Nam Hom (Aromatic Green Dwarf), Tap Sakae, Ka Lok, Thai Red Dwarf, Thalai Roi	0	3	1125
Vietnam	6	Dau Red Tall, Dau Yellow Tall, Ta Lua Tall, Green Ta Tall, Fired Bung Tall, Yang Lun Ta Tall, Xanh Lun Ta Tall, Sap Tall Makapuno	2	3	5120
TOTAL	**48**		**16**	**20**	**12 265**

Source: Annual project reports 2006, 2007; Project data analysis workshop (June 2008).

The availability of affordable and high quality planting material was improved with the establishment of the nurseries. Participating farmers have also increased their awareness on the availability of local disease-tolerant and high-yielding varieties which is expected to lead to improved use of these varieties.

Project partners indicated several constraints to the establishment and management of the nurseries, such as:

- Susceptibility of varieties to pests (Brontispa, mealy bug) and diseases (lethal yellowing)
- Occurrence of natural calamities such as typhoons, drought, cold weather and sea water intrusion which destroyed new plants
- Preference by farmers for early bearing varieties (hybrids and local dwarfs) and unavailability of good and early bearing varieties in some areas like Mexico.
- High prices of whole nuts (farmers prefer to sell nuts immediately, either as copra or whole nuts giving them immediate income rather than planting the seedlings in nurseries that need about 6 months before generating an income)

- Inaccessibility of the nursery sites due to poor roads
- Lack of adequate number of mother palms due to root wilt disease in India
- Competition in resources from other crops such as rubber and oil palm.

A Technical Advisory Note entitled *On-farm conservation of high value and high yielding coconut varieties in coconut growing communities* summarizes the findings, including the statistical analyses, about this intervention (**Annex 6**).

6.1.5 Total income and income diversification

Analysis of total income[7], composed of income derived from coconut, intercrop, livestock, other on-farm, off-farm and non-farm activities, shows that overall, four out of seven countries and eight out of 14 communities had significant differences in mean between the baseline and post-project total adjusted household income.

A comparison of means of income diversification by country and community before and after the project as measured by the Herfindahl[8] index shows that six out of 14 communities saw a significant diversification of their income while one community became more specialized. A significant diversification of income was seen at the global level. The Technical Advisory Note summarizing the project findings, including the statistical analyses, on diversification of economic activities for increasing income is in **Annex 10**.

At the global level, the project positively influenced expected total household income by 1778 international dollars. A higher level of education and more available land also positively influenced total income. There is geographic differentiation indicated by the significance of the community variable. The occurrence of natural calamities (indicated with a negative value) negatively influenced expected total income by 6010 international dollars.

At the national level, four out of seven countries showed that the project positively influenced expected total household income (India by 1562 international dollars, Philippines by 836 dollars, Thailand by 1996 dollars and Vietnam by 1518 dollars). At the community level, positive influence was found in eight out of 14 communities (including Ghana, Malaysia and Mexico where the project was carried out in only one community). Household size is a significant variable in many of the regressions, and it positively influenced total household income in all cases except in one community in India. In some communities, gender of the household head plays a role, where having a female head of household negatively influenced total household income (Ghana, Thodiyoor in India and Thungka in Thailand). Farm size also positively influenced household income in many communities. The Herfindahl index is significant in many of the regressions. While diversification positively influenced household income, this situation is reversed in two communities in Vietnam (where specialization positively influenced expected total income).

6.2 Food security

This study was intended to assess the effects of the interventions on food security and nutrition status of the participating households. However, the project leaders reported difficulties in conducting the survey, as the questionnaire dealt with ‘personal’ issues that may have been distressing to answer. A more sensitive collection methodology (rather than a standard questionnaire) would have been more appropriate and this was possibly a reason for the preponderance of missing data in the datasets, which limited the analysis of the food security data and disallowed the analysis of the nutrition data.

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[7] Total income is adjusted. Total adjust income is derived from the income from coconut (adjusted for the growth rate of the world price of coconut oil minus inflation) plus income derived from other sources

[8] The Herfindahl index is calculated as the sum of the squared shares of income from each activity (in this case coconut, intercrops, livestock, other on-farm, off-farm and non-farm). It always takes a value between zero and one, whereby one represents complete specialization.

The food security and nutrition survey was meant to measure the change in the food security and nutritional status of households as directly affected by an improved and diversified diet from the intercrops and home gardens, and indirectly by an improvement in income due to the income-generating activities.

Similar to the socio-economic data, there is a lack of counterfactual in the food security data, hence, the general trends in the food security situation were assessed from secondary data. The UN Millennium Development Goals (MDGs) Indicators website has data on the progress of all MDGs. Using the prevalence of under-weight children under the age of five as an indicator for food security, all countries, except Indonesia and the Philippines, have a clear trend of decline in the prevalence of under-weight children. These data were used to calculate the average trend in prevalence of under-weight children under five to compare with the project findings.

Table 10 compares the monthly expenditure on food between baseline and post-project data. Expenditure saw a significant change in Ghana, in all communities in India, and in Mexico. Two of these are significant increases. At the global level there is a significant decline in mean food expenditure. It is possible that the decline in expenditure is due to a higher availability of home grown food however, it is not possible to show this with the available data.

Table 10 Comparison of mean monthly expenditure on food by country.

Country	**Baseline**			**Post-project**			**Sign.**
Community	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	
Ghana	41	266.02	624.56	39	120.37	71.45	*
India	149	135.42	44.79	148	126.42	45.69	*
Pathiyoor	49	149.97	48.38	48	131.96	42.94	*
Devikulangara	50	129.11	37.37	50	93.09	31.35	***
Thodiyoor	50	127.47	45.31	50	154.43	39.32	***
Malaysia	57	180.10	66.40	35	165.35	91.72	
Mexico	32	181.45	35.97	29	207.38	17.37	***
Thailand	140	231.78	129.45	0	.	.	
Vietnam	0	.	.	76	171.16	77.74	
Total	419	189.99	215.71	327	147.44	67.85	***

*Note: *Significant at the 0.10 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.*

The food security survey contained statements on the food security situation with the question for respondents to indicate whether in the last three months they experienced a particular situation, with responses being ‘never’, ‘sometimes’ or ‘always’:

1. I worry whether my food will run out before I get some more money to buy more.
2. The food that I bought just didn’t last and I didn’t have money to get more.
3. I ran out of the foods that I needed to put together a meal and I didn’t have money to get more food.
4. I cannot afford to give my child(ren) a balanced meal.

Results of t-tests show that of the ten countries, five have seen a significant change in at least two of the food security situations, i.e. China, India (Pathiyoor, Devikulangara and Thodiyoor), Malaysia, Philippines (Tungkalan) and Tanzania. Also at the global level, there is a significant improvement.

Due to incomplete data, impact on food security could not be directly linked to the intercropping strategy, however during the time of the project, a total of 12 out of 17 communities have seen a significant increase in food security. UN statistics also show declining trends in food insecurity in all participating countries ranging from an annual change of – 0.8 to – 3.9%.

The survey also contained questions on the coping strategies households employed to deal with food shortages. Coping strategies, which guard households against shocks and guarantee their food security, are activities that are directly attributed to the household (rather than external factors). While short-term coping strategies allow households to survive in the short term, long-term strategies are those that lead to more structural improvement.

Respondents were asked which of the following short-term coping mechanisms they were using: (1) borrowed money to buy food or got food on credit; (2) mother ate less; (3) father ate less; (4) modified eating patterns/ skipping meals; (5) substituted commonly bought foods with cheaper kind; (6) modified cooking method; and (7) mortgaged/sold assets. Furthermore, they could choose the following long-term coping mechanisms: (8) home garden/backyard gardening; (9) livestock/fish/poultry raising; and (10) food processing (drying, preserving, etc).

Six out of 17 communities saw a significant decrease in the number of short-term coping strategies employed and one community an increase. The results also show that six communities saw a significant increase in the number of long term strategies employed and four a decrease. At the global level, the results show a decrease in the number of short-term strategies used and an increase in number of long-term strategies, which can be interpreted as an improvement in the ability of households to cope with food security shocks. Further analysis of three types of coping strategies that are similar to the project interventions shows that the number of communities that have seen a significant increase in the use of home garden (5 communities), livestock, poultry and fisheries (5 communities) and food processing (4 communities). The increase in the use of the home garden strategy was also significant at the global level.

6.3 Gender

The project was specifically designed to facilitate the inclusion of women in the activities. However, this has been more successful in some countries than in others. Female participation in training differed highly between country and topic. Table 11 gives an overview of participation in trainings by topic and gender. A total of 7146 farmers participated in trainings on intercrop production, livestock rearing, high value product production and marketing, nursery establishment and plant breeding, and CBO management. Of these participants 55% was female.

Participation of women in total training was found to be highest in India at 72% and lowest in Indonesia at 13%. While the survey questionnaire did not capture the specific reasons for this difference, it was noted that the project team in India specifically targeted stay-at-home women. In all other countries, female participation was 43% or more. At global level, lowest female participation was found for training on nursery management at 41%, and highest for high value products at 64%.

Participation of women in training on intercrops for example was 51% at the global level, however at the national level this ranged from 0 in Mexico and 3% Indonesia to 67 in India and 60% in Thailand. Participation of women in livestock trainings was 47% at the global level. At national level this ranged from 0 (Indonesia) and 36% (Ghana) to 100 (Mexico) and 59% (India). For high value products, female participation in training ranged from 36 in Indonesia to 90% in India.

Table 11 Participation in trainings by topic and gender.

	Intercrops		Livestock		Highvalue products		Nursery mgt		CBO mgt & microcredit		Total				
Country	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**		**F**		**Total No.**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**No**	**%**	**No**	**%**	
China	57	43	57	43	41	59	57	43	50	50	294	53	264	47	558
Ghana	65	35	64	36	29	71	100	0	53	47	53	51	50	49	103
India	33	67	41	59	10	90	49	51	34	66	490	28	1240	72	1730
Indonesia	97	3	100	0	64	36	99	1	97	3	323	87	47	13	375
Malaysia	-	-	55	45	56	44	-	-	62	38	217	57	162	43	379
Mexico	100	0	0	100	27	73	50	50	41	59	62	39	99	61	161
Philippines	53	47	48	52	42	58	54	46	37	63	673	43	880	57	1553
Tanzania	54	46	58	42	53	47	66	34	53	47	289	57	222	43	511
Thailand	40	60	42	58	34	66	39	61	36	64	217	37	377	63	594
Vietnam	51	49	57	43	40	60	59	41	56	44	618	52	564	48	1182
Total	**49**	**51**	**53**	**47**	**36**	**64**	**59**	**41**	**42**	**58**	**3241**	**45**	**3905**	**55**	**7146**

Note: The number indicates total number trained, some individuals have been trained more than once, thus the total number of people trained can be higher than the total number participating.

Some intangible impacts of the project were not measured in the study, although changes were observed by the project leaders among the women CBO members in their project sites, including:

- improved social status and self esteem
- economic and social empowerment
- increased level of confidence in technology adoption
- strengthened individual and group capacities (more knowledge and skills)
- effective use of natural human and social capital

6.4 Knowledge dissemination and networking

Information about the project was made available to the general public through the COGENT website (www.cogentnetwork.org) and the Google Coconut Group COGENT Page (http://groups.google.com/group/coconut?pli=1). The Google Group is a coconut knowledge network with over 300 members from different technical areas, including coconut germplasm conservation, breeding, agronomy, pathology, processing, and the private sector.

All the participating countries, established various linkages with government and non-government agencies (**Annex 12**). The implementing institutes linked with a significant number of organizations, including agencies in other government ministries, non government organizations, universities, research and development organizations, the private sector, and various media outlets. Opportunities to partner with other organization were taken to avail of complementary resources as well as to gain visibility in an effort to communicate the project's approach and achievements and support their adoption as models for reducing poverty in coconut growing communities.

Public awareness materials such as newspaper and magazine articles, radio, TV programmes and presentations relating to the project's poverty reduction research were carried out (**Annex 11**). Techno-guides and extension bulletins were obtained from extension agencies or developed in English or the local language, and then disseminated to farmers.

For the identification of the high yielding and high value coconut varieties, three methods were used: (1) farmers' meetings, (2) biodiversity fairs and (3) farmer field days. The research outputs are the catalogue of coconut varieties in which the characteristics of selected varieties are documented, scientific papers and presentations to reach the scientific community, extension material that communicates the interventions to policy makers and extension workers and the general media, and a recipe book to reach the general audience. An overview of these knowledge products is shown in Table 12 and the list of publications and public awareness materials in **Annex 11**.

Table 12 Knowledge generation products

Activity	Message	Medium	Users	Uses
Farmers' Meeting	Dissemination of relevant information and resolution of important issues related to project implementation	Open discussion, small group discussion	• Extension workers • Farmers • Researchers • Government officials	Basis for planning
Biodiversity Fairs*	On-farm research	Use of Participatory Research Approach tools in the characterization of farmers varieties	• Extension workers • Farmers • Researchers • Government officials	Conservation and utilization of indigenous coconut varieties
Field Days	Dissemination and promotion of project outputs	Display of products Project brochures	• Extension workers • Farmers • Researchers • Government officials	For replication and up-scaling
Catalogue of coconut	Characteristics of identified varieties	Information, education and	• Extension workers • Farmers	Basis in choice of planting materials

Activity	Message	Medium	Users	Uses
varieties*		communication materials	• Researchers • Policy makers	& documentation of coconut genetic resources
Scientific papers, meetings	Dissemination of outputs	Scientific papers, posters, presentations	• Scientists • Students • Policy makers	Reference
Extension material	Dissemination of outputs	Posters, bulletins	• Extension workers • Policy makers	Reference
Other media	Dissemination of outputs	Radio broadcast, newspaper articles, video materials	• Farmers • Consumers • Policy makers	Public awareness
Recipe book	Coconut recipes from the project countries	Book	• Consumers	Public awareness

*Note: *Only in China, India, Malaysia, Philippines, Tanzania, Thailand, Vietnam. Source: Annual project reports 2006, 2007; Project data analysis workshop (June 2008)*

7 Monitoring and evaluation of activities

Bioversity, through COGENT which is based at the Bioversity International Regional Office for Asia, the Pacific and Oceania in Serdang, Malaysia, managed the project and provided oversight on the implementation of the project in the participating countries. The COGENT Coordinator, with the assistance of support staff, served as the grant manager and functioned as the facilitator. Socioeconomic expertise from Bioversity was tapped, and with additional specific expertise from other CGIAR centres and national programs, the following were provided to the project (**Annex 13**):

- Scientific research methodologies
- Training of project coordinators and other national project staff
- Coordination and monitoring of project activities in all countries
- Facilitation of international networking
- Financial and project administration

Bioversity worked with the participating countries to implement the project through an annual Letter of Agreement with each national partner. The national agencies implemented the project, which is led by the country project leader and in partnership with the CBOs. At the local level, the CBO activities are facilitated by a community coordinator. The project provided computers, camera and motorcycles to help in project coordination, monitoring and reporting.

Each project country had one main implementing agency which in turn worked with other national and local partners and establish of effective linkages for the upscaling of the project activities. A full list of collaborating partners is presented in **Annex 12**.

The project supported annual review and planning meetings, participated in by the country project leaders and selected resource persons. These meetings served as an opportunity for the project leaders to present the progress in their countries, assess where the project objectives are against milestones and expected outputs (Table 1), share their successes and the constraints they faced, and develop and refine their annual work plans. These meetings were usually held back-to-back with technical training courses and workshops especially to provide the project leaders with needed technical knowledge and skills for implementing certain activities, such as the development of market channels for increasing smallholder competitiveness (**Annex 14**).

8 Budget utilization and other financial reports

Please see attached financial reports

9 Conclusion and perspectives

For both income and food security, clearest impact has been reached at the global level and in India and the Philippines at the individual country level. Impact on food security of poor households was also clear, showing improvement in their ability to cope with food security shocks. At the global level, the results show a decrease in the number of short-term strategies used and an increase in number of long-term strategies which are similar to the project interventions, such as the use of home gardens, livestock, poultry and fisheries, and food processing. These long-term strategies are those that lead to more structural improvement.

The provision of small loans to farmers and small entrepreneurs who are too poor to qualify for traditional financing was crucial for carrying out the income generating activities. In the case of India for example, this enabled many women to invest in small enterprises that they otherwise cannot engage in, and in the process, build their self confidence. However, project partners noted the implementation of the microcredit scheme as one of the weaknesses of the project. This is largely related to a lack of adequate CBO and microcredit management experience of the farmers. Although CBO members were trained in these skills, the capacity development effort was not sufficient to ensure the quality of management. Looking forward, the microcredit system can be further developed and possibly linked to the financing of processing machines to build small business enterprises, through strong linkages with existing microcredit schemes, through partnerships with the private sector, or through government loan funding. This will lead towards the attainment of twin goals of poverty alleviation and sustainable business development.

A total of 48 coconut varieties were identified in ten countries through participatory processes, characterized and documented. The project raised awareness of the farmers on the value of their coconut genetic resources and the potential economic returns from investing in coconut-based income generating activities. To sustain this economic base, the coconut seedling nurseries played a strategic role for producing planting materials and promoting on farm-conservation, serving as a model for effective and efficient nursery management.

On the study design, a major weakness was the lack of a control-group of non-participants. To improve reliability, it is recommended to collect data from non-participants in at least one site. Further research at a later stage could capture the medium- and long-term effects that cannot be measured immediately after the end of the project. Other data weaknesses include the lack of uniformity among countries in sample selection, data collection methods and data processing. The relatively small sample size also reduces the reliability. Better integration of the food security and socio-economic data linked with information on participation in specific interventions could also have greatly improved the quality of the impact assessment.

A survey conducted with the project leaders and some of their partners identified the greatest achievements of the project at the national level. The implementing agencies indicated the following (frequency of answer between brackets): mobilization of collective action in communities through CBOs for conservation and livelihood improvement (6), enterprise development (2), conservation and use of coconut genetic resources (2), empowerment of women (1), intercrop technologies (1), microcredit system (1). The greatest achievement of the project corresponds with one of the most important roles of Bioversity, i.e. the role of mobilizing collective action. Building on the strong capacity of national partners in traditional coconut conservation, cultivation and plant breeding combined with extension, this project brought a novel approach based on livelihoods, which required collective action both at the community and international level.

According to the national project leaders and their partners, the elements that needed most improvement in the project are: marketing and enterprise management (6), high value products production (5), microcredit system (3), intercrops (2), livestock production (2), CBO management (1), participatory planning (1), and coconut planting techniques (1).

The greatest weaknesses of the project activities are related to the market. This was recognized early on during project implementation, and as a result, training course (Value-chain approach to improving smallholder competitiveness in markets) for national project leaders was organized in 2007. Availability of market information to the resource-poor farmers was limited due to a lack of telecommunication and other information channels. As a result, producers in remote areas are in general at a disadvantage in seeking markets and negotiating sales with traders and commercial firms. This problem was exacerbated by the fact that agricultural extension advice generally concerns technical production issues and little guidance is given on marketing issues. Agricultural extension staff require training to enable them provide advice on marketing issues as well as technical matters. There is also a need to encourage formation of collective action and participation by small-scale producers to strengthen their bargaining position. More capacity building in marketing and production of high value products and better assistance and guidance to the CBO-members is necessary.

There were large differences in impact between the countries and communities. This is both due to specific implementation issues in the countries and communities, and intervening factors outside of the control of the project. For example, while effective linkages with both governmental and private sector partners were established in some countries, there has been a lack of government support in others. In some cases, the private sector became a logical strong partner. Such varied experiences can be a positive in a global project such as this, when the regional and inter-continental dimensions are taken into consideration, making more explicit the comparative advantage of each of the participating countries. This brings to fore the added value in the knowledge exchange that takes place in a multi-country project and the meaningful forms of collaboration that can go beyond the life of the project.

Farmers, being the clients of the project interventions, were involved in the planning, application and evaluation of the intervention strategies, and this ensured their relevance to the farmers' situation. Research and extension benefited from farmer feedback and guidance in their work, at all levels, ensuring that the results of their work are useful and accessible to the farmers. Farmers benefited from regular and useful technical support generated by research and extension, which serves as the bases for sustainability of the project. However, some partners have also indicated that the participatory process could have been improved to increase farmer involvement and commitment. We expect that as researchers become more skilled in participatory approaches, that implementation of research for development projects will be more facilitated. This will bring all project participants on board, create ownership, cultivate linkage between stakeholders and facilitate future mainstreaming.

Annexes

Annex 1	Template socio-economic questionnaire
Annex 2	Sampling strategies and data collection dates
Annex 3	Summary of CBO information
Annex 4	Summary of information about microcredit
Annex 5	Training manuals and extension bulletins disseminated and used in training activities
Annex 6	Policy brief summarizing the project findings on on-farm conservation of high value and high yielding coconut varieties.
Annex 7	Machines for household- and community-level processing of various parts of coconut.
Annex 8	Policy brief summarizing the project findings on the production and marketing of coconut high value products for enhancing household incomes
Annex 9	Policy brief summarizing the project findings on on intercropping for income generation and food security
Annex 10	Policy brief summarizing the project findings on diversification of economic activities for increasing income.
Annex 11	Publications and public awareness materials.
Annex 12	Collaborating organizations
Annex 13	Project staff and resource persons
Annex 14	Project meetings, training courses and workshops

Annex 1 Template socio-economic questionnaire

Baseline Survey Information
PART A Socio-economic data
(AT THE START OF THE PROJECT)

COUNTRY: _____ PROJECT SITE: _____
_____

Date: _____ Interviewer: _____

TO THE INTERVIEWER: PLEASE FILL UP THIS FORM COMPLETELY. DO NOT LEAVE ANY BLANK

GENERAL

(1) Name of head of household: _____

(2) Status: ☐ Single ☐ Married ☐ Others (*specify*):_____

(3) Age: _____

(4) Gender: ☐ M / ☐ F

(5) Number of Household Members: _____

(6) Education: ☐ Elementary ☐ Some High-School ☐ High-school ☐ Some College ☐ College ☐ Post-graduate ☐ No education ☐ Others (i.e., vocational), specify:

(7) Religion: _____

(8) No. of children going to school: _____

FARM INFORMATION

(9) Total Farm Area (*ha*): _____

Plot	**Land ownership***	**Range of Area in Hectare**			
Coconut		0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5
Rice		0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5
Maize		0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5
Others		0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5
Others		0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5
Total area		0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5

* i.e. land owner, tenant, farmworker

(10) No. of coconut trees planted on farm and age of trees

Age of trees	**1-5 years**	**6-10**	**11-20**	**21-30**	**31-40**	**41-50**	**51-60**	**Over 70**
Number of coconut trees								
Average yield (nr of nuts/tree/year)								

(11) Name(s) of coconut variety(ies) planted on your farm

Varieties Planted (Local Name)	**No. of seedlings planted**	**Year of planting**	**Source of planting material**

SKILLS/TRAINING ATTENDED

(12) a. List present skills related to farming/ agriculture:

_____

b. List other skills (e.g. masonry, carpentry, sewing etc):

_____

(13) Have you ever attended any skills development training seminar or workshop?

☐ Yes ☐ No

If **YES**, what were they about?

_____

SOCIO-ECONOMIC INFORMATION

(14) Summary of Annual Income by classification ***(this portion is just the summary of the reported income below, so they should tally when totalled)***

Sources	**Amount**
On-farm (agricultural products produced on the farm) Coconut based (e.g. whole nuts) Others (e.g. rice, maize, vegetables, poultry)	
Off-farm (processed agricultural products) Coconut based (e.g. coco candy, handicrafts) Others (e.g. rice wine, dried mango)	
Non-farm (income from outside the farm)	
Total annual income	

Sources of Annual Income

(15) Coconut products produced *(i.e. copra, tender nuts, fibre, shell, etc.)* pls. specify the unit	Estimated Annual Income Derived (*local currency*):				
	Sold	Consumed	Paid in Kind	Stock/ Inventory	Total
1					
2					
3					
Sub-total					
(16) Other major intercrops planted in the coconut farm	Estimated Annual Income Derived (*local currency*):				
	Sold	Consumed	Paid in Kind	Stock/ Inventory	Total
1					
2					
3					
Sub-total					
(17) Income from crops grown separate from the coconut farm	Estimated Annual Income Derived (*local currency*):				
	Sold	Consumed	Paid in Kind	Stock/ Inventory	Total
1					
2					
3					
Sub-total					

(18) Livestock raised in your farm	Estimated Annual Income Derived (*local currency*):				
	Sold	Consumed	Paid in Kind	Stock/ Inventory	Total
1					
2					
3					
Sub-total					
(19) Off-farm income other than coconut based	Estimated Annual Income Derived (*local currency*):				
	Sold	Consumed	Paid in Kind	Stock/ Inventory	Total
1					
2					
3					
Sub-total					
(20) Non farm income (e.g. overseas remittance, public servant, pension)	Estimated Annual Income Derived (*local currency*):				
					Total
1					
2					
3					
Sub-total					
Total annual income					

SOCIO-CULTURAL PROFILE

Health Matter

(21) When a household member gets sick or ill, how often do you seek medical advice/ help/ service (*i.e., see a doctor, traditional healer or go to a clinic or hospital*)?

☐ Never ☐ Sometimes ☐ Frequently ☐ Always

Membership in Organisation(S)

(22) Before the project have you been or are you still a member of any farmers' cooperative or community based organization? ☐ Yes ☐ No

If **YES**, list the name(s) of the cooperative(s)/organization(s):

Name of coop/CBO	**Year**	**Active member**		**Position held**	**Reasons for joining/leaving**
		Yes	**No**		

Access to and Sources of Financial Capital

(23) Are you able to easily obtain loans for financing farm-related activities (e.g. to buy farm inputs, livestock)? ☐ Yes ☐ No

(24) From what source(s) do you obtain capital to finance you farm-related activity(ies)?

☐ Banks ☐ Microfinance/ microcredit ☐ Grants ☐ Subsidies

☐ Own capital ☐ Relatives ☐ Others (pls. specify):_____

If **YES**, list the name(s) of the organisation(s), coops or other financial institution(s), where you were able to obtain these loans from and the corresponding amount:

Organisation/credit facility/ other sources	**Amount loaned**	**Interest rate**	**Amount Repaid**

Living Indicators

(25) Please check the box that best describes your house at present:

- ☐ Thatched/palm frond roof, bamboo or wood walls and floors
- ☐ Wood or bamboo walls, concrete floor with thatched/ palm frond roof
- ☐ Wood or bamboo walls, concrete floor with galvanized iron roofing
- ☐ Mostly concrete with galvanized iron/ tile roofing and some wooden structure
- ☐ With utilities like water and electricity

(26) Ownership of the house

☐ owned ☐ rented ☐ staying with relatives

(27) Source of drinking water

☐ private well ☐ public artesian well ☐ pump ☐ piped pump ☐ bottled water ☐ others, specify:_____

(28) Source of power

☐ kerosene lamp ☐ LPG lamp ☐ electricity ☐ others, specify:_____

(29) Source of fuel of cooking

☐ fire wood ☐ kerosene/gas ☐ electricity ☐ biogas ☐ others, specify:_____

(30) Type of toilet facility

☐ none ☐ open-pit ☐ closed-pit ☐ flushed/water ☐others, specify:_____

(31) Please put a check beside the functional appliances that you presently have:

Item		**Number of items**	**Mode of Acquisition**	
			Bought	**Given**
☐	Radio			
☐	TV			
☐	Refrigerator			
☐	Gas stove			
☐	Electric stove			
☐	Wood / coal stove			
☐	Sewing machine			
☐	Telephone/Cell phone			
☐	DVD/VCD			
☐	Stereo cassette/CD player			
☐	Personal computer			
☐	Others			

(32) Please put a check beside the functional means of transport that you presently have:

Item		**Number of items**	**Mode of Acquisition**	
			Bought	**Given**
☐	Bicycle			
☐	Motorcycle			
☐	Car			
☐	Others			

(33) Please put a check beside the functional farm equipment/machinery that you presently have:

Items (indicate items)		Number of items	Mode of Acquisition	
			Bought	Given
☐				
☐				
☐				

(34) Household expenses

Particulars	Expenses/month
a. ☐ Food	
b. ☐ House rent	
c. ☐ Education	
d. ☐ Medical	
e. ☐ Utilities (i.e, electricity, water, etc)	
f. ☐ Others (specify)_____	
TOTAL	

GENDER AND DECISION MAKING

(35) Involvement of male and female of the household in the coconut farming and coconut processing activities?

Activity	Number of female(s)	Number of Male(s)
Coconut farming activities		
Coconut processing activities		

(36) Who makes the decision on the following? (Please identify)

Particulars	Decision maker (in the household)		
	Male	Female	Both
1. On how most of household income is spent	☐	☐	☐
2. In planting/replanting of coconut	☐	☐	☐
3. In cutting coconut trees	☐	☐	☐
4. On what intercrops or other crops to plant			
Vegetables	☐	☐	☐
Fruit trees	☐	☐	☐
Staple crops	☐	☐	☐
5. Livestock keeping			
Cattle	☐	☐	☐
Goats	☐	☐	☐
Other	☐	☐	☐
6. Poultry keeping	☐	☐	☐
7. Selling agricultural products			
Coconut (whole nuts)	☐	☐	☐
Processed coconut products (indicate):	☐	☐	☐
a.	☐	☐	☐
b.	☐	☐	☐
c.	☐	☐	☐
Vegetables	☐	☐	☐
Fruits	☐	☐	☐
Staple crops	☐	☐	☐
Livestock	☐	☐	☐

Whole animal	☐	☐	☐
Meat	☐	☐	☐
Milk	☐	☐	☐
Poultry			
Whole animal			
Eggs			

(37) If you are not the owner of the farm, does the land owner allow you to participate in this poverty reduction project?

☐ Yes ☐ No

If **YES**, under what conditions? _____

PERCEPTIONS ON THE PROJECT

(38) What are your expectations of the project?

Objective

☐ Income increase
☐ Food security enhancement
☐ Food nutrition improvement
☐ Increase biodiversity
☐ Others, specify:

(39) Do you think the coconut biodiversity conservation component of the project could help improve your COMMUNITY's economic condition? ☐ Yes ☐ No

If **YES**, in what way?

_____

If **NO**, Why?

_____

(40) Do you think maintaining/conserving the coconut varieties on your farm will improve your livelihood?

☐ Yes ☐ No

If **YES**, in what way can your coconut varieties contribute to the improvement of your livelihood?_____

- Thank you very much for answering this survey form -

Annex 2 Sampling strategies and data collection dates

Country	Sampling strategy	Collection strategy	Date baseline	Date post
China	Random selection from the CBOs	Sometimes farmers interviewed together, also door-to-door. Interviews conducted by team members, no interpreter was needed	Oct 05	Nov 07
Ghana	Interested CBO members after a group meeting	Local language not spoken by everyone so sometimes interpreters were needed. Interviews were conducted one-on-one	Oct 05	Feb 08
India	All CBO members interviewed. Data processed was 33% of total data collected. Stratified random sample for participation in the interventions	No interpreters were needed. Interviews were conducted door-to-door	May-Aug 06	March-Apr 08
Indonesia	Stratified random sample for CBO members (0-1 ha, 1-1.5 ha, 1.5-2 ha)	Door-to-door, no interpreter needed	Jan 06	Jan 08
Malaysia	Those CBO members that came to the meeting	Staff from the team and agricultural department, no interpreter was needed Baseline was conducted at the group meeting, post data was collected going door-to-door	March 06 and July 06	Nov 07
Mexico	All CBO members	No need for interpreters. Interviewer went door-to-door	Sept-Oct 05	Nov-Dec 07
Philippines	San Isidro: random selection CBO members and non CBO-members Tanjay: those present when PRA was conducted (baseline), Tungkalan: all members of the CBO	Tanjay: baseline at a group meeting but one-on-one interviews, post door-to-door (same respondents). Interviews conducted by local team that can speak the dialect Tungkalan: interviews conducted by provincial staff. Individual interviews, used local dialect.	San Isidro: Late 05 Tanjay: Oct-Nov 05 Tungkalan: Oct-Nov 05	San Isidro: not yet Tanjay: Feb-Apr 08 Tungkalan: Feb-Apr 08
Tanzania	Baseline was PRA. Post survey, 50% of CBO members. Random selection consisting of 90% CBO members, 10% non-CBO members	No interpreters needed. Interviews conducted by project team and hired interviewers. Door-to-door interviews	PRA in Oct 05	April 08
Thailand	All CBO members	No interpreters needed. Door-to-door interviews	April 06	Dec 07
Vietnam	Randomly selected from list of CBO members	No interpreters needed. Meeting was called but interviews conducted one-by-one	BKT: Jan 06 DM: March 06 CB: Jan 06	Jan 08

Annex 3 Summary of CBO information

Country *Community*	Official name of registered CBO	Date	Government agency	Members		
				Male	Female	Total
1. China *Qinglan*	Qinglan Coconut Community	28 Dec 2005	Wenchang Poverty Reduction and Income Generating Office	63	68	131
2. Ghana *Nvuma*	Nvuma Community Coconut Farmers Cooperative Society	19 June 2007	Ghana Cooperative Union	71	40	111
3. India *Pathiyoor*	Pathiyoor Coconut Community Development Council	16 Aug 2006	Society's Registration Act	36	64	100
Thodiyoor	Thodiyoor Coconut Community Development Council	17 Jan 2007	Society's Registration Act	28	68	96
Devikulangara	Devikulangara Coconut Community Development Council	8 Nov 2006	Society's Registration Act	19	56	75
4. Indonesia *Sei Ara*	Sei Ara Community	15 May 2006	Sub district level office	40	0	40
Sindangjaya	Aneka Usaha Petani Kelapa	5 May 2006	Sub district level office	30	2	32
5. Jamaica *Pembroke Hall*	Pembroke Hall Coconut Farmers' Organization	-	-	36	14	50
6. Malaysia *Matunggong*	Matunggong Coconut Grower Organization	24 Mar 2006	Dept of Agriculture in Matunggong	72	19	91
7. Mexico *Bixina Tabasquena*	Bixina Tabasquena	3 Oct 2005	Secretary of External Relationships	29	21	50
8. Philippines *San Miguel*	San Miguel Agrarian Reform Beneficiaries Multi-Purpose Cooperative	29 Jan 2002	Cooperative Development Authority	89	119	208
San Isidro	Maharlika Development Cooperation	26 Jul 1999	Cooperative Development Authority	55	24	79
Tungkalan	Tungkalan Coconut Farmers Cooperative	19 Sep 2005	Cooperative Development Authority	31	40	71
9. Tanzania *Chambezi*	Chambezi Coconut Farmers' Community	Dec 2006	District Cooperative office	67	41	108
10.Thailand *Khog Wuaw*	Ban Khog Wuaw Coconut Shell Handicraft Community	19 Jun 2005	Dept of Agriculture Extension	35	53	88
Seang Arun	Seang Arun Coconut Farming Community	11 Nov 1997	Dept of Agriculture Extension	25	36	61
Thungka	Thungka Coconut Community	11 Jan 2006	Dept of Agriculture Extension	24	49	73
11.Vietnam *Binh Khanh*	Binh Khanh Tay	Nov 2005	Binh Khanh Tay commune authority	63	37	100
Chau Binh	Chau Binh	Nov 2005	Chau Binh commune authority	67	33	100

Country *Community*	Official name of registered CBO	Date	Government agency	Members		
				Male	Female	Total
Duc My	Duc My	Feb 2006	Duc My commune authority	48	52	100
Total				928	836	1764

Annex 4 Summary of information about microcredit

COUNTRY/ Community	Trained members on micro credit and management	Total amount	Total no. of borrowers		
			Male	Female	Total
1. China					
Qinglan	2005	3000	55	63	118
2. Ghana					
Nvuma	2006	2000	15	25	40
3. India					
Pathiyoor	2006	2827	25	47	72
Thodiyoor	2006	2489	18	72	90
Devikulangara	2006	2489	16	63	79
4. Indonesia					
Sei Ara	2006	2233	26	0	26
Sindangjaya	2006	1855	30	1	31
5. Jamaica					
Pembroke Hall	Not done	-	-	-	-
6. Malaysia					
Matunggong	2006	3050	26	8	34
7. Mexico					
Bixina Tabasquena	2005	3420	19	24	43
8. Philippines					
San Miguel	2006	1919	27	57	84
San Isidro	2006	9228	96	34	130
Tungkalan	2006	5293	37	58	95
9. Tanzania					
Chambezi	2006	3500	8	14	22
10. Thailand					
Khog Wuaw	2006	3864	2	16	18
Seang Arun	2006	3864	8	10	18
Thungka	2006	3864	6	32	38
11. Vietnam					
Binh Khanh	2006	3250	30	30	60
Chau Binh	2006	2000	5	15	20
Duc My	2006	4151	48	52	100
TOTAL		**64296**	**497**	**621**	**1118**

Annex 5 Training manuals and extension bulletins disseminated and used in training activities

Country	Coconut Topic	Training Manuals / Extension Bulletins Provided to the cbos	Year disseminated
China	Intercrops	1. Pepper cultivation techniques	2006, 2007
		2. Pepper: new planting technique	2007
		3. Banana cultivation techniques	2006, 2007
		4. Balsam pear cultivation techniques	2006
		5. Bitter gourd: new planting technique	2007
		6. The cultivation of arecanut	2007
	HVP	7. Coconut processing technology	2007
	Cultivation	8. Coconut cultivation techniques	2006
		9. Coconut: new planting technique.	2007
Indonesia	CBO	10. Cbo management	2006
		11. Micro credit system	2006
	Intercrops	12. Intercropping	2006
	Livestock	13. Chicken rearing	2006
		14. Sheep rearing	2006
	HVP	15. Virgin coconut oil	2006
		16. Making picture frame from coconut shell	2007
		17. Making handicraft from midrib of coconut	2007
	Nurseries	18. Nursery management	2006
	Others	19. Market research and product development	2006
		20. Market survey	2006
		21. Extension system and management	2006
		22. Batik and handicraft making	2007
India	Intercrops	23. Intercropping vegetables in coconut gardens	2008
		24. Agro management for tuber crops	2008
		25. Cultivation practices for ginger and turmeric	2008
		26. Cultivation practices for banana	2008
	Livestock	27. Fodder grass cultivation in coconut gardens	2008
		28. Azolla- a good source as cattle feed	2008
	HVP	29. Vermicompost from coconut leaves	2007
		30. Mushroom cultivation of coconut waste	2007
	Cultivation	31. Leaf rot disease of coconut	2007
		32. Integrated approach for managing root (wilt) affected coconut gardens	2007
		33. Agronomic strategies for managing root (wilt) affected coconut gardens	2007
		34. Integrated crop management practices for root(wilt) disease affected coconut gardens	2008
	Others	35. Poverty reduction in coconut growing communities	2007
Malaysia	Livestock	36. Egg incubator manual	2006
	Cultivation	37. Coconut shoot production for propagation and high density planting	2006
	HVP	38. Traditional method of vco production	2007
		39. VCO production	2006, 2007
Mexico		40. Coconut intercrops	2007
Philippines	HVP	41. Virgin coconut oil production manual for micro- and village-scale processing	2006
		42. Coconut sap sugar: natural sweetener	2007
	Nurseries	43. Use green Muscardine fungus (GMF) to control the rhinoceros beetle (*Oryctes rhinoceros*)	2006
		44. Life cycle of the rhinoceros beetle (*Oryctes rhinoceros*)	2006
		45. Control rhinoceros beetle with *Oryctes* virus	2006
		46. War against Brontispa (*Brontispa longissima*)	2007
		47. Participatory coconut planting project	2008

Country	Coconut Topic	Training Manuals / Extension Bulletins Provided to the cbos	Year disseminated
	Others	48. Understanding and using market information	2006
		49. Market research for agroprocessors	2006
Tanzania	CBO	50. The establishment of a community savings and credit cooperative society	2007
	Intercrops	51. Production of grain legumes	2006
	Livestock	52. Improved dairy goat husbandry	2007
		53. Construction of raised goat hut	2007
		54. Poultry husbandry	2007
	HVP	55. Processing of vco using jack operated expeller	2006
	Nursery	56. Nursery management	2006
Thailand	Livestock	57. Catfish production	2006
	HVP	58. VCO production (household method)	2006
		59. VCO and other products	2006
		60. VCO for health and beauty	2006
		61. Soap and products making	2006
		62. Bio fertilizer	2006
		63. Coconut shell production	2006
		64. Coconut midrib basket	2006
		65. Nata de coco production	2006
	Nursery	66. Coconut nursery	2006
	Cultivation	67. Coconut cultivation and maintenance	2006
		68. Coconut brontispa	2006
		69. Pest of Coconut	2006
		70. Control of *Brontispa longissima* (Gestro) By *Asecoides hispinarum*	2007
		71. Technology of maphrao kathi (curd coconut) production	2007
	Others	72. Packaging for products	2006
Vietnam	HVP	73. Coconut fiber production	2007
	Nursery	74. Seed selection	2007
		75. Nursery management	2007
	Cultivation	76. Coconut biology	2006
		77. Planting techniques	2007
		78. Research and development of makapuno coconut variety in tra Vinh province**:** mother palm selection, seednut selection, nursery technique, planting techniqueand plant protection	2007
		79. Pest and disease on coconut	2006
		80. Aromatic coconut variety: seed production, planting technique, plant protection	2006
		81. Coconut based farming system	2007
	Others	82. Training manual for trainers on coconut sustainable development	2006

Annex 6 Policy brief summarizing the project findings on on-farm conservation of high value and high yielding coconut varieties

Technical Advisory Note (TAN)

On-farm conservation of high value and high yielding coconut varieties in coconut growing communities

COGENT

Bioversity International

IFAD INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT

Technical Advisory Note (TAN)

On-farm conservation of high value and high yielding coconut varieties in coconut growing communities

Abstract

Poor coconut farmers in many parts of the world are facing difficulties to sustain their families' livelihoods from coconut income. It is important to improve their incomes and food security conditions and to maintain the genetic diversity of coconut. The International Coconut Genetic Resources Network (COGENT) and partners implemented the project "*Overcoming poverty in coconut growing communities*" aiming to help developing countries alleviate poverty among marginalized coconut farmers through improved coconut-based farming systems and the diversification and effective use of coconut products and by-products. By identifying, characterizing, and documenting local, high yielding and high-value coconut varieties, and by improving access to high-quality planting material, through the establishment of community-managed nurseries, on-farm conservation of coconut genetic resources is improved. This is supported by raising awareness among farmers of valuable coconut varieties. The documentation and characterization of plant genetic resources is important to make these resources useful for farmers, breeders and researchers. A total of 48 coconut varieties were identified in ten countries through participatory processes, and characterized and documented. A total of 36 nurseries were established which together distributed 12,265 seedlings. The impact on yield is still to be measured, as new seedlings are not bearing yet. Constraints to the establishment of nurseries included the occurrence of pests and diseases and natural calamities, and a lack of reliable sources of seed-nuts for the nurseries due to a high coconut price.

Introduction

Poor coconut farmers in many parts of the world are facing difficulties to sustain their families' livelihoods from coconut income. Like many poor farmers in developing countries, these farmers often face limited landholding, declining productivity and an unstable price of coconut, resulting in poverty, food-insecurity and a low nutritional status. While it is important to improve the incomes and food-security conditions of these households it is also vital to maintain the genetic diversity of coconut in the process. COGENT and its partners implemented the project "*Overcoming poverty in coconut growing communities*" from 12 July 2005 until 11 July 2008, using an IFAD grant. The goal of the project was to help developing countries alleviate poverty among marginalized coconut farmers in China, Ghana, India, Indonesia, Jamaica, Malaysia, Mexico, the Philippines, Tanzania, Thailand and Vietnam through improved coconut-based farming systems and the diversification and effective use of coconut products and by-products. The major interventions of this project were to improve the production and marketing of high-value products from all parts of the coconut, to establish community-managed coconut seedling nurseries (also selling high-quality coconut seedlings), to introduce cash and food security intercrops, and to introduce livestock and/or fodder production.

In this document we describe the establishment of community-managed nurseries for coconut seedlings. This intervention aimed to identify, characterize and document local high-yielding and high-value coconut varieties, to improve access to high-quality planting material, and to raise awareness among farmers of valuable coconut varieties and promote their use on-farm. The documentation and characterization of plant genetic resources is needed, to ensure useful access to these resources by farmers, breeders and researchers.

Main research programme*:* components

The main research component was the identification, characterization and documentation of high value and high yielding local coconut varieties in the communities. Community-managed nurseries were then established to provide communities with access to this coconut germplasm. At the same time, the nurseries provide an important step towards *in-situ* conservation of high value and high yielding coconut varieties, through building capacity for management of these resources at the community level.

Conditions for replicability

This component served a strategic role in setting up models of effective and efficient nursery management rather than just seedling production per se. The knowledge and skills imparted are transferrable, and can be used in the production of other tree seedlings, which can be sold for higher income.

Programme implementation

Target group and outputs

The target group is poor coconut farmers. The intervention is implemented through community-based organizations (CBOs), thus all farmers involved in this intervention are members of a CBO.

This intervention had three outputs: (1) farmers' varieties identified and characterized, (2) nurseries established and planting materials produced and distributed, (3) farmers trained in community nursery management and plant breeding.
To have a better understanding of the coconut production systems in the participating countries, Table 1 presents a comparison of the mean land area under coconut, the total number of coconut trees and the number of trees per hectare of coconut area, in the countries and communities, by baseline and post-project.

Table 1. Overview of comparison of means of coconut production variables

	Land area coconut (ha)			Total number of coconut trees planted			Number of trees per hectare		
	Baseline	**Post-project**	**Sig**	**Baseline**	**Post-project**	**Sig**	**Baseline**	**Post-project**	**Sig**
Ghana	**.93**	**.83**		**305**	**243**		**278**	**248**	
India	**.08**	**.08**		**17**	**18**		**420**	**450**	
Pathiyoor	.09	.10		16	17		238	227	
Devikulangara	.09	.09		19	22		671	764	
Thodiyoor	.07	.07		15	16		352	358	
Malaysia	**1.88**	**1.95**		**248**	**218**		**128**	**118**	
Mexico	**4.99**	**4.54**		**620**	**594**		**124**	**132**	
Philippines	**1.59**			**164**	**1901**	*******	**109**		
San Miguel	2.07			137	4365	***	68		
Tunkalan	1.35			178	172		134		

	Land area coconut (ha)			Total number of coconut trees planted			Number of trees per hectare		
	Baseline	**Post-project**	**Sig**	**Baseline**	**Post-project**	**Sig**	**Baseline**	**Post-project**	**Sig**
Thailand	**1.49**	**2.17**		**211**	**303**		**157**	**138**	
Khog Wauw	.11	.10		11	12		25	69	**
Thungka	1.32	1.82		172	268	*	148	146	
Saeng Arun	3.51	4.44	*	524	604		206	145	
Vietnam	**.33**	**.28**		**54**	**42**	*****	**163**	**164**	
Binh Khanh Tay	.19	.18		29	32		155	175	
Chau Binh	.42	.32		73	54		176	177	
Duc My	.38	.32		62	39	*	157	145	
All	**1.19**	**1.30**		**167**	**433**	*******	**234**	**257**	

Note: *Significant at the 0.10 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

While the mean area under coconut has remained constant in all communities but one (Saeng Arun in Thailand) we see a significant difference in mean number of coconut trees before and after the project for four communities and at the global level (due in large part to the highly significant increase in the Philippines). For the two Vietnamese communities this is a reduction of number of coconut trees, the change in number of trees per hectare however is not significant. Number of trees per hectare is only significantly higher for one community, Khog Wauw in Thailand. This is due to the scarcity of available land in this community and the fact that farmers also plant coconut trees in public areas and at their relatives' farms.

Table 2 shows an overview of the number of varieties identified in farmers' fields before and after the project. Six communities and all countries together show significant differences in the mean absolute number of coconut varieties before and after the project, which is again a reduction in the case of the community Chau Binh in Vietnam. Mean number of varieties per hectare however, only shows a significant change at the global level and for one of the Thai communities. It is possible that the significant difference is related to the improved ability of farmers to recognize and name varieties instead of an actual increase in number of varieties planted on farm. We do not show data on yields as the end of the project is too recent to measure the impact on this variable (new plants do not bear fruits yet).

Table 2. Overview of comparison of means of number of varieties

	Total number of coconut varieties			Number of varieties per hectare		
	Baseline	**Post-project**	**Sig**	**Baseline**	**Post-project**	**Sig**
Ghana	**1.11**	**1.08**		**1.14**	**1.26**	
India	**1.02**	**1.25**	******	**28.16**	**36.17**	
Pathiyoor	.90	1.37	**	17.16	25.37	
Devikulangara	1.10	1.26		46.82	53.75	
Thodiyoor	1.30	1.13		42.50	27.72	
Malaysia	**1.00**	**1.11**		**.99**	**.87**	
Mexico	**1.53**	**1.52**		**.41**	**.44**	
Philippines	**1.16**	**1.58**	*******	**1.05**	**.**	
San Miguel	1.25	1.24		.64	.	
Tunkalan	1.12	1.70	***	1.30	.	
Thailand	**.87**	**1.36**	*******	**1.28**	**2.22**	******
Khog Wauw	.78	1.18	**	2.32	7.40	**
Thungka	.86	1.41	***	1.13	1.48	
Saeng Arun	1.00	1.46	***	1.13	1.91	
Vietnam	**1.41**	**1.01**	*******	**7.21**	**6.33**	
Binh Khanh Tay	1.43	1.32		12.42	8.26	
Chau Binh	1.52	.77	***	3.96	3.93	
Duc My	1.29	1.07		5.04	7.62	
All	**1.09**	**1.28**	*******	**5.61**	**10.61**	*******

Note: *Significant at the 0.10 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

A significantly negative correlation exists between the area under coconut and the number of trees per hectare (correlation coefficients -.128, significance level 0.01), implying that the plant density is higher at farms with smaller plots. There is also a significantly negative correlation between the total area planted with coconut and the number of varieties per hectare (correlation coefficients -.180, significance level 0.01) while there is a significantly positive correlation between the total area planted with coconut and the total number of varieties planted (correlation coefficients .138, significance level 0.01). These two findings together imply that although an increase in coconut area is likely to lead to an increase in number of coconut varieties planted, there is decrease in marginal returns, which means that with each unit of land expansion, the increase in number of varieties becomes less. These findings reinforce the key role that smallholder farmers play in on-farm conservation of coconut diversity.

Implementation

To implement the intervention, strong CBOs were needed. CBOs were formed and members were trained in CBO management. Then training on nurseries was conducted, participatory selection of coconut varieties was carried out with farmers and characterization and documentation was carried out. Community and individual nurseries were established and planting material propagated.

Training on community nurseries was carried out, with participation of a total of 941 farmers of which 41 percent is women (see Table 3). Coconut farmers are involved in the management of the nurseries by participating in seed-nut selection, nursery establishment activities such as fencing, maintenance such as weeding, watering, polythene-bagging and selling of seedlings, and collection of repayments. A total of 226 CBO-members are involved in nursery management operations, of which 30 percent is women (also shown in Table 3).

Table 3. Participation in nursery management activities by country

	Participants in training on nursery management and plant breeding					Involvement in nursery management				
	Male		Female		Total	Male		Female		Total
Country	**No.**	**%**	**No.**	**%**	**No.**	**No.**	**%**	**No.**	**%**	**No.**
China	59	57	45	43	104	3	100	0	0	3
Ghana	5	100	0	0	5	10	91	1	9	11
India	55	49	58	51	113	5	100	0	0	5
Indonesia	68	99	1	1	69	68	99	1	1	69
Malaysia	0	-	0	-	0	14	64	8	36	22
Mexico	8	50	8	50	16	3	75	1	25	4
Philippines	84	54	73	46	157	13	62	8	38	21
Tanzania	63	66	32	34	95	17	57	13	43	30
Thailand	32	39	50	61	82	4	57	3	43	7
Vietnam	178	59	122	41	300	22	41	32	59	54
Total	**552**	**59**	**389**	**41**	**941**	**159**	**70**	**67**	**30**	**226**

Source: Country project reports.

Impact

Table 4 shows an overview of the number and names of the high-value and high-yielding coconut varieties that were identified and characterized, the number of

nurseries established and the manner in which they are managed (individual vs. CBO), and the number of seedlings that were distributed.

Table 4. Coconut varieties identified, nurseries established and seedlings distributed

Country	No varieties characterized	High-yielding & high-value varieties	Nursery implementation		No seedlings planted
			Individual	CBO	
China	4	Hainan Green Tall Hainan Yellow Dwarf Hainan Red Dwarf Aromatic Dwarf	5	0	180
Ghana	5	Kukue Anyele Kukue Mbole local sweet variety local thick shell variety local thick husk variety	0	1	200
India	6	West Coast Tall Chowghat Orange Dwarf Chowghat Green Dwarf other local varieties	0	3	1600
Indonesia	7	Sindangjaya 1 Sindangjaya 2 Sindangjaya 3 Sindangjaya 4 Sei Ara 1 (greenish) Sei Ara 2 (reddish) Sei Ara 3 (yellowish)	2	0	670
Malaysia	2	Malayan Red Dwarf Sabah Local Tall	0	4	480
Mexico	4	San Rafael Tall El Pailebot Tall Sanchez Magallanes Tall San Luis – San Pedro Tall	2	0	340
Philippines	7	Laguna Tall Laguna Dwarf Catigan dwarf Tacunan Dwarf Makapuno Other local varieties	0	3	2350
Tanzania	2	East African Tall Pemba Red Dwarf	5	3	200
Thailand	5	Nam Hom (Aromatic Green Dwarf) Tap Sakae Ka Lok Thai Red Dwarf Thalai Roi	0	3	1125
Vietnam	6	Dau Red Tall Dau Yellow Tall Ta Lua Tall Green Ta Tall Fired Bung Tall Yang Lun Ta Tall Xanh Lun Ta Tall Sap Tall Makapuno	2	3	5120
TOTAL	**48**		**16**	**20**	**12265**

Source: Annual project reports 2006, 2007; Project data analysis workshop (June 2008).

Identification of local varieties and documentation of their characteristics are important to ensure the continued use of these varieties by farmers and breeders.

Methods of identifying, documenting and promoting high value and high yielding local varieties included farmers' meetings, biodiversity fairs, field-days, and catalogues. We will show and overview of these activities in the section on dissemination pathways.

The availability of affordable and high quality planting material has improved due to the existence of the nurseries. The prices of planting material from CBO-managed nurseries in Mexico, Philippines and Vietnam are 57, 25 and 43 percent lower than private or governmental nurseries. This has improved farmer options. Participating farmers have also increased their awareness on the availability of local disease-tolerant and high-yielding varieties which will lead to improved use of these varieties.

Constraints

Constraints to the establishment of nurseries were:

- Susceptibility to pests (coconut leaf beetle, mealy bug) and diseases (lethal yellowing) of coconut varieties
- Occurrence of natural calamities such as typhoons, drought, cold weather, and sea-water invasion which destroyed new plants
- Preference for early bearing varieties (hybrids and local dwarfs)
- Unavailability of good and early bearing varieties in some areas like Mexico.
- High prices of whole nuts (farmers prefer to sell nuts immediately, either as copra or whole nuts giving them immediate income rather than planting the seedlings in nurseries that need about 4 to 6 months before generating an income)
- Inaccessibility of the nursery sites due to poor road networks
- Lack of adequate number of mother palms due to root wilt disease in India
- Competition in resources from other crops such as rubber and oil palm

Gender dimension

From the data presented in Table 2 we have seen that participation of women in trainings on nursery management and plant breeding has been 41 percent. At the national level this ranged from 1 percent in Indonesia and 0 percent in Ghana to 51 percent in India and 61 percent in Thailand. Involvement of women in nursery management is 30 percent at the global level, ranging from 0 percent in China and India to 59 percent in Vietnam.

Dissemination pathways

Table 5 shows an overview of the knowledge generation and dissemination strategies employed in the project.

Table 5. Knowledge generation and dissemination strategies

Activity	Message	Medium	Users	Uses
Farmers' Meeting	Dissemination of relevant information and resolution of important issues	Open discussion, small group discussion	• Extension workers • Farmers • Researchers	Basis for planning

Activity	Message	Medium	Users	Uses
	related to project implementation		• Government officials	
Biodiversity Fairs*	On-farm research	Use of Participatory Research Approach tools in the characterization of farmers varieties	• Extension workers • Farmers • Researchers • Government officials	Conservation and utilization of indigenous coconut varieties
Field Days	Dissemination and promotion of project outputs	Display of products Project brochures	• Extension workers • Farmers • Researchers • Government officials	For replication and up-scaling
Catalogue of coconut varieties**	Characteristics of identified varieties	IEC materials	• Extension workers • Farmers • Researchers • Policy makers	Basis in the choice of planting materials
Coconut recipe book	Use of coconut	Book	• Consumers	Public awareness
Scientific papers, meetings	Dissemination of outputs	Scientific papers, posters, presentations	• Scientists • Students • Policy makers	Reference
Extension material	Dissemination of outputs	Posters, bulletins	• Extension workers • Policy makers	Reference
Other media	Dissemination of outputs	Radio broadcast, newspaper articles, video materials	• Farmers • Scientists • Students • Policy makers	Reference

Notes: *Only in India, Malaysia, Philippines, Thailand; **Only in China, India, Malaysia, Philippines, Tanzania, Thailand, Vietnam. Source: Annual project reports 2006, 2007; Project data analysis workshop (June 2008)

Further research needs

The following research needs have been identified:

- Identification of the purity of mother palms as seed-nut source
- Methods to improve continuous supply of seed-nuts for community-managed nurseries
- Improvement of collective action for community-based nursery management
- Development of appropriate tools in germplasm exchange among countries particularly in countries affected by diseases and pests

Related information

Useful links: http://www.cogentnetwork.org/
http://www.bioversityinternational.org/

References: Community Project Monitoring Reports
Project socio-economic and food security database

Contacts: Dr. Maria Luz George (International Project Coordinator)

Acronyms: CBFS - Coconut-based farming system
CBO - Community-based organization
PPP - Purchasing Power Parity

Annex 7 Machines for household- and community-level processing of various parts of coconut.

Community/Country	Year purchased	Machine	Coconut part	High value product
Qinglan, China	2005	Beating/decorticating machine	Husk	Coir
	2005	Door mat making machine	Husk	doormats
	2005	Geotextile machine	Husk	Cocofiber textiles
	2005	Rope making machine	Husk	Single and double twine ropes
	2005	Shell polisher/cutter	Shell	Handicrafts
	2005	Oil expeller	Kernel	VCO
	2005	Egg incubator		For livestock intervention
Nvuma, Ghana	2006	Beating/decorticating machine	Husk	Coir
	2006	Door mat making machine	Husk	doormats
	2006	Geotextile machine	Husk	Cocofiber textiles
	2006	Rope making machine	Husk	Single and double twine ropes
	2006	Shell polisher/cutter	Shell	Handicrafts
	2006	Oil expeller	Kernel	VCO
	2006	Egg incubator		For livestock intervention
Devikulangara, India	2007	Spinning units	Husk	Single ropes
	2007	Coconut water machine	Water	Health drink
Pathiyoor, India	2007	Spinning units	Husk	Single ropes
	2007	Copra cutter	Kernel	Traditional oil
	2007	Copra dryers	Kernel	Traditional oil
	2007	Oil expeller	Kernel	Traditional oil
Thodiyoor, India	2007	Spinning units	Husk	Single ropes
	2007	Copra dryers	Kernel	Traditional oil
	2007	Sealing device	Kernel	Preserves
Sei Ara, Indonesia	2006	Fiber processing units	Husk	Coir
	2006	Beating/decorticating machine	Husk	Coir
	2006	Coconut food making equipment	Kernel	Food
	2006	Oil expeller	Kernel	VCO
	2006	Egg incubator		For livestock intervention
Sindangjaya, Indonesia	2006	Beating/decorticating machine	Husk	Coir
	2006	Fiber processing units	Husk	Coir
	2006	Coconut food making equipment	Kernel	Food
	2006	Oil expeller	Kernel	VCO
	2006	Egg incubator		For livestock intervention
Pembroke Hall, Jamaica	2007	VCO making equipment	Kernel	VCO
Matunggong, Malaysia	2006	Beating/decorticating machine	Husk	Coir
	2006	Door mat making machine	Husk	doormats
	2006	Geotextile machine	Husk	Cocofiber textiles
	2006	Rope making machine	Husk	Single and double twine ropes
	2006	Shell polisher/cutter	Shell	Handicrafts
	2006	Oil expeller	Kernel	VCO
	2006	Egg incubator		For livestock intervention
Bixina Tabasquena, Mexico	2006	Oil expeller	Kernel	VCO
San Miguel, Philippines	2006	Shell polisher/cutter	Shell	Handicrafts
	2006	Vinegar making machine	Water	Vinegar
Tungkalan, Philippines	2006	Beating/decorticating machine	Husk	Coir
	2006	Fertilizer making machine	Husk	Cocopeat biofertilizer

Community/Country	Year purchased	Machine	Coconut part	High value product
	2006	Kiln	Shell	charcoal
San Isidro, Philippines	2006	Rope making machine	Husk	Single and double twine ropes
	2006	VCO making equipment	Kernel	VCO
Chambezi, Tanzania	2006	Beating/decorticating machine	Husk	Coir
	2006	Door mat making machine	Husk	doormats
	2006	Egg incubator		For livestock intervention
	2006	Geotextile machine	Husk	Cocofiber textiles
	2006	Oil expeller	Kernel	VCO
	2006	Rope making machine	Husk	Single and double twine ropes
	2006	Shell polisher/cutter	Shell	Handicrafts
Khog Wuaw, Thailand	2007	Geotextile machine	Husk	Cocofiber textiles
	2006	Midrib basket making machine	Leaves	Baskets, brooms
	2007	Rope making machine	Husk	Single and double twine ropes
	2006	Shell polisher/cutter	Shell	Handicrafts
Seang Arun, Thailand	2007	Geotextile machine	Husk	Cocofiber textiles
	2007	Rope making machine	Husk	Single and double twine ropes
Thungka, Thailand	2006	Shell polisher/cutter	Shell	Handicrafts
	2006	VCO making equipment	Kernel	VCO
Binh Khanh, Vietnam	2006	Beating/decorticating machine	Husk	Coir
	2006	Geotextile machine	Husk	Cocofiber textiles
	2006	Rope making machine	Husk	Single and double twine ropes
Chau Binh, Vietnam	2006	Rope making machine	Husk	Single and double twine ropes
Duc My, Vietnam	2006	Geotextile machine	Husk	Cocofiber textiles
	2006	Rope making machine	Husk	Single and double twine ropes

Annex 8 Policy brief summarizing the project findings on the production and marketing of coconut high value products for enhancing household incomes

Technical Advisory Note (TAN)

High value coconut products to enhance income of the poor in coconut growing communities

COGENT

Bioversity International

IFAD
INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT

Technical Advisory Note (TAN)

High value coconut products to enhance income of the poor in coconut growing communities

Abstract

Poor coconut farmers in many parts of the world are facing difficulties to sustain their families' livelihoods from coconut income. It is important to improve their incomes and food security conditions and to maintain the genetic diversity of coconut. The International Coconut Genetic Resources Network (COGENT) and partners implemented the project "Overcoming poverty in coconut growing communities" aiming to help developing countries alleviate poverty among marginalized coconut farmers through improved coconut-based farming systems and the diversification and effective use of coconut products and by-products. The intervention described in this document is that of the development of high-value products derived from all parts of the coconut tree and fruit. Community members were supported with training (64% of those trained were women), equipment and micro-credit to carry out this income-generating activity. Data shows that in two out of four countries the project had a positive influence on off-farm income although at the global level this is not shown. Important factors positively or negatively influencing off-farm income at the global level are government assistance and plant disease. Major constraints for the successful implementation of this intervention include limited access to market information, poor management skills of the community-based organizations and of the micro-credit system, and technical limitations.

Introduction

Poor coconut farmers in many parts of the world find it difficult to sustain their families' livelihoods from coconut income. Like many poor farmers in developing countries, they often face limited landholding, declining productivity and volatile coconut prices, resulting in poverty, food insecurity and a low nutritional status. While it is important to improve income and food security conditions of these households, it is also vital to maintain the genetic diversity of coconut in the process. The International Coconut Genetic Resources Network (COGENT) and partners, with an IFAD grant, implemented the project "Overcoming poverty in coconut growing communities" from July 2005 until July 2008. The goal of the project was to help developing countries overcome poverty among marginalized coconut farmers in China, Ghana, India, Indonesia, Jamaica, Malaysia, Mexico, the Philippines, Tanzania, Thailand and Vietnam through improved coconut-based farming systems and the diversification and effective use of coconut products and by-products. One country (Jamaica) was unable to implement the project activities due to the occurrence of the coconut disease 'lethal yellowing' which occupied the human resources at the coconut research institute. The major interventions of this project were to improve the production and marketing of high-value products from all parts of the coconut; to establish community-managed coconut seedling nurseries and selling high-quality coconut seedlings; to introduce cash and food security intercrops, and to introduce livestock and/or fodder production.

In this document we describe the production and marketing of high value products made of various parts of the coconut tree and fruit. The intervention aimed to increase income derived from the coconut through adding value to parts of the entire coconut palm by processing them into high-value products such as virgin coconut oil, handicrafts and other food- and non-food products. This should also promote awareness of the importance of coconut.

Main research programme: components

The main research question was whether through establishing production of high-value coconut products, coconut-grower income could be successfully increased and an incentive for the improved management of the coconut farming system could be created.

Conditions for replicability

The project was implemented in a total of 19 communities in 10 countries. National level implementing organizations included national research institutes and governmental bodies. In many of the implementing countries logistical support was provided by the local governments, through provision of low interest-rate credit or planting materials like vegetable seeds. Apart from the main implementing agencies in each country an additional total of more than 50 other partners were involved in the project, from both the public and private sector. In the Philippines, replication of the project is already underway in other communities, supported by the Philippines Coconut Authority. The communities differ in their socio-cultural profile, and interventions were made compatible with local conditions.

Important conditions for replicability of this intervention include:

- Capacity development among participants
- Availability of capital, equipment and facilities
- Sufficient infrastructure for successful market linkages
- Solid CBO management in the enterprise
- Availability of sufficient raw materials at the required time
- Local support from public and private sector

Programme implementation

Target group and outputs

The target group is poor coconut farmers. The intervention is implemented through community-based organizations (CBOs), thus all are members of a CBO. For a more intuitive understanding of the results and to enable some comparison between countries we have converted all financial data into international dollars, using the Purchasing Power Parity conversion factors of 2005. At the global level, the mean income per capita was 795 international dollars before implementation of the project. Eight out of the 14 communities had less than 2 international dollars per capita per day. Of those, 3 had less than 1 dollar per day. In all communities, average income

per capita was less than 5 international dollars per day. On average, farm households had 2.19 hectares of farmland with means per community ranging from 0.08 hectares (Thodiyoor, India) to 9.88 hectares (Mexico) before the project. The high-value product intervention aimed to increase income derived from adding value to different parts of the coconut and coconut tree.

Implementation

Activities included (1) developing high-quality marketable products from the coconut husk, midrib, shell and white meat (copra); (2) training CBO-members in enterprise management and market linkages, and (3) utilization of the appropriate equipment for the production of these high-value products at the village-level. Products include coir and coir-based products such as geo-textiles, doormats and ropes from coconut husk; brooms and baskets from midribs; charcoal and coconut shell handicrafts from coconut shell; and virgin coconut oil, aromatherapy massage oil and massage soap from coconut meat. The communities were supported with processing machinery, tools and micro-credit. They were trained on production, processing, utilization and marketing of products that differ among countries and communities. Rapid market surveys and profitability analyses were conducted for each type of product produced, to assess its potential in the market.

Products that are produced and marketed include:

- Coir-based products such as rope, geotextile and doormats
- Shell-based products such as handicrafts (bowls, bags etc.)
- Oil-based products such as virgin coconut oil (VCO) both for food and cosmetic uses
- Copra-based products such as candy, pastries, sugar and vinegar
- Midrib-based products (of the leafs) such as baskets

Table 1 gives an overview of the trainings provided. A total of 2205 people were trained on production of food and non-food products from coconut, of which 64 percent was female.

Table 1. Overview of participants in high value product training courses by country

Country	Male		Female		Total No
	No.	%	No.	%	
China	29	41%	42	59%	71
Ghana	11	29%	27	71%	38
India	56	10%	482	90%	538
Indonesia	75	64%	42	36%	117
Malaysia	152	56%	118	44%	270
Mexico	23	27%	62	73%	85
Philippines	158	42%	215	58%	373
Tanzania	111	53%	97	47%	208
Thailand	88	34%	172	66%	260
Vietnam	97	40%	148	60%	245
Total	800	36%	1405	64%	2205

Note: The number indicates total number trained, some individuals have been trained more than once, thus the total number of people trained can be higher than the total number participating. Source: Country project reports

Impact

The intervention increased the interest, knowledge and technical skills in production, processing, packaging, labeling and market promotion of products among CBO members of 10 countries. By building capacity and collective action it also increased bargaining power of CBOs. Linkages were established with both government agencies and private enterprises (more than 50 partners in this particular project) in the production and marketing of coconut-based products. Raw material is better utilized and converted into more valuable products. It also increased local and national awareness on the importance of coconut as a "tree of life" among farmers, governments and private sector.

Income

As part of the project, data was collected independently in each country, using a standardized questionnaire template. Depending on the country, socio-economic baseline data were collected late 2005 or early 2006 and a second set of data was collected late 2007 or early 2008. Some countries adapted the questionnaire to suit their situation. Baseline and post-project data are available from 14 communities in 7 countries. To enable a comparison between the baseline and post-project data, we also used the 2005 conversion factors for the post-project data, corrected for the respective national inflation rates9.

Analysis of the impact of this intervention has three constraints. Firstly, the intervention is not applied uniformly across all countries. In some locations it is an activity carried out at the CBO level, while in other communities individual households carry out the activity depending on what the communities decide is appropriate for them. Secondly, the data is not collected uniformly in all countries. In some cases income derived from high value coconut is included in coconut income, while in others it is part of off-farm income. The last constraint is also related to the data, because it is not possible to differentiate between income derived from coconut high-value products and income from other off-farm activities.

To overcome these constraints we start by including in the analysis only those countries that have included high-value products in off-farm income and we will adopt a statistical method to control for other intervening factors. Table 2 gives an overview of the income derived from off-farm activities before and after the project by community.

Table 2. Comparison of means of off-farm income by baseline and post-project

	Baseline			Post-project			
	No of households (N)	Mean Income	SD	No of households N	Mean Income	SD	Sign.
India	**150**	**5.45**	**66.79**	**150**	**163.06**	**427.38**	***
Pathiyoor	50	0.00	0.00	50	92.90	326.11	**
Devikulangara	50	16.36	115.68	50	125.96	530.94	
Thodiyoor	50	0.00	0.00	50	270.32	386.02	***
Philippines	**87**	**135.01**	**320.71**	**85**	**144.10**	**411.72**	

[9] National inflation rates for 2005-2007 were derived from the CIA World factbooks 2006, 2007 and 2008. See: https://www.cia.gov/library/publications/the-world-factbook.

San Miguel	35	160.03	301.97	35	0.00	0.00	***
Tungkalan	52	118.18	334.56	50	244.97	515.15	
Thailand	**138**	**1140.86**	**1909.13**	**163**	**1558.95**	**2488.69**	
Khog Wauw	50	2684.24	2232.48	52	2546.32	2782.08	
Saeng Arun	53	142.13	471.08	56	249.21	772.56	
Thungka	35	448.39	1269.92	55	1958.97	2789.64	***
Vietnam	**63**	**173.19**	**280.11**	**76**	**916.92**	**1292.03**	***
Binh Khanh	21	325.36	366.69	19	2047.46	1531.36	***
Chau Binh	21	0.00	0.00	30	72.90	399.31	
Duc My	21	194.21	229.12	27	1059.14	1112.24	***
Total	**568**	**322.39**	**1062.23**	**579**	**643.87**	**1573.79**	***

Although the mean difference in income gives an indication of the change occurred during the time of the project, it does not determine whether these changes have been caused by the project or whether external factors have caused this change. Ideally this would be assessed by comparing the data of participants to that of non-participants, however such data is unavailable. We therefore employ a statistical method to control for the observed and unobserved intervening factors.

The statistical procedure involves two stages: firstly we estimate a probit function in which the dependent variable is a dichotomous variable that indicates measurement before (0) or after (1) the project. This function estimates the parameters that have changed during the project which are not direct outputs of the project; secondly, the Inverse Mills Ratio that can be derived from this estimation is then used to formulate equations for income derived from off-farm activities. This should ensure that we control for observed and unobserved differences between the two groups.

With the Inverse Mills Ratio as a control variable, we estimate the second-stage regression with ordinary least square (OLS) with dependent variable off-farm income for India, Philippines, Thailand and Vietnam. The results show that for the four countries together, the project does not have a significant influence of income derived from off-farm activities. Other factors, such as government assistance in the project, the occurrence of plant disease, the size of the household and the gender of the household head, do have a significant influence on off-farm income. Positive government intervention positively influences off-farm income by 596 international dollars, the occurrence of plant disease (for which the variable takes a negative value if present) negatively influences off-farm income by 701 international dollars. It is likely that with plant disease, production is lower and there is thus less access to supply for processing. Having a female head of household negatively influences off-farm income by 196 international dollars and one additional household member negatively influences it by 70 international dollars. The Inverse Mills Ratio is also significant.

The second-stage regressions for the individual countries show that for two out of four countries, India and Vietnam, the project positively influences off-farm income, by 71 and 656 international dollars, respectively. For India an increase in farm size by one hectare negatively influences off-farm income by 1171. Average farm size in the sample from India is 0.11 hectares and it seems likely that a land constraint is pushing farm households into off-farm activities. The Inverse Mills Ratio is also significant for the Indian estimation.

At the community level we find that the project positively influences off-farm income in all four communities, Pathiyoor and Thodiyoor in India and Binh Khanh and Duc My in Vietnam, by 94, 136, 1671, and 613 international dollars respectively. In India

another contributing factor to off-farm income is the level of education of the head of household.

Constraints

The HVP intervention was not successful in all countries. This had different causes related to the marketability of the products such as limited access to markets and market information, poor quality of products produced, limited volumes for larger scale marketing, and competition of substitute products. The success of the production and marketing of the high value coconut products was also constrained by a lack of managerial skills at CBO-level and for the micro-credit system. There were also technical limitations such as the unavailability of efficient and cheap processing equipment and malfunctioning of equipment without access to spare parts. External factors that constrained this intervention were the occurrence of natural calamities (typhoons, floods, pests and diseases) which we already found in the results of the impact analysis.

Sustainability

The intervention has forged linkages between farmers and both public and private sector actors and has improved the awareness of the importance and marketability of coconut and its processed products. Some local governments have demonstrated their support for the project by duplicating the interventions in other coconut-growing communities. With this government support and backing of the private sector, interventions can be made sustainable in the long term.

The choice of high value products has been adapted to local preferences and opportunities. For example in Vietnam, successful marketing is underway of midrib baskets that cater to the local culture of gift baskets for special occassions (Keizer, M. 2006. Building the Market Chain, Coconut in Vietnam, Midrib baskets: The art of giving, Bioversity International, Rome, Italy).

Gender dimension

Participation of women was high in most countries. Table 1 already showed that at the global level 57 percent of the participants in training on the production of non-food products were women, for food products this was 63 percent. At national level, female participation in training ranged from 17 percent in Ghana, to 91 percent in Mexico (non-food) and from 50 percent in Thailand to 100 percent in Philippines (food). Women are involved in the decision making process and management of the CBO.

Dissemination pathways

Table 3 shows the knowledge generation and dissemination strategies used in the project.

Table 3. Knowledge generation and dissemination strategies

Activity	Message	Medium	Users	Uses
Farmers' Meeting	Dissemination of relevant information and resolution of important issues related to project implementation	Open discussion, small group discussion	• Extension workers • Farmers • Researchers • Government officials	Basis for planning

Activity	Message	Medium	Users	Uses
Biodiversity Fairs*	On-farm research	Use of Participatory Research Approach tools in the characterization of farmers varieties	• Extension workers • Farmers • Researchers • Government officials	Conservation and utilization of indigenous coconut varieties
Field Days	Dissemination and promotion of project outputs	Display of products Project brochures	• Extension workers • Farmers • Researchers • Government officials	For replication and up-scaling
Catalogue of coconut varieties**	Characteristics of identified varieties	information, education and communication materials	• Extension workers • Farmers • Researchers • Policy makers	Basis in the choice of planting materials
Scientific papers, meetings	Dissemination of outputs	Scientific papers, posters, presentations	• Scientists • Students • Policy makers	Reference
Extension material	Dissemination of outputs	Posters, bulletins	• Extension workers • Policy makers	Reference
Other media	Dissemination of outputs	Radio broadcast, newspaper articles, video materials	• Farmers • Scientists • Students • Policy makers	Reference

Notes: *Only in India, Malaysia, Philippines, Thailand; **Only in China, India, Malaysia, Philippines, Tanzania, Thailand, Vietnam. Source: Annual project reports 2006, 2007; Project data analysis workshop (June 2008)

Further research needs

Further research needs have mostly been identified in the technical sphere such as the utilization of processing-waste for other purposes (such as coconut residue from virgin coconut oil production for baby-food), establishment of products shelf-life and the characterization of coconut sap produced from different local varieties. A further aspect that should be considered is how community-members can become more involved in the planning process of marketing activities.

Related information

Useful links: http://www.cogentnetwork.org/

http://www.bioversityinternational.org/

References: Community Project Monitoring Reports

Project socio-economic and food security database

Contacts: Dr. Maria Luz George (International Project Coordinator)

Acronyms: CBFS - Coconut-based farming system

CBO - Community-based organization

PPP - Purchasing Power Parity

Annex 9 Policy brief summarizing the project findings on on intercropping for income generation and food security

Technical Advisory Note (TAN)

Intercropping for income generation and food security

COGENT

Bioversity International

IFAD INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT

Technical Advisory Note (TAN)

Intercropping for income generation and food security

Abstract

Poor coconut farmers in many parts of the world are facing difficulties to sustain their families' livelihoods from coconut income. It is important to improve their incomes and food security conditions and to maintain the genetic diversity of coconut. The International Coconut Genetic Resources Network (COGENT) and partners implemented the project "Overcoming poverty in coconut growing communities" aiming to help developing countries alleviate poverty among marginalized coconut farmers through improved coconut-based farming systems and the diversification and effective use of coconut products and by-products. Part of the strategy was to introduce cash and food security intercrops that are compatible with coconut and feasible for the specific conditions of the communities.

Out of 11 countries we had data available for 14 communities in 7 countries for an evaluation of the impact of the strategy. At the national level, 3 out of 7 countries have seen a significantly positive change in income derived from intercrops. At the community level this is 7 out of 14 communities. At the global level the project has helped increase the income derived from intercrops by 191.75 international dollars per annum. Due to incomplete data, impact on food security could not be directly linked to the intercropping strategy, however during the time of the project, 12 out of 17 communities have seen a significant increase in food security. UN statistics also show declining trends in food insecurity in all participating countries ranging from an annual change of -0.8 to -3.9 percent.

Introduction

Poor coconut farmers in many parts of the world are facing difficulties to sustain their families' livelihoods from coconut income. Like many poor farmers in developing countries, these farmers often face limited landholding, declining productivity and an unstable price of coconut, resulting in poverty, food-insecurity and a low nutritional status. While it is important to improve the incomes and food-security conditions of these households it is also vital to maintain the genetic diversity of coconut in the process. COGENT and its partners implemented the project "Overcoming poverty in coconut growing communities" from 12 July 2005 until 11 July 2008, using an IFAD grant. The goal of the project was to help developing countries alleviate poverty among marginalized coconut farmers in China, Ghana, India, Indonesia, Jamaica, Malaysia, Mexico, the Philippines, Tanzania, Thailand and Vietnam through improved coconut-based farming systems and the diversification and effective use of coconut products and by-products. The major interventions of this project were to improve the production and marketing of high-value products from all parts of the coconut, to establish community-managed coconut seedling nurseries (also selling high-quality coconut seedlings), to introduce cash and food security intercrops, and to introduce livestock and/or fodder production.

In this document we will describe the introduction of cash and food security intercrops that are compatible with coconut and feasible for the agronomic, climatic, socio-cultural, and market conditions of the specific communities. The strategy was implemented through community-based organizations (CBOs). The CBO members were supported through appropriate technologies, village level equipments, training and capacity building and access to markets. Effective linkages were established with other agencies for technological support, input supply and credit facilities.

Main research programme: components

A Coconut-Based Farming System (CBFS) model was introduced to increase income from coconut-based farming and to improve food security. Through a participatory process the most suitable intercrops were selected for each community, including both cash and food crops, considering the specific local agronomic, socio-cultural and market conditions. The project assisted in the provision of high quality planting material and inputs through a micro-credit scheme, which was implemented as a community revolving fund. Effective recycling of coconut and other crop wastes through vermi-composting was implemented in some communities to improve production and reduce waste.

The intervention relies heavily on collective action through community-based organizations to integrate physical, natural, financial, social and human capital. These organizations were established or strengthened, with emphasis on ensuring broad access and participation of several categories of stakeholders, including women. Income-generation action plans were developed and implemented for each CBO. The CBOs also managed the revolving funds of the micro-credit.

Conditions for replicability

The project was implemented in a total of 19 communities in 10 countries, China, Ghana, India, Indonesia, Philippines, Mexico, Malaysia, Vietnam, Tanzania and Thailand. National level implementing organizations included national research institutes and governmental bodies. In many of the implementing countries, logistical support was provided by the local governments through provision of planting materials like vegetable seeds, training in the management of the crops, or facilitation of access to markets.

The communities differ in their socio-cultural profile, and interventions were made compatible with local conditions. The relative importance of intercrops in total income before the project ranged from less than 1 percent to almost 9 percent while after the project this ranged from less than 1 percent to 46 percent. At the global level the mean share of intercrop income in total income increased from 3 to 7 percent.

Apart from the main implementing agencies in each country an additional total of more than 50 other partners were involved in the project, from both the public and private sector. In the Philippines replication of the project is already underway in other communities, supported by the Philippines Coconut Authority.

Programme implementation

Target group and outputs

The target group is poor coconut farmers. The intervention is implemented through community-based organizations (CBOs), thus all are members of a CBO. At the global level the mean income per capita was 795 international dollars before implementation of the project. Out of 14 communities, more than half (8) had less than 2 international dollars per capita per day and of those, three had less than 1 international dollar per day. In none of communities did the average income per capita reach 5 international dollars per day. On average, farm households had 2.19 hectares of farmland with means per community ranging from 0.08 hectares (Thodiyoor, India) to 9.88 hectares (Mexico) before the project.

The intercropping intervention aimed to: (1) increase household income derived from crops planted between coconut trees and (2) to improve the food security and nutritional situation of the households involved.

Implementation

Each country selected the most suitable intercrops, both cash and food crops, for the agronomic and market conditions in the project sites. The project assisted in the selection of crops and provision of planting material. Table 1 presents an overview of the number of participants in each country, totaling 1000, and the crops introduced for all ten countries. Crops like tubers were intended to enhance the food security of the CBO-members, whereas crops like vegetables and fruits aimed to improve their nutritional status. Other crops such as cacao and watermelon were mainly introduced to enhance income. Apart from deriving extra income, intercropping had the potential to improve the performance of coconut because of additional management provided for the intercrops and the creation of a better microclimate in the coconut-based farming systems.

CBO members were also trained in the production of intercrops and in vermi-composting. A total of 40 technical trainings on intercropping were conducted.

Table 1. Overview of intercrop intervention

Country	No of participants	Crops introduced	Purpose	Comments
China	29	banana, papaya, areca nut, peanuts, cassava, sweet potato, vegetables	mostly food security	-
Ghana	23	eggplant, cassava, plantain, pepper	income food security	Poor soils, small areas planted
India	97	tuber, banana, mushroom, vegetables	income food security	Some damage due to water stagnation in 2007
Indonesia	72	banana, cacao, pandanus	income food security	-
Malaysia	77	tapioca, maize, pineapple, banana, tuber, fruit trees, vegetables	income food security	Problems with pests and diseases and seed germination
Mexico	16	watermelon, chilies, papaya, banana, cassava	income food security	Winds and rain destroyed crops in 2007
Philippines	138	Corn, vegetables banana, watermelon, fruit trees	income food security	Drought and strong winds affected production. Typhoon in 2006 destroyed most crops in 1

Country	No of participants	Crops introduced	Purpose	Comments
				community
Tanzania	39	legumes cassava sweet potato maize, groundnut pineapple	income food security	Lack of rain limited production
Thailand	125	sweet potato, vegetables, banana papaya lemon grass, arecanut, taro	income food security	-
Vietnam	384	banana, cacao, mango, orange, papaya, pomelo, sugarcane, sweet potato	income food security	Problems with salt water intrusion. One community with significant reduction in mean income from intercrops
Total	1000	-	-	

Source: Country project reports

Impact

Income

As part of the project, collection of data was carried out independently in each country, using a standardized questionnaire template. Depending on the country, socio-economic baseline data were collected late 2005 or early 2006 and a second set of data was collected late 2007 or early 2008. Some countries adapted the questionnaire to suit their situation. Baseline and post-project data are available from 14 communities in 7 countries. For a more intuitive understanding of the results and to enable some comparison between countries we have converted all financial data into international dollars, using the Purchasing Power Parity conversion factors of 2005[10.] To enable a comparison between the baseline and post-project data we also used the 2005 conversion factors for the post-project data, corrected for the respective national inflation rates11.

Table 2 shows that at national level, three out of seven countries (India, Malaysia and Philippines) have a significant difference in mean income derived from intercrops before and after the project. In these three countries, the project had good linkage with providers of good planting materials. In Vietnam the project was implemented in three communities of which one has seen a significant decrease and one a significant increase in mean income derived from intercrops. For Thailand, only one community has a significant difference. The mean difference of the total sample is also significant and positive.

Table 2. Comparison of means of intercrop income in international dollars per annum by baseline and post-project

	Baseline					Post-project					
	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	Sig
Ghana	**41**	**78.73**	**226.25**	**0.00**	**1249.80**	**41**	**128.69**	**155.75**	**0.00**	**663.39**	
India	**150**	**60.52**	**126.35**	**0.00**	**1154.74**	**150**	**254.88**	**429.43**	**0.00**	**2724.62**	***
Pathiyoor	50	97.81	203.82	0.00	1154.74	50	353.75	562.50	0.00	2639.86	***
Devikulangaragara	50	50.98	54.57	0.00	208.59	50	189.57	244.54	0.00	1191.44	***
Thodiyoor	50	32.79	41.59	0.00	160.19	50	221.33	411.20	0.00	2724.62	***

[10] The Purchasing Power Parity (PPP) is the long-run equilibrium condition for the exchange rate of a country (Abuaf and Jorion, 1990), i.e. the adjustment of the exchange rate that allows for the comparison of the same goods among countries. The conversion factors for 2005 have been released by the International Comparison Program of World bank. See: http://siteresources.worldbank.org/ICPINT/Resources/ICP_final-results.pdf.
[11] National inflation rates for 2005-2007 were derived from the CIA World factbooks 2006, 2007 and 2008. See: https://www.cia.gov/library/publications/the-world-factbook.

	Baseline					Post-project					
Malaysia	**57**	**132.82**	**282.79**	**0.00**	**1202.31**	**35**	**27.79**	**96.98**	**0.00**	**491.83**	******
Mexico	**32**	**61.01**	**92.90**	**0.00**	**294.53**	**29**	**58.49**	**81.80**	**0.00**	**291.59**	
Philippines	**87**	**64.98**	**135.45**	**0.00**	**694.25**	**85**	**916.86**	**1099.81**	**0.00**	**4806.54**	*******
San Miguel	35	31.40	121.13	0.00	638.48	35	1092.12	1074.34	0.00	3338.58	***
Tunkalan	52	87.58	140.92	0.00	694.25	50	794.17	1111.48	0.00	4806.54	***
Thailand	**138**	**45.22**	**201.99**	**0.00**	**1506.59**	**163**	**55.05**	**223.28**	**0.00**	**2055.27**	
Khog Wauw	50	16.70	59.45	0.00	345.26	52	84.14	148.58	0.00	528.50	***
Saeng Arun	53	92.57	315.00	0.00	1506.59	56	82.11	349.00	0.00	2055.27	
Thungka	35	14.28	43.21	0.00	188.32	55	0.00	0.00	0.00	0.00	*
Vietnam	**63**	**94.31**	**184.43**	**0.00**	**954.87**	**76**	**113.75**	**274.83**	**0.00**	**1093.56**	
Binh Khan	21	15.16	69.46	0.00	318.29	19	97.65	261.76	0.00	1093.56	
Chau Binh	21	204.11	255.12	0.00	954.87	30	9.23	26.25	0.00	131.23	***
Duc My	21	63.66	123.73	0.00	318.29	27	241.20	374.18	0.00	1093.56	**
Total	**568**	**68.83**	**182.17**	**0.00**	**1506.59**	**579**	**244.78**	**577.98**	**0.00**	**4806.54**	*******

Notes: *Significant at the 0.10 level, **Significant at the 0.05 level, ***Significant at the 0.01 level. Source: own data

Although the mean difference in income gives an indication of the change occurred during the project period it does not determine whether these are changes effected by the project or whether external factors have effected these changes. Ideally this would be assessed by comparing the data of participants to that of non-participants, however such data is unavailable. We therefore employ a statistical method to control for the observed and unobserved intervening factors.

The statistical procedure involves two stages: firstly we estimate a probit function in which the dependent variable is a dichotomous variable that indicates measurement before (0) or after (1) the project. This function estimates the parameters that have changed during the project which are not direct outputs of the project; secondly, the Inverse Mills Ratio (IMR) that can be derived from this estimation is then used to formulate equations for income derived from off-farm activities. This should ensure that we control for observed and unobserved differences between the two groups.

With the Inverse Mills Ratio as a control variable, we estimate the second stage regression with Ordinary Least Squares (OLS). We only show the results for those countries that showed a significant difference in mean income derived from intercrops before and after the project.

The results show that at the global level the project intervention has a significantly positive relationship with annual income derived from intercrops. Taking into account underlying observable and unobservable factors that have changed during the project, it positively influences expected income from intercrops by 192 international dollars per annum. Differences between communities also affect the income derived from intercrop. We further find infrastructure (roads) to have a significant relationship with income derived from intercrops. The coefficient is negative which seems counterintuitive because a lack of paved roads would have a negative value. It seems likely that those communities that are most remote have benefitted relatively more from the intervention as previously they had higher transaction costs to market their products while now they can benefit from the collective action created by the project intervention. Besides, the variables for plant disease and occurrence of natural calamity also have a significant coefficient. Because these variables take a negative value if these situations have occurred, we find that the presence of plant and livestock diseases negatively influences expected intercrop income by 106 and 602 international dollars respectively. The Inverse Mills Ratio is also significant.

From the regressions for the individual countries we find that in all three countries, India, Malaysia and Philippines, the project intervention has a significant relationship with income derived from intercrops. While the coefficients of India and Philippines are positive, indicating a positive effect, we find a negative coefficient for Malaysia. This is not surprising as we found that the mean of intercrop income of the baseline was significantly higher than that for and post-project data. Participation in the project positively influences expected intercrop income by I06 international dollars in India and 841 international dollars in the Philippines. In Malaysia however, the project has negatively influenced expected income from intercrop by 130 international dollars. It is possible that this reduction is off-set by increases in other income categories because the project had implemented different income generating strategies.

The results of the regression for India show that socio-economic variables such as household size, gender of the household head, and also farm size have a significant relationship with intercrop income. Those households that are larger, have a male head and have more farm area are more likely to have a higher income from intercrops. For the Philippines the relationship with farm size is also positive. In both India and Malaysia we find a significant coefficient for the Inverse Mills ratio which indicates some bias by unobserved factors.

In the regression for India we find the community variable to be significant. In 7 out of 11 communities the project has positively influenced expected intercrop income (8 out of 14 if you include those countries where the project has only been implemented in one community, i.e. Ghana, Malaysia and Mexico). This is the case in Pathiyoor and Devikulangara of India (152 and 145 international dollars respectively), San Miguel and Tungkalan of the Philippines (1280 and 629 international dollars respectively), Khog Wauw in Thailand and Duc My in Vietnam (60 and 191 international dollars respectively). The project has negatively influenced expected intercrop income in Chau Binh in Vietnam (178 international dollars). The Inverse Mills Ratio is significant in three cases and is positively influencing expected income.

Food security

The data for food security are limited as they do not have a direct link to the socio-economic data and also do not contain information on participation in intercrops. The data do give an indication of the general trends in food insecurity in the communities which we compare with national trends.

The food security survey contained statements on the food security situation with the question for respondents to indicate whether in the last three months they experienced this situation never, sometimes or always:

1. I worry whether my food will run out before I get some more money to buy more
2. The food that I bought just didn’t last and I didn’t have money to get more
3. I ran out of the foods that I needed to put together a meal and I didn’t have money to get more food
4. I cannot afford to give my child(ren) a balanced meal

With a simple Chi-square test we have tested whether the distribution of answers during the baseline and after the project were the same. The table shows that during

the time of the project, 7 out of 18 communities have seen a reduction in the occurrence of the four situations related to food insecurity indicated with the above questions. At the country level, Vietnam showed the biggest average food insecurity change (-3.9%), and Mexico, the least (-.08%). We have also taken into account the national trends in food security, derived from data from the United Nations, which shows that all countries have seen a general trend of decline in food insecurity. This trend ranged from an annual change of -0.8 to -3.9 percent in the prevalence of underweight children under the age of five.

Constraints

From the second stage estimations of the global level data, we found plant disease and occurrence of natural calamity to have a significantly negative relationship with the level of income derived from intercropping. The presence of plant disease negatively influences intercrop income by 106 international dollars and the occurrence of a natural calamity by 602 international dollars. Other specific problems have already been indicated in Table 1 and included unsuitable biophysical conditions, high cost of inputs (i.e. fertilizer and seeds), and managerial problems at CBO level.

Sustainability

The degree of farmers' involvement in planning and decision making determines the level of social and psychological acceptability; hence a participatory approach in implementing the intervention is crucial. Assistance provided by the implementing agencies and other collaborating institutions (local government, private sector) facilitated sourcing of inputs such as seeds, and partnerships forged (such as involvement of the farmers in setting up demonstration farms for private companies) create win/win situations. Training in conducting market surveys and in production techniques (e.g. organic farming) as well as postharvest handling and storage contribute to bigger profits for the farmers

Gender dimension

The project was specifically designed to facilitate the inclusion of women in the activities. At the global level 51% of the participants in intercropping are women (509 women out of 1000 participants) and the same percentage participated in trainings for intercropping. The participation of women, both with respect to participation in intercrops and training received was found to be lowest in Indonesia (both 3%) and Mexico (31 and 0% respectively) and highest in India (73 and 67%) and Thailand (62 and 60% respectively).

Dissemination pathways

Table 3 summarizes the knowledge generation and dissemination strategies employed in the project.

Table 3. Knowledge generation and dissemination strategies

Activity	Message	Medium	Users	Uses
Farmers' Meeting	Dissemination of relevant information and resolution of issues related to project implementation	Open discussion, small group discussion	• Extension workers • Farmers • Researchers • Government officials	Basis for planning

Activity	Message	Medium	Users	Uses
Biodiversity Fairs*	On-farm research	Use of Participatory Research Approach tools in the characterization of farmers varieties	• Extension workers • Farmers • Researchers • Government officials	Conservation and utilization of indigenous coconut varieties, intercrops and livestock
Field Days	Dissemination and promotion of project outputs	Display of products Project brochures	• Extension workers • Farmers • Researchers • Government officials	For replication and up-scaling
Catalogue of coconut varieties**	Characteristics of identified varieties	IEC materials	• Extension workers • Farmers • Researchers • Policy makers	Basis in the choice of planting materials
Scientific papers, meetings	Dissemination of outputs	Scientific papers, posters, presentations	• Scientists • Students • Policy makers	Reference
Extension material	Dissemination of outputs	Posters, bulletins	• Extension workers • Policy makers	Reference
Other media	Dissemination of outputs	Radio broadcast, newspaper articles, video materials	• Farmers • Scientists • Students • Policy makers	Reference

Notes: *Only in India, Malaysia, Philippines, Thailand; **Only in China, India, Malaysia, Philippines, Tanzania, Thailand, Vietnam. Source: Annual project reports 2006, 2007; Project data analysis workshop (June 2008)

Further research needs

Further research needs have been identified in four areas: (1) long term impacts, (2) the interaction in integrated systems, (3) other crop options, and (4) Integrated Pest Management and organic fertilizers.

1. Because the project ended only recently, long-term impacts can presently not be measured. Better data on a control-group of non-participants and better links between the socio-economic, participation and food-security data could also greatly improve the reliability of the conclusions. This would also allow for an analysis of presently unobserved bias in the access of participants to the CBOs.

2. The costs and benefits of the interactions in the farming systems are presently not well-known, both between livestock and intercrops and between coconut and intercrops. In both cases there is a need to assess whether the strategies compete for resources or exist in a beneficial situation whereby there is "cross-fertilization" in terms of resources (e.g. manure for intercrops and fodder for livestock). Economic and biological / agronomic analyses would be required.

3. Integration of medicinal/herbal plants to coconut-based intercropping systems

4. Integrated Pest Management (IPM) of coconut-intercrop combinations at varying ecological conditions. Use of inexpensive and indigenous sources organic fertilizer to replace expensive inorganic fertilizer

Related information

Useful links: http://www.cogentnetwork.org/

http://www.bioversityinternational.org/

References: Community Project Monitoring Reports

Project socio-economic and food security database

Contacts: Dr. Maria Luz George (International Project Coordinator)

Acronyms: CBFS - Coconut-based farming system

CBO - Community-based organization

PPP - Purchasing Power Parity

Annex 10 Policy brief summarizing the project findings on diversification of economic activities for increasing income.

Technical Advisory Note (TAN)

Diversification of economic activities to increase income among coconut farmers

COGENT

Bioversity International

IFAD INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT

Technical Advisory Note (TAN)

Diversification of economic activities to increase income among coconut farmers

Abstract

Poor coconut farmers in many parts of the world are facing difficulties to sustain their families' livelihoods from coconut-derived income. It is important to improve their incomes and food security conditions and to maintain the genetic diversity of coconut. The International Coconut Genetic Resources Network and partners implemented the project "Overcoming poverty in coconut growing communities" aiming to help developing countries overcome poverty among marginalized coconut farmers through improved coconut-based farming systems and the diversification and effective use of coconut products and by-products.

The main intervention aimed at income generation and strengthening food security was to improve the production and marketing of high-value products from all parts of the coconut, to introduce cash and food security intercrops, and to introduce livestock and/or fodder production. At the global level, the project positively influenced expected annual household income by 1778 international dollars. At the national level, the project positively influenced expected annual household income in four out of seven countries, with increases ranging from 836 (Philippines) to 1996 (Thailand) international dollars. At the community level, in eight out of 14 communities. Household size and farm size are both significant variables in many of the models that mostly positively influenced expected total income. Income diversification positively influenced household income in most countries. In four out of seven countries and at the global level, food security has also improved. Implementation of the interventions was constrained by the occurrence of animal and plant diseases, limited access to veterinary and other services, and a lack of or inadequate capital. Natural calamities also damaged crops. Lastly, a lack of market information limited farmer bargaining power and market access.

Introduction

Poor coconut farmers in many parts of the world are facing difficulties to sustain their families' livelihoods from coconut income. Like many poor farmers in developing countries, these farmers often face limited landholding, declining productivity and volatile coconut prices, resulting in poverty, food insecurity and low nutritional status. While it is important to improve the incomes and food security conditions of these households, it is also vital to maintain the genetic diversity of coconut in the process. The International Coconut Genetic Resources Network (COGENT) and partners, with an IFAD grant, implemented the project "Overcoming poverty in coconut growing communities" between July 2005 and July 2008. The goal of the project was to help developing countries overcoming poverty among marginalized coconut farmers in China, Ghana, India, Indonesia, Jamaica, Malaysia, Mexico, the Philippines, Tanzania, Thailand and Vietnam through improved coconut-based farming systems and the diversification and effective use of coconut products and by-products.

The major interventions of this project were to establish community-managed coconut seedling nurseries that also sell high-quality coconut seedlings, to improve the production and marketing of high-value products from all parts of the coconut, to introduce cash and food security intercrops, and to introduce livestock and/or fodder production, but in this document we will focus on the latter three. Households were able to diversify their economic activities and improve their overall household income. The strategy was implemented through community-based organizations (CBOs). The CBO members were supported through provision of planting materials, appropriate technologies, village level equipment, and training and capacity building. Effective linkages were established with other agencies for technological support, input supply and credit facilities.

Main research programme: components

Through a participatory process, the most suitable intercrops were selected for each community, including both cash and food crops, considering the capacity of the households and specific local agronomic, socio-cultural and market conditions. The project assisted in the provision of high quality planting material and inputs through a micro-credit scheme. Effective recycling of coconut and other crop wastes through vermi-composting was implemented in some communities to improve production and reduce waste. The same approach was also used to decide on the type of livestock (cattle, pigs, chicken, etc.) to introduce.

The project supported the farmers with a revolving fund (for purchase of stock and veterinary drugs), training and technical advice. For the production of coconut high-value products, CBO-members were supported with processing machinery, tools and micro-credit. They were trained on production, processing, utilization and marketing of products that differed among countries and communities.

Conditions for replicability

The project was implemented in a total of 19 communities in 10 countries: China, Ghana, India, Indonesia, Philippines, Mexico, Malaysia, Vietnam, Tanzania and Thailand. National level implementing organizations included national research institutes and governmental bodies. In many of the implementing countries logistical support was provided by the local governments through provision of low interest rate credit or planting materials like vegetable seeds.

The communities differed in their socio-cultural profile, and interventions were made compatible with local conditions. The relative importance of intercrops in total income before the project ranged from less than 1 percent to almost 9 percent while after the project this ranged from less than 1 percent to 46 percent. At the global level the mean share of intercrop income in total income increased from 3 to 7 percent.

Apart from the main implementing agencies in each country an additional total of more than 50 other partners were involved in the project, from both the public and private sector. In the Philippines replication of the project is already underway in other communities, supported by the Philippines Coconut Authority.

Programme implementation

Target group and outputs

The target group is poor coconut farmers. The intervention is implemented through community-based organizations (CBOs), thus all are members of a CBO. At the global level, the mean level of income per capita was 795 international dollars before implementation of the project. Eight out of 14 communities had less than 2 international dollars per capita per day, of those 8, three had less than 1 international dollar per day. In none of communities did the average income per capita reach 5 international dollars per day. On average, farm households had 2.19 hectares of farmland with means per community ranging from 0.08 hectares (Thodiyoor India) to 9.88 hectares (Mexico) before the project.

Implementation

The interventions aimed to increase income derived from a coconut-based farming system and improve food security and nutrition. Livestock and intercrop interventions were implemented at the household level. Each community selected the most suitable intercrops, both cash and food crops, and livestock for the agronomic and market conditions in the project sites. The project assisted in the selection of crops and livestock, provision of planting materials, animals and shelter if necessary, plus training on management of crops and livestock.

Table 1 presents an overview of the number of participants in each country, together totaling 1000 for intercrops and 731 for livestock, and the crops and animals introduced for all ten countries. Crops such as tubers were intended to enhance the food security of the CBO members, whereas crops such as vegetables and fruits aimed to improve their nutritional status. Other crops such as cacao and watermelon were mainly introduced to enhance income. Also the animal products were intended for both home use and marketing. Apart from deriving extra income, intercropping had the potential to improve the performance of coconut because of additional management provided for the intercrops and the creation of a better microclimate in the coconut-based farming systems. Livestock can contribute by providing a source of natural fertilizer.

Table 1. Overview of intercrop and livestock interventions

Country	Intercrops		Livestock	
	No of participants	Crops introduced	No of participants	Livestock introduced
China	29	banana, papaya, areca nut, peanuts, cassava, sweet potato, vegetables	30	chicken
Ghana	23	eggplant, cassava, plantain, pepper	35	pigs, chicken, sheep
India	97	tuber, banana, mushroom, vegetables	115	cow, goat, chicken, duck, rabbit, fishery
Indonesia	72	banana, cacao, pandanus	52	chicken, sheep
Malaysia	77	tapioca, maize, pineapple, banana, tuber, fruit trees, vegetables	40	honeybees, chicken
Mexico	16	watermelon, chilies, papaya, banana, cassava	9	chicken, turkey
Philippines	138	corn vegetables banana, watermelon, fruit trees	92	buffalo, pigs, goat, chicken
Tanzania	39	legumes cassava sweet potato maize, groundnut pineapple	43	goat, chicken

Thailand	125	sweet potato, vegetables, banana papaya lemon grass, areca nut, taro	183	cow, pig, chicken, duck, catfish, other fish
Vietnam	384	banana, cacao, mango, orange, papaya, pomelo, sugarcane, sweet potato	132	honeybees, cow, pig, chicken, duck, fish, frog
Total	1000	-	731	

Source: Country project reports

The activities for high value products were mainly implemented at the CBO level and included the development of high quality marketable products from all parts of the coconut tree and fruit, training of CBO-members in enterprise management and market linkages, and establishment and utilization of the appropriate equipment for the production of these high-value products at village-level. The communities were supported with processing machinery, tools and micro-credit. They were trained on production, processing, utilization and marketing of products that differ among countries and communities. Rapid market surveys and profitability analyses were conducted for each type of product produced, to assess its potential in the market. Products produced and marketed included coir-based products such as rope, geotextile and doormats from the husk, shell-based products such as charcoal and handicrafts (bowls, bags etc.), midrib-based products such as brooms and baskets, oil-based products such as virgin coconut oil (VCO) both for food and cosmetic uses, coconut milk-based products such as candy and pastries and, sugar from sap and vinegar from coconut water.

Impact

Income

As part of the project, data was collected independently in each country, using a standardized questionnaire template. Depending on the country, socio-economic baseline data were collected late 2005 or early 2006 and a second set of data was collected late 2007 or early 2008. Some countries adapted the questionnaire to suit their situation. Baseline and post-project data are available from 14 communities in seven countries. For a more intuitive understanding of the results and to enable some comparison between countries we have converted all financial data into international dollars, using the Purchasing Power Parity conversion factors of 2005[12]. To enable a comparison between the baseline and post-project data we also used the 2005 conversion factors for the post-project data, corrected for the respective national inflation rates[13].

Total income is composed of income derived from coconut, intercrops, livestock, other on-farm activities, and off-farm and non-farm sources of income. Because the activities of the income have had most influence on intercrop, livestock and off-farm activities we examine the mean income level before and after the project derived from these income categories in Table 2.

[12] The Purchasing Power Parity (PPP) is the long-run equilibrium condition for the exchange rate of a country (Abuaf and Jorion, 1990), i.e. the adjustment of the exchange rate that allows for the comparison of the same goods among countries. The conversion factors for 2005 have been released by the International Comparison Program of World bank. See: http://siteresources.worldbank.org/ICPINT/Resources/ICP_final-results.pdf.
[13] National inflation rates for 2005-2007 were derived from the CIA World factbooks 2006, 2007 and 2008. See: https://www.cia.gov/library/publications/the-world-factbook.

Table 2. Comparison of means of livestock, intercrop, off-farm and total income

Country	Baseline			Post-project			
	No of households (N)	Mean Income	SD	No of households N	Mean Income	SD	Sign.
Income from livestock							
Ghana	41	85	224.03	41	304	534.38	**
India	150	142	462.59	150	622	1221.94	***
Malaysia	57	49	123.12	35	204	415.42	**
Mexico	32	386	676.26	29	333	730.19	
Philippines	87	564	849.98	85	569	937.13	
Thailand	140	717	1611.44	163	438	1309.02	*
Vietnam	63	250	308.21	76	387	800.24	
All	570	369	961.68	579	469	1071.19	
Income from intercrop							
Ghana	41	79	226.25	41	129	155.75	
India	150	61	126.35	150	255	429.43	***
Malaysia	57	133	282.79	35	28	96.98	**
Mexico	32	61	92.90	29	58	81.80	
Philippines	87	65	135.45	85	917	1099.81	***
Thailand	138	45	201.99	163	55	223.28	
Vietnam	63	94	184.43	76	114	274.83	
All	568	69	182.17	579	245	577.98	***
Off-farm income							
Ghana	41	1	8.39	41	0	0.00	
India	150	5	66.79	150	163	427.38	***
Malaysia	57	38	184.49	35	352	962.62	*
Mexico	32	0	0.00	29	0	0.00	
Philippines	87	135	320.71	85	144	411.72	
Thailand	138	1141	1909.13	163	1559	2488.69	
Vietnam	63	173	280.11	76	917	1292.03	***
All	568	322	1062.23	579	644	1573.79	***
Total income							
Ghana	41	1317	1056.65	41	1276	1110.76	
India	150	1750	847.44	150	3953	2071.70	***
Malaysia	57	3908	2919.68	35	5268	4663.74	
Mexico	32	3462	2010.12	29	3827	1619.67	
Philippines	87	2326	2235.58	84	3887	3618.33	***
Thailand	138	5561	4854.08	163	9894	9339.01	***
Vietnam	63	1773	824.69	76	3706	1759.32	***
All	568	3048	3224.90	578	5470	6137.24	***
Herfindahl index for income diversification							
Ghana	41	.71	.24	41	.41	.14	***
India	150	.70	.16	150	.57	.17	***
Malaysia	57	.66	.20	35	.66	.20	
Mexico	32	.54	.15	29	.52	.12	
Philippines	87	.57	.21	85	.48	.25	***
Thailand	134	.68	.24	163	.58	.20	***
Vietnam	63	.52	.18	76	.53	.20	
All	564	.64	.21	579	.55	.20	***

Note: *Significant at the 0.10 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

At national level, four out of seven countries (Ghana, India, Malaysia and Thailand) have a significant difference in mean income derived from livestock before and after the project, three out of seven countries (India, Malaysia and Philippines) have a significant difference in mean income derived from intercrops, three out of seven countries (India, Malaysia and Vietnam) have a significant difference in mean income derived from off-farm activities and finally four out of seven countries (India, Philippines, Thailand and Vietnam) have a significant difference in total household

income. At the global level a significant difference in mean is observed for intercrop income, off-farm income and total household income.

Because the project has most likely changed the composition of total household income we also examine the Herfindahl index, which is an index that indicates the economic diversity of a household. It is calculated as the sum of the squared shares of income from each activity (in this case coconut, intercrops, livestock, other on-farm, off-farm and non-farm). The index always takes a value between zero and one, whereby one represents complete specialization. Out of seven countries, four have seen a significant diversification of their income. At the global level, we also find a significant diversification of income.

Although the mean difference in income gives an indication of the change that occurred during the time of the project, it does not determine whether these changes have been caused by the project or whether external factors have caused this change. Ideally this would be assessed by comparing the data of participants to that of non-participants, however such data is unavailable. We therefore employ a statistical method to control for the observed and unobserved intervening factors. An important factor is the price of coconut, which has increased rapidly over the years of the project. This difference is likely to bias the outcomes of the analysis. We need to include a variable that represents the world coconut oil price. However, because the value will be identical for all households in each community this leads to collinearity14 between this variable and the variable that represents the project in the estimation. We have therefore corrected income derived from coconut by adjusting it for the growth rate of the price of coconut oil (minus inflation)15. This amount was then used to calculate total income.

The statistical procedure involves two stages: firstly, we estimate a probit function in which the dependent variable is a dichotomous variable that indicates measurement before (0) or after (1) the project. This function estimates the parameters that have changed during the project which are not direct outputs of the project; secondly, the Inverse Mills Ratio that can be derived from this estimation is then used to formulate equations for income derived from off-farm activities. This should ensure that we control for observed and unobserved differences between the two groups. With the Inverse Mills Ratio as a control variable, we estimate the second-stage regression with ordinary least square (OLS). We only show the results for those countries that showed a significant difference in mean total income before and after the project.

At the global level we find that the project positively influenced expected total household income by 1778 international dollars. A higher level of education and more available land also positively influenced total income. There is geographic differentiation indicated by the significance of the community variable. The occurrence of natural calamities negatively influenced expected total income by 6010 international dollars

At the national level we find that in four out of seven countries, the project positively influenced expected total household income (India by 1561, Philippines by 836,

[14]Collinearity is a statistical phenomenon in which two variables in a linear regression are highly correlated. Although it does not affect the predictive power of the model as a whole it does affect the calculations of the individual predictors.

[15] assuming that national coconut prices will follow the development of coconut oil world prices

Thailand by 1996 and Vietnam by 1518 international dollars). At the community level this is eight out of 14 communities (including Ghana, Malaysia and Mexico where the project was carried out in only one community each). Household size is a significant variable in many of the regressions, and it positively influenced expected total income in all cases, apart from one community in India. In some communities, gender of the household head plays a role, where having a female household head negatively influenced expected total household income (Ghana, Thodiyoor in India, and Thungka in Thailand). Farm size also positively influenced total income in many communities. The Herfindahl index is significant in many of the regressions, and while diversification positively influences household income, this situation is reversed in two of the Vietnamese communities (where specialization positively influences expected total income). The Inverse Mills Ratio is significant in 10 out of 18 regressions, showing bias in the sample. Overall, improvements in income are better with bigger-sized farms and households, with male household heads.

Food security

The data for food security are limited as they do not have a direct link to the socio-economic data and also do not contain information on participation in intercrops. The data do give an indication of the general trends in food insecurity in the communities which we compare with national trends. The food security survey contained statements on the food security situation with the question for respondents to indicate whether in the last three months they experienced this situation never, sometimes or always:

1. I worry whether my food will run out before I get some more money to buy more
2. The food that I bought just didn't last and I didn't have money to get more
3. I ran out of the food that I needed to put together a meal and I didn't have money to get more food
4. I cannot afford to give my child(ren) a balanced meal

The data (missing information for Indonesia) were analyzed using SPSS. The results show that of the 10 countries, five have seen a significant change (t-test) in at least two of the food security situations, i.e. China, India (Pathiyoor, Devikulangara, Thodiyoor), Malaysia, Philippines (Tungkalan) and Tanzania. Also at the global level, there is a significant improvement. We have also compared the percentages to the general national food security changes based on data from the United Nations, shown in the last column. All countries have seen a general trend of decline in food insecurity. This trend ranged from an annual change of -0.8 to -3.9 percent in the prevalence of underweight children under the age of five.

Overview

Table 3 shows an overview of the regressions for the outcome indicators (intercrop, livestock, off-farm and total income and food security). Some countries have had a negative influence on some of the income categories. This is most likely due to a shift in previous economic activities to others. The column of food security shows the change in occurrence of food security situations. The indicated numbers are derived

by giving a positive change the value 1, a negative change a value -1 and no change a value 0 for each situation and adding them for the four situations. For both income and food security, clearest impact has been reached in India, Philippines and at the global level. It is possible that impact has been underestimated due to data constraints.

Table 3. Summary of outcome indicators

Explanatory variables	Significant influence of project by income category[1]				Food security[2]
	Intercrop	Livestock	Off-farm	Total income	
Ghana					**0**
India	*****105.53**		****71.09**	*****1561.71**	**+4**
Pathiyoor	**151.61		*94.45	***1993.75	+4
Devikulangara	***145.29			***1524.88	+4
Thodiyoor			*136.02	***1719.80	+4
Malaysia	****-129.84**	*****164.69**			**+4**
Mexico					**-1**
Philippines	*****840.81**			****835.57**	**+1**
San Miguel	***1279.46	***-517.51	***-203.65		+2
Tunkalan	***629.41			*1108.43	0
Thailand		*****-555.78**		*****1995.60**	**-2**
Khog Wauw	**60.17				-2
Thungka					-2
Saeng Arun		***-1713.72		*3071.75	-2
Vietnam			*****655.70**	*****1518.35**	**-4**
Binh Khanh Tay			***1671.49	***1369.46	-2
Chau Binh	***-178.18			***1732.36	0
Duc My	**190.57		**613.07	***1111.05	-2
All	*****191.75**			*****1778.06**	**+4**

Note: 1These are the coefficients of the second stage regressions. Coefficient significant at the *0.10 level, **0.05 level, and the ***0.01 level. 2Based on the change in occurrence of food security situations presented in Table 24, the indicated numbers are derived by giving a positive change the value 1, a negative change a value -1 and no change a value 0 for each situation and adding them for the four situations. The values marked in red show a decrease in income or food security.

Constraints

As indicated, there are differences between the countries and communities. This is due to specific implementation problems in each of the communities and intervening factors. Many countries faced animal diseases such as Avian flu (Asia), foot and mouth disease and Newcastle Disease (Tanzania). Access to veterinary services and quality breeder-stocks is often limited resulting in unnecessarily high mortality among livestock. Services are usually concentrated in higher potential areas. The provincial departments of livestock and dairy development tend to have higher densities of veterinary institutions and activity in areas where production is highest. Capital requirements for the production of livestock were often too high to be carried by the micro-credit funds. Financial and asset barriers therefore often prevent small farmers from intensifying their production because the investment required often exceeds their capital wealth. Plant diseases affected the productivity of intercrops planted and natural calamities such a hurricanes and volcano eruptions destroyed plants and coconut trees. In the regression at global level, we found that the occurrence of natural calamities negatively influenced expected total income by 6009 international dollars.

Availability of market information to the resource-poor farmers is limited due to a lack of telecommunications and other means of disseminating information. As a result, producers in remote areas are at a serious disadvantage in seeking markets and negotiating sales with traders and commercial firms. This problem is exacerbated by the fact that agricultural extension advice generally concerns technical production

issues and little guidance is given on marketing issues. Agricultural extension staff require training to enable them to provide advice on marketing issues in addition to technical matters.

Sustainability

Farmers as the client of the interventions were deeply involved in the planning, application and evaluation of the intervention strategies, in order to ensure their relevance to their situation. Research and extension benefited from farmer feedback and guidance in their work, at all levels, ensuring that the results of their work are useful and accessible to the farmers. Farmers benefited from regular and useful technical support (including training programmes and management of the revolving fund) generated by research and extension, which serves as the bases for sustainability of the project.

The project recognized farmers, researchers, NARS, extension, Government agencies (District Assemblies/ provincial councils), NGOs, CBOs, Opinion leaders and donors as parties who have mutual benefit of the livestock intervention. The project therefore forged the linkage and partnership with these institutions and organizations in the testing and evaluation of the intervention and created the awareness of the potential of livestock for poverty reduction. By demonstrating the flexibility and viability of the technology with the farmers, the trial farms created "neighborhood effect" and "innovation waves through farmer to farmer lateral learning and horizontal diffusion. For example in Ghana the livestock project is linked with the development policy of poverty alleviation through the Nzema East District Assembly and Ghana Cooperative Union. Under these agencies, farmers of selected communities are expected to be assisted financially and technically in their selected farming related enterprises.

Gender dimension

The project was designed to facilitate the inclusion of women in the activities. Women independently own sheep, pigs, goats and "backyard" poultry in the different countries and are now able to market the produce and retain the proceeds. They are now self-reliant and economically empowered. Women also play a central role in household and community food sovereignty. They invested their labour and expertise in the livestock intervention because of the economic relevance and market opportunities. Women are also involved in the decision making process and CBO management.

Participation of women in livestock trainings was 47 percent at the global level. At national level this ranged from 0% (Indonesia) and 36% (Ghana) to 100% (Mexico) and 59% (India). For intercrops this was 51% at the global level at the national level this was found to be lowest in Mexico (0%) and Indonesia (3%) and highest in India (67%) and Thailand (60%). For high value products 64 percent of the participants in training were women. At national level, female participation in training ranged from 36 percent in Indonesia to 90 percent in India.

Dissemination pathways

Table 4 summarizes the knowledge generation and dissemination strategies employed in the project.

Table 4. Knowledge generation and dissemination strategies

Activity	Message	Medium	Users	Uses
Farmers' Meeting	Dissemination of relevant information and resolution of important issues related to project implementation	Open discussion, small group discussion	• Extension workers • Farmers • Researchers • Government officials	Basis for planning
Biodiversity Fairs*	On-farm research	Use of Participatory Research Approach tools in the characterization of farmers varieties	• Extension workers • Farmers • Researchers • Government officials	Conservation and utilization of indigenous coconut varieties, intercrops and livestock
Field Days	Dissemination and promotion of project outputs	Display of products Project brochures	• Extension workers • Farmers • Researchers • Government officials	For replication and up-scaling
Catalogue of coconut varieties**	Characteristics of identified varieties	Information, education and communication materials	• Extension workers • Farmers • Researchers • Policy makers	Basis in the choice of planting materials
Scientific papers, meetings	Dissemination of outputs	Scientific papers, posters, presentations	• Scientists • Students • Policy makers	Reference
Extension material	Dissemination of outputs	Posters, bulletins	• Extension workers • Policy makers	Reference
Other media	Dissemination of outputs	Radio broadcast, newspaper articles, video materials	• Farmers • Scientists • Students • Policy makers	Reference
Coconut recipes book	Use of coconut	Book	• Consumers	Public awareness

Notes: *Only in India, Malaysia, Philippines, Thailand; **Only in China, India, Malaysia, Philippines, Tanzania, Thailand, Vietnam. Source: Annual project reports 2006, 2007; Project data analysis workshop (June 2008)

Further research needs

Further research needs have been identified in three areas: (1) implementation (2) long term impacts, (3) the interaction in integrated systems.

1. Some countries, such as India, clearly have had more success in income increase and food security than others; further research is needed on the underlying reasons to understand the conditions for replicability.

2. Because the project ended only recently, long-term impacts can presently not be measured. An impact assessment study in three years' time would allow this determination. Better data on a control-group of non-participants and better links between the socio-economic, participation and food-security data could also greatly improve the reliability of the conclusions. This would also allow for an analysis of presently unobserved bias in the access of participants to the CBOs.

3. The costs and benefits of the interactions in the farming systems are presently not well-known, both between livestock and intercrops and between coconut

and intercrops. In both cases there is a need to assess whether the strategies compete for resources or exist in a beneficial situation whereby there is "cross-fertilization" in terms of resources (e.g. manure for intercrops and fodder for livestock). Economic and biological / agronomic analyses would be required.

Related information

Useful links: http://www.cogentnetwork.org/

http://www.bioversityinternational.org/

References: Community Project Monitoring Reports

Project socio-economic and food security database

Contacts: Dr. Maria Luz George (International Project Coordinator)

Acronyms: CBFS - Coconut-based farming system

CBO - Community-based organization

PPP - Purchasing Power Parity

Annex 11 Collaborating organizations

Country	Main implementing partner	Organization	Nature of linkage
China	Coconut Research Institute	Tropical Crops Germplasm Research Institute	Research
		Wenchang Science and Technology Bureau	Research
		Luda Coconut Plantation	Research
		Cocosea Food Company	Research
		Hainan Forest Authority	Research
		Wenchang Agriculture Bureau	Research, Training
		Wenchang Forestry Bureau	Advice
		Wenchang Poverty Reduction and Incomes Generating Office	Training, Advice
Ghana	Oil Palm Research Institute	Nzema East District Assembly	Advice
		Animal Research Institute	Research
		Wienco Fibers Ltd	Training, Advice
		Gold Coast Foliage Ltd	Training
		Crops Research Institute	Planting materials
		PEEWOOD Craft and Art Cottage	Training
India	Central Plantation Crops Research Institute	Kerala Agricultural University	Planting materials
		Vayalar Coconut Community	Training
		Local media (such as Mathrubhumi, Malayala Manorama Daily, Kerala Kaumudi, Chandrika Daily, Thejus Daily, Desabhimani Daily)	Public awareness
		All India Radio	Public awareness
		Banks (such as Canara Bank, Kayamkulam and Primary Agri. Development Bank, Alappuzha)	Funding support
		Kerala State Department of Animal Husbandry	Research
		Krishi Bhavan (Kerala State Dep. of Agriculture)	Research
		Krishi Vigyan Kendra	Planting materials
		Vegetable and Fruit Promotion Council of Kerala	Planting materials
		Central Tuber Crops Research Institute	Planting materials
		Kerala State Dairy Development Department	Research
Indonesia	Indonesian Center for Estate Crops Research and Development	Batik and Handicraft in Yogjakarta	Training
		Department of Forestry and Estate Services	Training
		Livestock and Agricultural Services	Training
		Assessment Institute for Agricultural Technology	Advice
Jamaica	Coconut Industry Board	International Coconut Genebank in Cote d'Ivoire	Planting materials
Malaysia	Department of Agriculture	Federal Agriculture Marketing Authority	Training
		Veterinary and Animal Husbandry Department	Research
		Rural Development Corporation	Advice
Mexico	Instituto de Investigaciones Forestales, Agricolas y Pecuarias	Tabasco AC Foundation	Training
		Secretary of Development for Agriculture	Training
		Coconut Producers State Advisory of Tobasco Civil Association	Advice
		Tabasco State Advice of Science & Technology	Potential funds

Country	Main implementing partner	Organization	Nature of linkage
Philippines	Philippine Coconut Authority	Provincial government of Oriental Negros	Planting materials
		Provincial Veterinary Office	Training
		Juboken	Training
		Department of Agrarian Reform	Research, Training, Advice
		Altertrade Corporation	Training
		City Agriculturist Office	Training Advice
		NOPA Foods Corporation	Training
		Bahandi sa Kaumahan ug Kadagatan	Training
		Department of Agriculture	Planting materials
		Cocoa Foundation of the Philippines (COCOAPHIL)	Training
		Albay Packaging Center	Training
		East-West Seed Company	Training
Tanzania	Ministry of Agriculture and Food Security	Ministry of Agriculture	Planting materials
		Labour, Employment and Youth Development	Advice
		Bagamoyo District Council	Advice
		Small Industries Development Organization	Training
		Centre for Counselling, Nutrition & Health Care	Advice
		Bagamoyo's District Office	Advice
		Livestock Breeding Station	Quality livestock
Thailand	Horticulture Research Institute	Chaiburi Village Administration	Advice
		Chumphon Agricultural Extension Office	Research
		Chumphon Community Development Office	Advice
		Thungka Sub District Administration Office	Advice
		Fertilizer Sub District Programme	Advice
		Office of Provincial Livestock Development	Research
		Phattalung Community Development Office	Advice
		Seang Arun Sub district Administration Office	Advice
		Phattalung Agricultural Extension Office	Planting materials
		UN Food and Agriculture Organization	Research
		Department of Agricultural Extension	Research, Training
Vietnam	Oil Plant Institute	Thuan Hiep cooperative, Ben Tre province	Advice
		Tra Bac company, Tra Vinh province	Advice
		Phu Hung, Ben Tre province	Advice
		Viet Kor company, Ben Tre province	Advice
		United States Department of Agriculture	Training
		Ben Tre provincial government	Research, Advice
		Silver Mill Corporation	Training
		ED&Fman company	Planting materials
		VODA	Training
		International Labor Organization	Advice

Annex 12 Publications and public awareness materials

PROJECT
Website

1. Cogent website - http://www.cogentnetwork.org/index.php?page=projectaccess

2. Google Coconut Group COGENT Page - http://groups.google.com/group/coconut/web/cogent

Newsletter: COGENT Updates

3. George M. L. Malaysia: A Little Investment Goes A Long Way. http://coconut.googlegroups.com/web/COGENTUpdate2007-1.jpg. 15 March 2007

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IN-COUNTRY
Scientific/Technical papers

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Mexico

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Ghana

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Malaysia

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Philippines

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Vietnam

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China

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Ghana

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India

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Indonesia

91. Income generating activities in Indonesia

Malaysia

92. Virgin Coconut Oil: A New Life for Matunggong Coconut Farmers

Philippines

93. Emerging coconut-based agro entrepreneurs: Tungkalan Coconut Farmers Cooperative

Thailand

94. Income generating actitivies in Thailand

Tanzania

95. Income generating activities by the Chambezi Coconut Growers Community in Tanzania

Vietnam

96. Coconut-based activities in Binh Khanh Tay, Duc My and Chau Binh communities

Annex 13 Project staff and resource persons

Name	Position/Organization	Contribution to the project
BIOVERSITY		
1. Dr. Maria Luz George	Senior Scientist COGENT Coordinator (July 2006-present)	Grant Management
2. Dr. Pons Batugal	Senior Scientist COGENT Coordinator (2005-June 2006)	Grant Management
3. Mr. Yeow Giap Seng	Program Assistant	Project support
4. Ms. Kanniah Jayashree	Scientific Assistant	Project support
5. Mr. Jeffrey Oliver	Communications Officer	Public awareness
6. Mr. Menno Keizer	Dutch Associate Expert	Socioeconomics and markets expertise; training on socioeconomic aspects of implementing the IFAD project on *Overcoming Poverty in Coconut Growing Communities*
7. Ms. Froukje Kruijssen	Dutch Associate Expert	Socioeconomics and markets expertise; training; data analysis
Resource persons		
8. Dr. Lucilla Lapar	Scientist International Livestock Research Institute (ILRI)	Economics and markets expertise; training on value-chain approach to improving smallholder competitiveness in markets
9. Dr. Paul Stapleton	Communications specialist Potato International Center (CIP)	Training on technical writing, seminar presentation, proposal preparation and public awareness
10. Ms. Lorna Sister	Specialist, Users' Perspectives With Agricultural Research and Development CIP-UPWARD	Resource person for the synthesis of project findings and formulation of policy briefs
11. Ms. Arma Bertuso	Specialist, Users' Perspectives With Agricultural Research and Development CIP-UPWARD	Resource person for the synthesis of project findings and formulation of policy briefs
12. Ms. Erlene Manohar	Project Leader for Philippines and Rural development expert Philippine Coconut Authority Philippines	Rural development expertise, training, resource person for the development of protocols and operations manual for poverty reduction research in coconut growing communities
13. Dr. Corazon Barba	Nutritionist University of the Philippines Philippines	Development of survey methodology for the food security and nutrition survey; training; data analysis
14. Mr. Carlos dela Cruz	Engineer National Irrigation Administration Philippines	Training on equipment operations and pilot testing of HVP technologies
15. Ms. Nguyen Thi Le Thuy	Project leader Oil Palm Institute Vietnam	Training on Vietnamese candy making
16. Dr. Consorcia E. Reano	Statistician, University of the Philippines, Philippines	Resource person on the use of morphometric methods of characterizing farmers' coconut varieties and documentation of coconut food recipes

Annex 14 Project meetings, training courses and workshops

Date	Place	Title	Type of activity	No of participants
9 – 13 May 2005	Hatyai, Thailand	Project Inception Meeting	meeting	20 participants 12 countries
12 – 14 Jun 2006	Bogor, Indonesia	Technical Writing, Seminar Presentation, Public Awareness & Proposal Preparation	training	21 participants 9 countries
15 – 17 Jun 2006	Bogor, Indonesia	Socioeconomic and Participatory Approaches to Reduce Poverty in Coconut Growing Communities	training	20 participants 11 countries
19 – 21 Jun 2006	Bogor, Indonesia	Annual Review and Planning Meeting	meeting	25 participants 12 countries
2 – 3 Jul 2007	Wenchang City, China	Value-Chain Approach to Improving Smallholder Competitiveness in Markets	training	17 participants 10 countries
4 – 6 Jul 2007	Wenchang City, China	Annual Review and Planning Meeting	meeting	24 participants 10 countries
19 – 21 May 2008	Los Baños, Philippines	Data Analysis	workshop	16 participants 10 countries
22 – 27 May 2008	Los Baños, Philippines	Project Completion Meeting	meeting	20 participants 10 countries