



1997 Portfolio Report



EnterpriseWorks

WORLDWIDE

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EnterpriseWorks Worldwide designs and implements programs in conjunction with an extensive network of affiliates and partner organizations including EnterpriseWorks' country and associate offices, cooperatives and producer associations, international NGOs, private companies, government development banks and parastatals, and government agencies. Without these collaborative relationships, the program achievements highlighted in this report would not have been possible. We would like to thank the following organizations for all of their good work.

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EnterpriseWorks Country and Associate Offices

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Asociacion de Pequeños Caficultores de Guatemala (ASPECAGUA - Association of Small-Scale Coffee Producers of Guatemala)
Bharatiya Agro-Industries Foundation (BAIF) [India]
Biological Nitrogen Fixation for International Development (NifTAL) [USA]
CARE/Mozambique
Catholic Relief Services (CRS)/The Gambia [USA]
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Dairy Development Unions (DDUs) [India]
EDA Rural Systems [India]
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Lembaga Pengelolaan Kawasan Hutan Partisipatif (LPKHP - Participatory Forest Management Institution) [Indonesia]
Marinducare Foundation, Inc [Philippines]
Nagkakaisang mga Tribu ng Palawan (NATRIPAL - United Tribes of Palawan) [Philippines]
National Dairy Research Institute (NDRI) [India]
National Dairy Development Board (NDDB) [India]
Natugo (Self-Help) [Mali]
Natural Resources Institute (NRI) [U K]
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EXECUTIVE SUMMARY

In 1997, EnterpriseWorks Worldwide provided ongoing financial, technical, or managerial assistance to small- and micro-enterprises through twenty-seven major projects. Twenty-four of these projects generated significant economic impacts and the rest were either still at early stage or were research activities.¹ In addition, EnterpriseWorks monitored the continuing impact of three projects that no longer required assistance from the organization.

The projects monitored for impact were located in ten countries in Africa, six in Asia, and three in Latin America. During the year, EnterpriseWorks operated country or associate offices in eleven nations: Benin, El Salvador, India, Mali, Nepal, Niger, the Philippines, Senegal, Tanzania, Uganda, and Zimbabwe. In the other countries, EnterpriseWorks collaborated with other organizations, mostly international or local nongovernmental organizations (NGOs) or cooperatives and producer associations.

EnterpriseWorks assisted small-scale producers in eight commodity program areas: animal fiber, coconuts, coffee, dairy and other livestock, household energy, market gardening, natural products, and oilseeds and other staple foods. Table S-1 lists the organizations' portfolio of projects as of the end of 1997. Five of the projects began in 1997. The oldest continuing project dates back to 1985, but the median age of the projects was 3 years. The total budget commitments for these projects (including signed contracts for future years) were close to \$32.9 million. In 1997, total expenditures for these projects were \$3.5 million and their cumulative expenditures to date amounted \$19.7 million. About 60% of the firm budgets for these projects have been expended.

In 1997, EnterpriseWorks' expenditures totaled \$5.2 million, including \$3.0 million in institutional funding from USAID/Washington and \$2.2 million from funders supporting specific projects. These figures exclude funding donors provided directly to our country offices or partner organizations for projects. Program expenditures are projected to increase to \$7.5 million in 1998. In decreasing order, the largest funders for the programs were nine USAID missions overseas, the Biodiversity Conservation Network, two private utility companies, the U.S. Environmental Protection Agency, the World Bank, Starbucks Coffee, the Ford Foundation, and the Rockefeller Foundation.

Table S-2 summarizes EnterpriseWorks' program outreach and impact through the end of 1997. Since 1993, EnterpriseWorks has assisted nearly 19,000 enterprises that continued to generate economic impact in 1997. These enterprises benefited almost 177,700 **economic participants** (owners, workers, principal raw material suppliers, and consumer households who made or saved money as a result of project activities). This year alone, the projects generated \$9.47 million in **total monetary benefits**, 15% from **producer cost savings**, 53% in **producer income gains from sale of final goods and services**, and 32% from **consumer savings**. Cumulative total monetary benefits from 1993 to 1997 amounted to nearly \$35.5 million. The assistance EnterpriseWorks provided during this period will continue to generate economic benefits for many years to come.

¹ Three of the monitored projects were replications of the oilseed processing activities pioneered by EnterpriseWorks that were implemented by partner organizations with direct EnterpriseWorks assistance: the Zambia Oils Project implemented by AFRICARE, the Mozambique Oils Project of CARE, and the Gambia Oils Project of Catholic Relief Services. Current information was not available on Apro Tec/Kenvas' independent replication of the ram press technology invented by EnterpriseWorks.

Commodity Area	Start Date	End Date	Age of Project (Years)	Life of Project Budget	1997 Expenditures	Cumulative Expenditures	Percent of Budget Expended
<i>Animal Fiber</i>				\$5 195 732	\$205 091	\$4 572 302	88 0%
Brazil Merino Fiber	10/1/01	6/30/06	4 8	\$5 195 732	\$205 091	\$4 572 302	88 0%
<i>Coconuts</i>				\$480 610	\$43 752	\$436 671	90 9%
Philippine Coconut	6/1/02	12/31/07	5 6	\$359 410	\$21 949	\$346 983	96 5%
Philippines Coir	2/1/05	12/31/08	2 3	\$121 200	\$21 803	\$98 688	74 0%
<i>Coffee</i>				\$2 153 500	\$418 114	\$1 390 606	64 6%
El Salvador Coffee	1/1/05	3/31/07	3 0	\$2 078 500	\$361 864	\$1 334 356	64 2%
Guatemalan Coffee	4/1/07	12/31/08	0 8	\$75 000	\$56 250	\$56 250	75 0%
<i>Dairy and Other Livestock</i>				\$3 440 006	\$519 249	\$1 654 558	48 1%
India Dairy	10/1/04	3/31/04	3 7	\$3 002 379	\$385 573	\$1 282 233	42 7%
Zimbabwe Livestock	10/1/05	3/31/07	2 3	\$437 627	\$133 676	\$172 325	85 1%
<i>Household Energy</i>				\$3 365 748	\$249 434	\$1 311 330	39 9%
Mali Household Energy	6/1/06	3/1/07	1 6	\$2 158 001	\$133 583	\$133 583	6 2%
Senegal Household Energy	4/1/01	2/28/08	6 8	\$1 207 747	\$115 851	\$1 207 747	100 0%
<i>Market Gardening</i>				\$4 255 643	\$540 494	\$1 887 911	38 1%
Brazil Market Gardening	10/1/01	10/31/01	0 2	\$849 684	\$70 908	\$70 908	8 3%
Mali Market Gardening	4/1/05	3/30/02	2 8	\$1 652 097	\$143 240	\$319 893	19 4%
Niger Market Gardening	3/1/07	3/31/01	0 8	\$960 692	\$167 778	\$167 778	17 5%
Senegal Market Gardening	4/1/01	2/28/08	6 8	\$1 493 170	\$158 508	\$1 379 337	89 0%
<i>Natural Products</i>				\$2 036 392	\$586 323	\$1 478 199	72 6%
India Forest Silk and Wild Honey	2/1/05	8/31/05	2 3	\$616 358	\$288 484	\$514 304	83 4%
Indonesia Resins Bamboo and Rattan	1/1/06	12/31/08	2 0	\$466 249	\$76 821	\$226 665	48 6%
Nepal Essential Oils	1/1/05	1/1/07	3 0	\$825 085	\$199 215	\$643 566	78 0%
Philippines Rattan	6/1/04	12/31/08	3 6	\$128 700	\$21 803	\$93 064	74 0%
<i>Oils and Staple Foods</i> ^a				\$10 090 806	\$829 824	\$5 815 984	57 6%
Benin Oil	11/1/01	10/31/01	0 2	\$776 802	\$60 946	\$60 946	7 8%
Gambia Oils ^c	1/1/05	12/31/07	3 0	\$172 214	ND	\$172 214	100 0%
Mali Oils	1/1/06	2/2/98	2 0	\$1 280 630	\$138 581	\$249 103	19 5%
Mozambique Oils ^b	10/1/94	3/31/08	3 3	\$242 914	ND	ND	ND
Senegal Jatropha	4/1/05	12/31/08	2 8	\$86 989	\$37 405	\$69 591	80 0%
Tanzania Oils	11/1/85	5/30/08	12 2	\$1 406 686	\$177 499	\$748 884	53 2%
Uganda Oils	10/1/03	10/1/02	4 3	\$3 124 780	\$164 119	\$1 613 094	51 6%
Zambia Oils ^d	10/1/02	12/31/07	5 3	\$2 248 723	\$133 432	\$2 248 723	100 0%
Zimbabwe Oils	8/1/80	3/28/00	8 4	\$751 068	\$117 842	\$53 479	8 0%
<i>Other Programs</i>				\$1 163 563	\$110 415	\$1 163 545	100 0%
Caribbean	5/1/02	1/31/07	4 7	\$582 875	\$79 000	\$582 857	100 0%
India Philippines & Sri Lanka Rhizobium	3/1/04	2/28/07	3 0	\$256 603	\$31 415	\$256 603	100 0%
Thailand Micro Enterprise Finance	6/1/03	3/31/06	2 8	\$324 085	50	\$324 085	100 0%
<i>Totals</i>				\$32 882 000	\$3 502 696	\$19 741 106	60 0%

^a Represents projects implemented by other organizations
^b Includes expenditures from 1985 to February 1997
^c ND - No Data

Table S-1 Enterprise Works Project Portfolio in 1997

Commodity Areas and Projects	Base Year	Economic Participants in Base Year	Economic Participants in 1997	Total Monetary Benefits in Base Year	Total Monetary Benefits in 1997	Cumulative Total Monetary Benefits 1993 1997
<i>Animal Fiber</i>		712	3 286	\$163 582	\$496 798	\$1 748 555
Bolivia Alpaca Fiber	1993	712	3 286	\$163 582	\$496 798	\$1 748 555
<i>Coconuts</i>		240	9 813	\$10 778	\$367 032	\$1 568 599
Philippines Coconut	1994	189	9 358	\$9 766	\$351 477	\$1 552 032
Philippines Cour	1996	51	455	\$1 012	\$15 555	\$16 567
<i>Coffee</i>		463	1,072	\$41,121	\$275 848	\$425 613
El Salvador Coffee	1995	463	1 072	\$41 121	\$275 848	\$425 613
<i>Dairy and Other Livestock</i>		2,287	10 303	\$45,731	\$206 063	\$251 794
India Dairy	1996	2 287	10 303	\$45 731	\$206 063	\$251 794
<i>Household Energy</i>		10 208	32,402	\$761 504	\$2 934 113	\$9 904 420
Mali Household Energy	1997	1 176	1 176	\$55 323	\$55 323	\$55 323
Senegal Household Energy	1993	9 032	31 226	\$706 181	\$2 878 790	\$9 849 097
<i>Market Gardening</i>		1 864	7 626	\$514 588	\$1 687 192	\$5 739 459
Mali Market Gardening	1995	611	2 748	\$99 936	\$299 869	\$622 743
Senegal Market Gardening	1993	1 253	4 878	\$414 652	\$1 387 323	\$5 116 716
<i>Natural Products</i>		2 210	2,743	\$44 256	\$84 228	\$199 406
India Tasar Silk and Wild Honey	1997	87	87	\$1 799	\$1 799	\$1 799
Indonesia Resins Bamboo and Rattan	1996	101	178	\$2 024	\$5 636	\$7 660
Nepal Essential Oils	1995	573	1 198	\$11 460	\$24 405	\$49 583
Philippines Rattan	1995	1 449	1 280	\$28 973	\$52 388	\$140 364
<i>Oilseeds and Staple Foods</i>		63 824	106 814	\$1 656 222	\$3 210 653	\$13 785 115
Mali Oils	1997	416	416	\$8 315	\$8 315	\$8 315
Mozambique Oils ^b	1995	2 066	24 033	\$14 159	\$160 012	\$207 744
Tanzania Oils	1993	46 496	31 730	\$1 142 760	\$1 013 436	\$5 773 040
Uganda Oils	1994	2 301	4 160	\$58 970	\$83 212	\$451 492
Zambia Oils ^b	1993	3 989	20 596	\$154 090	\$1 309 376	\$4 833 968
Zimbabwe Oils	1993	8 556	25 879	\$277 928	\$636 302	\$2 510 556
<i>Other Programs</i>		2 274	3 639	\$633 969	\$210 203	\$1 838 390
Guatemala Ceramics	1994	244	400	\$18 058	\$54 225	\$181 665
India Philippines & Sri Lanka Rhizobium	1995	1 004	2 319	\$21 409	\$46 386	\$138 480
Thailand Micro Enterprise Finance	1994	629	920	\$341 144	\$109 592	\$1 031 105
Completed Projects	1993 1994	397	ND	\$253 358	ND	\$487 140
<i>Totals</i>		84,082	177 698	\$3,871 751	\$9 472 130	\$35 461 351

a Base year is the first year during this period when the project had significant economic impact

b Replication projects implemented by other organizations

c Honduras Cashews Nepal Potato Tissue Culture Nepal Venture Capital Training

ND no data

Table S-2 Enterprise Works Program Outreach and Impact Through the End of 1997

Figure S-1 reports on the types of economic participants benefiting from the programs and projects in 1997. More than 43% of the producer participants benefiting in 1997 were women. Figure S-2 shows recent trends in the economic impact of the programs.

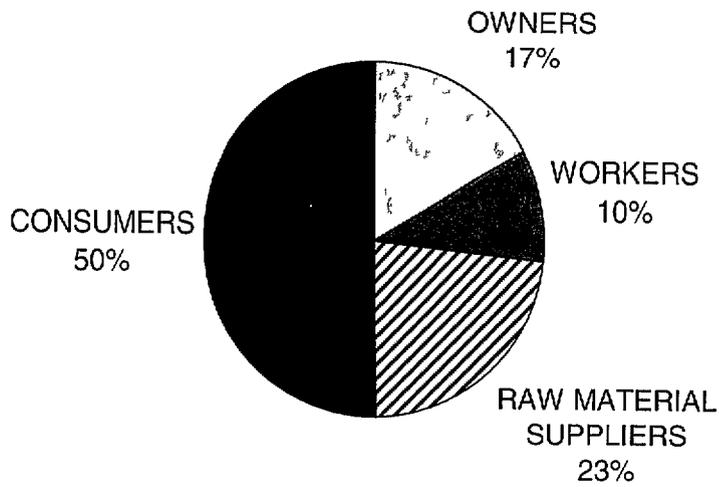


Figure S-1 Types of Economic Participants Benefiting in 1997

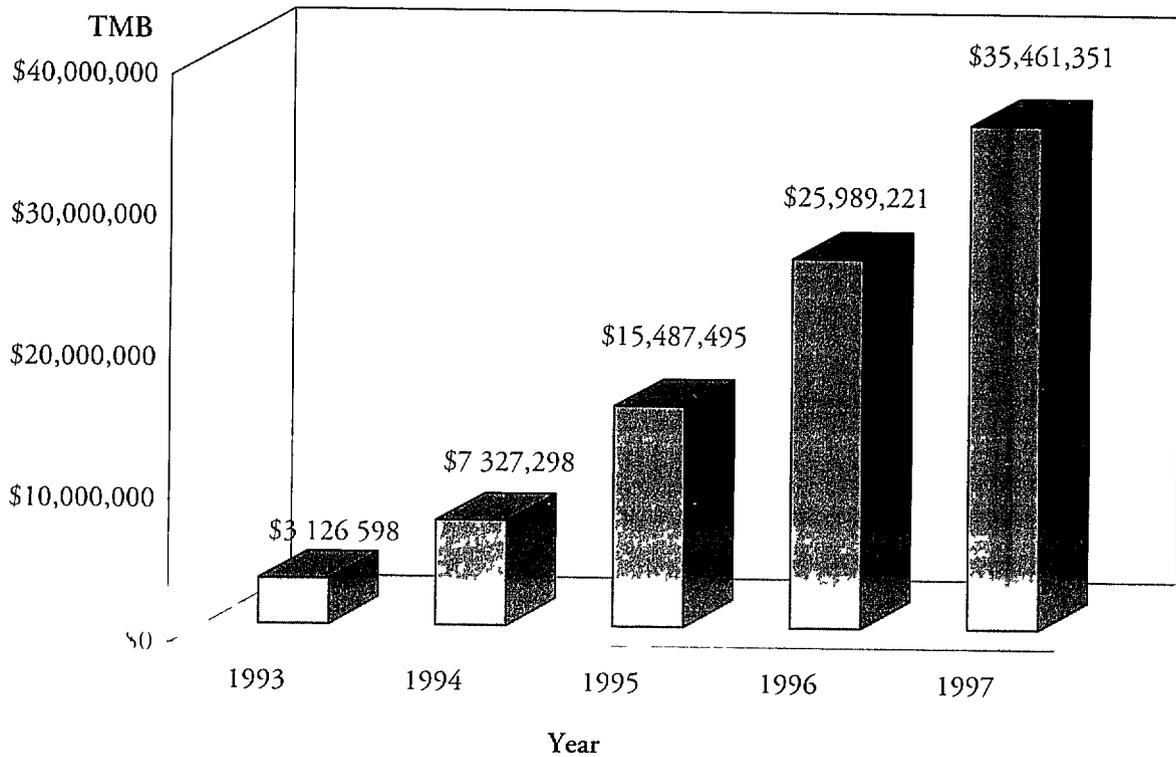


Figure S-2 Trends in Cumulative Total Monetary Benefits 1993—1997

Program Overview

The following overview of program highlights in 1997 summarizes the objectives, progress, and accomplishments of the projects monitored for impact this year

Animal Fiber

Building on the experience of an earlier project for sheep's wool production and processing in Guatemala, EnterpriseWorks designed a similar integrated project for alpaca fiber in Bolivia. The Bolivian Altiplano is a remote region with a high rate of poverty. Since the harsh climate of the Altiplano makes it virtually impossible to grow most crops, the main economic livelihood in the region is raising alpacas, llamas, sheep, and goats. Before the project, unprocessed alpaca fiber from Bolivia was transported to Peru for processing and marketing and, consequently, Bolivian herders received relatively low prices for their fiber.

The Bolivia Alpaca project, which began in 1991, is the largest project implemented by EnterpriseWorks to date. Working with a camelid producers association, EnterpriseWorks introduced improved genetic stock of alpacas, better management practices for pasture land, veterinary services and inputs, and improved fiber shearing techniques. EnterpriseWorks then helped establish a \$1.6 million fiber processing plant, set up a revolving loan fund for the herders, and developed direct fiber marketing linkages with major European buyers. The processing company is owned by the producers' association, the herders themselves, and other local investors. EnterpriseWorks has completed its technical assistance and financial support for the initial stage of the project. The producers association will use its share of the profits from the fiber processing plant to continue extension services for herders that the government cannot provide. The association will also use loan repayments from herders and the processing company to fund additional loans.

As a result of this project, alpaca fiber production per animal increased 45% and mortality rates declined 30% for young alpacas and 47% in adult alpacas. Meat production per animal also increased due to better nutrition and health. The processing company is selling the fiber as "tops" (inch-thick cords of aligned fiber). The former president of Bolivia, Gonzalo Sanchez de Lozada, lauded this activity as "the country's best development project." The United Nations Development Program also highlighted it as **one of the two model projects worldwide in the International Year of Poverty Alleviation**.

As a result of the EnterpriseWorks project, the alpaca herders' association was subsequently able to obtain funding from other donors and expand services for camelid producers to other geographic areas in Bolivia. In 1997, nearly 3,300 alpaca producers benefited from the project. The value of the alpaca fiber processed in 1997 was almost \$497,000. The total value of processed alpaca fiber production from 1995 through 1997 was nearly \$1.75 million.

The fiber processing company now hopes to proceed to the next stage of processing, spinning alpaca tops into yarn. The potential profit from yarn spinning is triple that of tops processing, but a significant amount of additional capital is required for this step and it increases the complexity of operations. EnterpriseWorks helped the fiber processing company develop a business plan for yarn spinning and is now trying to seek investment capital to upgrade the processing plant.

Coconuts

In the Philippines, EnterpriseWorks promoted small-scale processing of coconuts so that farmers could add value to their products locally. The first step was developing the capacity of a research institute at the University of the Philippines at Los Baños to do product and process testing and training. Working together with EnterpriseWorks staff and consultants, the institute assessed the feasibility of twenty-nine enterprise opportunities for coconut products.

The study identified five options with the best prospects for success by small scale producers 1) improved kilns for high quality copra production 2) the fresh-dry method for coconut oil, 3) wet coconut processing for snack foods 4) high-quality charcoal from coconut shells and 5) decortication of coconut husks for coir fiber and coir dust

Major typhoons adversely affected coconut production and processing in the first year and electricity outages also proved to be a bottleneck in the early stages of the project Subsequently, a total of thirty-three new coconut processing enterprises were created through this project Although EnterpriseWorks has finished providing direct support to this project, the assistance was designed so that it would continue to benefit additional coconut producers in the future The coconut product testing and training center is continuing to operate on its own EnterpriseWorks also upgraded the capacity of national and multi-province NGOs to assist coconut processing enterprises

In another project in the Philippines EnterpriseWorks has been providing business development services for coir processing enterprises Coir the fiber extracted from coconut husks is used in production of mattresses, brushes, cordage mats and erosion control materials Coir products are sold on both the domestic market and the export market The byproduct coir dust can be used as a substitute for peat moss This project targeted indigenous people of the uplands EnterpriseWorks provided technical and managerial assistance to NGOs and farmers associations for coir processing The Government of Lopez Province chose one of the farmers associations assisted by this project as the best cooperative in the province in 1997 The coconut and coir processing projects benefited over 9 800 economic participants in 1997 generating \$367 000 of total monetary benefits that year, for a cumulative total of \$1 57 million

Coffee

With support from the Inter-American Development Bank EnterpriseWorks began a large project for improving coffee production in El Salvador in 1995 This project established or improved processing facilities for cooperatives that produce gourmet-quality parchment coffee and green coffee (parchment coffee is the stage of processing in which the outer covering has been removed from mature red coffee cherries Green coffee is produced by drying parchment coffee and cleaning and grading the beans)

EnterpriseWorks also developed linkages between these cooperatives and smaller or poorer ones that did not have their own processing facilities The project reduced water pollution and soil degradation by transforming coffee processing waste into a low cost organic fertilizer for coffee farmers and decreasing water consumption in processing EnterpriseWorks helped coffee cooperatives and farmers obtain credit on better terms and trained the farmers to use chemical fertilizers more efficiently and adopt integrated pest management systems EnterpriseWorks also increased the efficiency of coffee processing by reducing the weight of coffee cherries needed to produce 1 kg of green coffee by 10 percent In 1997 the El Salvador Project benefited approximately 1 100 coffee farmers The assisted coffee processing enterprises reduced their production costs and increased coffee sales by \$276,000, for a two-year total of almost \$426 000

In 1997 EnterpriseWorks began its **first collaboration with Starbucks Coffee** in a separate project in Guatemala This two-year pilot project in the Jalapa area funded the capital costs of establishing improved processing plants ("beneficios") for two groups that grew a gourmet coffee variety (*arabica*) but only had rudimentary processing facilities The assistance improved the quality of the processed beans so a higher price could be obtained It also decreased water use in processing by 60 percent and reduced processing costs

EnterpriseWorks is in the process of securing funding from the Inter-American Development Bank for a major regional coffee initiative to expand work with coffee producers in El Salvador and begin similar activities in Honduras and Nicaragua EnterpriseWorks is exploring the possibility of expanding its partnership with the Starbucks Company to assist coffee producers in other countries EnterpriseWorks also plans to develop new integrated production and processing projects for tree crops such as chocolate and cashews

Dairy and Other Livestock

EnterpriseWorks developed an animal feed supplement to increase the digestive efficiency of cows and water buffalos used for dairy production as well as other ruminant livestock. Use of the supplement increases milk production by dairy livestock and the percentage of dairy fat in the milk, the key factor in the price farmers receive for the milk. In addition, the feed supplement reduces the amount of methane released by the animals, a gas that has been linked to global warming. The feed supplement contains molasses for energy and palatability, urea for protein assimilation, and important trace minerals that are often deficient in the diets of dairy cattle raised by small-scale herders in developing countries. EnterpriseWorks and its partners (including the National Dairy Development Board and the Self-Employed Women's Association) are promoting manufacturing, marketing, and purchase of **molasses-urea products (MUPs)** by dairy producers in Gujarat, India over a ten-year period.

In 1996, the project promoted use of large molasses-urea blocks that the animals could lick whenever they wanted, but this form of the product made it difficult to ensure that the animals obtained the optimal amount of the supplement. To solve this problem, the project developed a granular form of the supplement in 1997 so that measured amounts could be mixed into the animals' feed rations. This year, EnterpriseWorks also designed a more cost-effective technology for producing the MUPs that has eight times the capacity of the previous process, reducing production costs by one-third. The project continued developing a network of local sales agents for marketing and extension services for dairy herders. Sales agents initially received a salary, but the fixed compensation is gradually being replaced by sales commissions. There were about 10,300 economic participants in the India Dairy Project in 1997 and the total monetary benefits that year exceeded \$206,000, for a cumulative total of nearly \$252,000.

The Zimbabwe Livestock Project is a research activity testing the use of sunflower seedcake in the diets of dairy and beef cattle and poultry. The seedcake is a byproduct of sunflower oil production in a ram press or motorized expeller. This research is examining how different proportions of seedcake in the diet affect the animals' health, productivity, and methane emissions.

Household Energy

In the mid-1980s, EnterpriseWorks helped promote a fuel-efficient household charcoal stove in Kenya and the organization has transferred the technology to Mali and Senegal. The improved stove reduces consumer costs for charcoal in cooking, a significant share of the household budget for many urban households in the region. The stove has environmental benefits because it reduces the amount of wood that needs to be cut for charcoal production as well as emissions of carbon dioxide from household cooking, a gas linked to global warming. The improved stove also makes cooking faster and reduces the family's exposure to smoke, which can cause lung and eye problems.

In 1997, over 10,400 fuel-efficient charcoal stoves were sold in Senegal and Mali, for a cumulative total of more than 30,200. The improved stoves last two to three years, while traditional all-metal stoves may last less than a year. An average household in Mali and Senegal can reduce its charcoal consumption by 40-50% with the improved stove, saving \$60-\$100 a year. For every 1,000 improved stoves in use in Senegal, 570 tonnes of charcoal are saved per year, eliminating the need to clear-cut 57-60 hectares of forest land and reducing carbon dioxide emissions (another gas that can contribute to global warming) by 1,718 tonnes. In 1997, more than 32,400 improved stove users, producers, and sellers benefited from the two projects. The total monetary benefits that year exceeded \$2.93 million and the cumulative benefits were more than \$9.9 million.

Market Gardening

Many small farms in West Africa have unused arable land because the availability or cost of labor for lifting and distributing water for crops limits the planted area. By saving labor, irrigation pumps enable farmers to increase their incomes by planting a larger area. Use of a pump can also boost yields of crops per unit area if it results in application of a greater amount or more even distribution of water.

The Bielenberg treadle pump is an inexpensive foot-powered device for lifting water from surface water or wells with a depth of less than 7.8 meters. Carl Bielenberg, an EnterpriseWorks engineer, adapted a design from Bangladesh to 1) provide farmers with a complete unit, 2) make it easier to manufacture in small African workshops using locally available materials, and 3) require minimal repairs, which can be costly or difficult to obtain in rural Africa. This pump operates on both suction and pressure so that farmers can lift water into a storage basin not adjacent to the well or transport it through plastic tubing for up to 50 meters on flat fields (less on sloping land).

EnterpriseWorks first promoted the Bielenberg pump in full-scale projects in Senegal and Mali. In 1997, new pump projects began in Benin and Niger. EnterpriseWorks trained workshops to produce the pumps using special tooling purchased from the project on a lease purchase basis. It also helped manufacturers demonstrate the pumps to farmers and advertise and establish a network of private sales agents. Most manufacturers offer credit to pump buyers, usually with a down payment of 33-50% and the rest due in 3-4 months after the next crop harvest.

Working with some of the manufacturers, EnterpriseWorks staff subsequently developed four more pump models:

- A larger Bielenberg pump for farmers with ample water from rivers or lakes,
- A Bangladesh-type pump without the pressure pumping feature,
- A different type of treadle pump that can lift water from a depth of up to 20 meters, but at a slower rate than the Bielenberg pump, and
- A handpump preferred by many women users despite its lower water lifting capacity.

In 1997, 805 of the various pumps were sold in Mali and Senegal for a cumulative total of about 3,100 (excluding 200 sold in an earlier pilot project in Mali). About 50 pumps were sold in the new Benin and Niger projects in late 1997.

The Senegal and Mali projects also promoted several other technologies for market gardeners:

- A hand-augured PVC tubewell that is 50-67% of the cost of a dug well where soil conditions are suitable,
- Wrapped screens (a perforated PVC pipe covered with a geotextile fabric and then installed in the bottom of a well to increase the surface area) that can boost the water recharge rate 60-100% in some areas,
- Floating row covers (an imported thin spun polypropylene fabric that provides partial shade from intense sunlight, allows water to pass through, and protects against some plant pests), and
- Production of onions from sets (small bulbs raised from seed before the regular onion planting season) rather than seeds allows onions to be harvested two months earlier when market prices are higher.

In Senegal, 63 hand-augured tubewells were sold in 1997, the first year of commercial production, but this technology was not feasible in Mali due to different climate and soil conditions. A total of 569 wrapped screens and 2,500 of the two-meter long row covers were sold in Senegal in 1997 and about 7,500 kg of onion sets were produced for sale or the farmers' own use. The various market gardening activities benefited over 7,600 producers and had total monetary benefits of nearly \$1.69 million for the year and almost \$5.74 million to date.

Natural Products

The Natural Products Program has pioneered initiatives that give people an incentive to preserve forest products and other natural resources by establishing local processing enterprises that make use of the resources more profitable. EnterpriseWorks trained resource collectors to use environmentally sustainable harvesting methods and avoid over-harvesting. It also developed simple monitoring systems to track resource stocks and strengthened the ability of community-based institutions to control resource use.

The Tasar Silk and Wild Honey Project in Uttar Pradesh, India established two companies in 1997. One company processes tasar silk produced by silkworms that feed on oak leaves in the Garhwal Himalayas.² Individual growers harvest the oak leaves from common-property forests and raise silkworms in central rearing facilities. The project trained the leaf collectors to avoid indiscriminate breaking of branches for animal fodder and trampling of the seedlings by livestock. A simple monitoring system was instituted to track the sustainability of the tasar oak leaf supply.

The second company processes honey purchased from upland beekeepers who raise an indigenous bee species. Due to the cold climate in the Garhwal Himalayas, the project helped upland beekeepers organize an arrangement with lowland farmers for maintaining the bee boxes in winter. The honey is produced in the uplands and it has a marketing advantage over honey from other areas because this location has religious significance and attracts pilgrims.

Rattan is one of the most valuable natural products exported from Asia. These climbing forest palms are used to make furniture, handicrafts, baskets, traps, cordage, food dyes, cloth, and twine. The Philippine Rattan Project provided direct technical and managerial support to one rattan furniture cooperative and three groups of rattan collectors or processors and strengthened the capacity of NGOs and government agencies to help others identify new production and marketing opportunities.

The Indonesia Resins, Bamboo, and Rattan Project is working in a participatory forest management area (PFMA) where 17,000 people and a large number of rare or endemic species of wildlife live. Resins from the sap of some *Dipterocarp* tree species are used in industrial production of paint, varnishes, plastics, boat sealants, and perfumes. Some resins can be obtained by collecting hardened sap from the ground after it is naturally exuded by the trees, while others are harvested by tapping trees. This project trained resin collectors to use sustainable tapping techniques and established a resin processing enterprise. Although 23 tons of resin were collected from the area in 1996, the government did not issue the permit needed to sell the resin outside of the PFMA until late 1997. No more resin was collected in 1997 while awaiting government registration of a resin producers cooperative.

The Indonesia project also encouraged collection of rattan and bamboo for local weaving of mats to be purchased by a handbag manufacturer in Jakarta. While some of these handbags were sold in 1996, the country's economic turmoil in 1997 virtually eliminated the domestic market for them and there were problems in finding export buyers. The project adapted to changing market conditions by encouraging handicraft producers to use the mats in making tissue holders, portfolios, placemats and training people to weave rattan baskets instead of mats.

The Nepal Essential Oils Project has established two processing plants for extracting essential oils from plant products through steam distillation. Essential oils can be exported for scents or flavors in cosmetics and other products and some have medicinal uses. The principal product in the Nepal project is oil from spikenard (*jatamansi*) roots, but oils have also been produced from parts of other plants such as juniper, valerian, and anthonogen. The solid byproduct left after distillation (marc) is also marketable. In 1997, the various Natural Product projects benefited over 2,700 resource collectors and owners and workers of the processing enterprises. Sales of final products amounted to \$84,000, a cumulative total of \$199,000.

²This is a different species of silkworm from the one that feeds on mulberry leaves and produces regular silk. Tasar silk has different characteristics and is used on the domestic market in India.

Oilseeds and Staple Foods

Rural people in most African countries consume less oil and fat than is necessary for good health. In 1985, an EnterpriseWorks engineer invented a small manually operated ram press for producing cooking oil. The ram press can process a variety of oilseeds including sunflower, sesame, dried coconut, safflower, shelled peanuts, canola, mustard seed, niger nut, jatropha, and castor beans. Sesame and soft-shelled varieties of sunflower can be processed in the ram press without having to use a separate decorticating machine to remove the shells before pressing and these are the oilseeds most commonly used.

Many small-scale farmers and entrepreneurs can afford to buy a ram press—but few can afford the purchase price of a motorized expeller, which also has high fuel, repair, and maintenance costs. The cold-pressed oil from the ram press is ready to use after either filtering it through a simple paper or cloth filter, boiling it with water and then decanting the oil, or simply letting the sediment settle for one to two days and then pouring off the oil. The byproduct seedcake from processing sunflower or sesame seed makes a good animal feed that can improve livestock productivity.

EnterpriseWorks began promoting this technology in Tanzania in 1986. Subsequently, EnterpriseWorks and other organizations have had major projects for ram press production and use in other countries: the Gambia, Kenya, Mali, Mozambique, Uganda, Zambia, and Zimbabwe. Eventually five different sizes of ram presses were developed to fill different market niches. The smaller ram press models can easily be operated by one woman. Initially EnterpriseWorks trained multiple small-scale manufacturers and repair artisans for the press in each country (except for Mozambique which imported presses from Zimbabwe from the start because the demand was more uncertain due to the economic dislocation left in the wake of more than a decade and a half of war). In most countries, it also proved necessary to increase the supply of planting seed for suitable varieties of oilseeds. More than 6,800 ram presses have been sold through the end of 1997.³

The previous approach of establishing multiple small-scale manufacturers of the ram press in each country may have been necessary in the initial stages of disseminating the technology, but eventually kept the press price higher in some countries and necessitated expending a lot of project resources in ensuring quality control. EnterpriseWorks has begun experimenting with a different approach that has the potential to benefit larger numbers of people. After adapting the design to facilitate use of mass manufacturing techniques to scale up production of higher quality and lower cost presses, EnterpriseWorks began a joint venture for mass production with one of the larger existing ram press manufacturers in Zimbabwe.

El Niño weather brought devastating droughts and floods to East and Southern Africa in 1997. As a result, the total oilseed harvest, new ram press sales, and oil production per press declined substantially from the previous year in many countries. Nevertheless, nearly 107,000 ram press owners, workers, oilseed farmers, and—in some countries—consumer households that saved money due to a lower price of oil benefited from these projects in 1997. The value of the oil and seedcake produced in the ram press exceeded \$3.21 million that year, for a cumulative total of \$13.79 million. Production is expected to return to more normal levels in 1998.

A nutritional study in the Gambia found that women and children in villages with the ram press had better diets due to the greater availability of edible oil for the household's own use as well as sale to generate income for purchasing other foods. EnterpriseWorks also began expanding the oilseed projects to include other technologies for staple food processing, such as a peanut butter mill, peanut sheller, coconut grater, and shea nut butter press. In Senegal, EnterpriseWorks is testing the use of oil from the physic nut (*Jatropha curcus*) as a diesel fuel substitute for grain mills and soapstock.

³ Excluding Kenya, where some 460 presses had been sold through mid 1996.

Challenges and Lessons Learned

On an annual basis, EnterpriseWorks Worldwide gathers information from field staff on the specific challenges and lessons learned in each project. This information is used for continuous improvement of existing programs and the design of new projects. In addition, EnterpriseWorks conducts midterm and final evaluations of major projects and produces publications to inform other organizations and individuals about the program experience. Some general challenges and lessons follow.

- Poverty alleviation in developing countries is a major challenge, especially in reaching the poorest of the poor who may have high rates of malnutrition and disease and little or no land, education, and other resources besides their will to work long and hard hours to improve their lot. In addition, underdeveloped regions frequently have unfavorable climates, locational disadvantages relative to input supply and product markets, poor roads, and unreliable access to water and electricity.
- Credit alone is not sufficient to bring about sustainable increases in the income of small- and micro-enterprises and the availability of working capital may be a greater constraint for them than fixed capital. Small- and micro-enterprises often need a range of business development services that may include business planning, product design and quality control, access to more productive technology, training and extension services for entrepreneurs and workers, and better marketing linkages.
- Local processing of agricultural crops and natural products is an important way to allow rural communities to share in the value added to the primary products.
- Middlemen often receive a large percentage of the total value of a retail product, particularly for products produced in remote areas or for risky markets, but intermediaries perform useful functions in identification of markets, product transport and distribution, and in some cases, working capital credit. In some cases, these functions can be taken over effectively by producer groups or producer associations, but in others building better linkages with intermediaries may be a preferred strategy for increasing the incomes of small-scale producers.
- Small- and micro-enterprises often face obstacles from discriminatory government policies that favor or subsidize large-scale industry. These policies may include discriminatory trade and tariff barriers, direct subsidies, tax exemptions and rates, less access to credit or preferential terms for financing, and unequal effects from public investments in research and development or infrastructure.
- Enterprises based on processing of agricultural or natural resource products are subject to the vagaries of severe or unusual weather.
- When economic benefits are reported in US dollar terms, the Total Monetary Benefits of programs are subject to large swings from currency exchange rates.
- It is usually more cost effective to upgrade the skills of existing producers than to train new producers. Starting a new small business is a difficult task, even in the United States, and the rate of enterprise closure is particularly high in developing countries. Enterprise closure does not necessarily mean failure; it may be a positive response to changes in demand or supply by highly flexible informal sector businesses. Moreover, entrepreneurs moving on to a different activity may bring with them capital and new skills developed in the previous enterprise.
- Low-income producers have a high price elasticity of demand for production inputs and technologies by necessity. They are forced to make tradeoffs between greater long-term profitability and higher short-term costs or quality.

- Enterprises owned and operated by women may have other objectives besides growth of the business and expanding employment. Women in developing countries often choose micro-enterprises that can provide part-time or seasonal income without impinging on their family responsibilities.
- Depending on the complexity of manufacturing of a technology, the extent and location of the derived demand for it, and marketing and distribution costs, the least cost means of supplying a technology can either be achieved by encouraging competition among multiple manufacturers or centralizing production to take advantage of mass manufacturing techniques and economies of scale. In general, the income and employment from manufacturing equipment for small-scale producers is small relative to that generated by the users of the equipment.
- Exports may offer the potential for the greatest income gains, but export markets are often volatile and highly competitive and reaching them is usually more complex due to stricter quality specifications and volume and timeliness requirements. In some cases, it may be better to focus on the domestic market, at least initially. Some high-value or specialized products may only have an export market.
- Several viable strategies are available for ensuring sustainability of services and impact: 1) requiring full cost recovery for the services provided by NGOs, cooperatives, or producer associations; 2) transforming projects into businesses; 3) relying on the private sector to provide services from the start, and 4) designing projects so that continued services are not needed after the initial assistance has been provided to an enterprise.
- Achieving full cost recovery remains a major challenge for micro-enterprise business development programs, but obtaining at least partial cost recovery is important as an indicator of the demand for the services and client perceptions of their quality. Cost recovery also makes more funds available to expand services to benefit additional clients.
- In some cases, it is easier to achieve cost recovery for business development services through indirect means such as adding an interest rate premium to loans, paying a slightly lower price for inputs purchased from small-scale producers, or funding services out of profits from processing and marketing enterprises owned by cooperatives or producer associations. However, the sale price of inputs and payments for raw material purchases must remain competitive with alternative providers.

INTRODUCTION

As the millennium approaches, the world faces a continuing challenge of eradicating the vicious cycles of poverty, hunger, disease, environmental degradation, and other global imbalances. Unfortunately, many major foreign assistance programs are widely believed to be ineffective because they do not benefit those most in need and have sometimes been plagued by waste or corruption. Yet, Africa, Asia, and Latin America have a tremendous resource in the two billion people in the developing world who are self-employed and striving to be self-reliant. EnterpriseWorks Worldwide is responding to this potential by targeting these small-scale producers with an increasingly comprehensive range of self-help initiatives.¹

The **mission** of EnterpriseWorks is to generate economic growth in developing countries through business development programs that enable small-scale producers of agricultural products and other commodities to build more competitive enterprises. Investing its own resources alongside local partners, EnterpriseWorks focuses on innovative and value-adding productivity and marketing improvements that allow small-scale farmers and micro-entrepreneurs to profit from increased efficiency, expanded operations, and new regional and international business links. EnterpriseWorks maximizes its outreach by collaborating with public and private sector organizations that share its commitment to environmentally sustainable and socially responsible business practices.

EnterpriseWorks leverages project funding from other organizations and operates through its own country offices and other partner organizations. EnterpriseWorks **fundors and partners** include multilateral aid agencies and development banks, government agencies in developed and developing countries, U.S. and transnational corporations, private enterprises in developing countries, cooperatives and producer associations, local and international nongovernmental organizations (NGOs), foundations, and universities and research institutes.

EnterpriseWorks specializes in a limited number of commodity program areas to maintain deeper technical expertise and greater cost-effectiveness. The organization begins its work with a **subsector analysis** to identify the resources, opportunities, and constraints for small-scale producers in the **value chain** from production of raw materials through processing and marketing. EnterpriseWorks then designs and implements projects to enable the producers to increase the quantity or quality of their products and add value through more profitable processing and marketing opportunities. Projects are also designed to avoid or reduce environmental pollution and conserve natural resources. EnterpriseWorks actively promotes replication of its development approaches by the private sector and other organizations within and across countries.

Instead of providing handouts, EnterpriseWorks increases the ability of people to become self-reliant through multiple types of **business development services**. These services include feasibility studies, business planning and startup, product development or improvement, technology development, adaptation, testing, and commercialization, technical and business management assistance and training, credit and equity financing, market assessment, and development of new marketing linkages. These business development services complement the expanding micro-credit programs of other institutions. For greater cost effectiveness, EnterpriseWorks emphasizes replication of successful activities directly through our own projects in additional countries and indirectly by other organizations and the private sector.

Since 1993, EnterpriseWorks has implemented a comprehensive annual **Impact Tracking System (ITS)** to monitor the outreach, impact, proven sustainability, and cost-effectiveness of all major projects using a standard set of indicators for accountability to funders and use as an internal management tool. This information is aggregated by commodity area and the organization's portfolio as a whole. USAID has recognized EnterpriseWorks Impact Tracking System as "state-of-the-art" for international development NGOs. In addition, midterm and final evaluations are prepared to improve the performance of existing projects and inform the design of new projects.

¹ EnterpriseWorks Worldwide began operations in 1978 as a not for profit (501c3) development assistance organization created through a joint initiative of the U.S. Congress and U.S. Agency for International Development (USAID). In 1998, the organization's name was changed from Appropriate Technology International (ATI) to reflect the broader focus of its current programs, which goes beyond technology development and commercialization to include other business development services for small scale producers. EnterpriseWorks currently receives institutional funding from the USAID Global Bureau's Economic Growth Cluster and project funding from a variety of international public and private sources.

Program outreach and impact are measured by the number of economic participants and additional value of total monetary benefits resulting from project activities. **Economic participants** consist of producer participants and consumer households benefiting from enterprises assisted by EnterpriseWorks projects. Producer participants include people who produce income as 1) owners, 2) workers and 3) principal raw material suppliers for the assisted enterprises. **Total monetary benefits (TMB)** include 1) producer cost savings, 2) producer income gains from the sale of *final goods and services*, and 3) consumer savings from lower-cost products or a greater efficiency of product use.

To keep the costs of the system down, data were only collected on projects that received financial, technical, or managerial assistance from EnterpriseWorks in 1993 or later. While some prior projects are still generating sizable and even increasing economic impacts (such as the Cameroon Palm Oil Project), no funds were available to collect and analyze information on the earlier projects and many of them fall outside of our current areas of specialization.

This **Portfolio Report**, prepared by Eric Hyman, Lisa Stosch, and Patrick Cunningham, describes the major programs and projects of EnterpriseWorks between 1993 and 1997. To complement this report, EnterpriseWorks is producing a series of companion documents. An annual **Impact Report** contains the full quantitative information on project and program outreach, impact, and cost effectiveness. It also provides a cost-benefit analysis on the organizations' overall portfolio. EnterpriseWorks will also produce a series of **Commodity Reports** that describe individual program areas in greater detail than is included in this Portfolio Report. In future years, EnterpriseWorks also plans to prepare **Geographic Reports** on programs in Africa, Asia, and Latin America.



Animal Fiber

Bolivia Alpaca Fiber Project

October 1991 - June 1996

Project Overview

EnterpriseWorks and AIGACAA, a camelid producers association in the Bolivian *altiplano*, improved animal husbandry, established commercial processing of alpaca fiber into "tops" (inch-thick cords of aligned fiber), provided credit for livestock genetic improvements, and sold the processed fiber on international and domestic markets

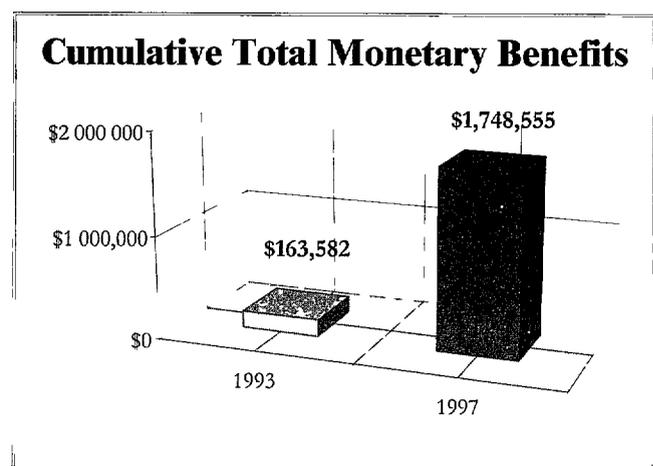
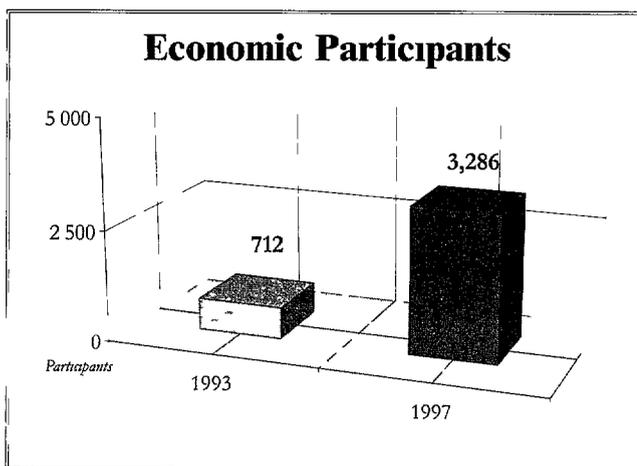
Project Partner

- Asociacion Integral de Ganaderos de Camelidos de los Andes Altos (AIGACAA - The Integrated Association of Camelid Producers of the High Andes)

Funders

- United Nations Capital Development Fund (UNCDF)
- United Nations Development Program (UNDP)
- Fondo de Desarrollo Campesino (Farmers Development Fund)
- The Integrated Association of Camelid Producers of the High Andes (AIGACAA)
- Unidad Ejecutora del Proyecto Camelidos (UNEPCA - Camelid Project Implementing Unit)
- USAID/Government of Bolivia (PL 480)

Budget \$5,195,732, Expended 88%



Objectives and Targets

- Increase alpaca (48,000 head) fiber production 48% per animal by year 3,
- Increase animal meat production 35% per animal by the third year through better nutrition and improved pasture,
- Decrease adult animal mortality 40% and young animal mortality 25% by year 3 through improved animal health care and disease prevention,
- Increase local value added through a producer-owned alpaca fiber processing enterprise by year 2

Accomplishments

Farm Level Investment AIGACAA provided \$727,300 of loans to herders for the purchase of improved genetic stock, alpacas and improved pasture management. Loan amounts ranged from \$300-\$3,000 per household, averaging \$1,528. So far, the loan repayment rate exceeded 98 percent. This was one of the few rural credit programs in Bolivia where loans were being repaid on time and administrative costs recouped due to strict enforcement of loan collection and the linking of technical and marketing assistance with credit.

Veterinary Care AIGACAA provided on-farm technical assistance to more than 600 member households and maintained 3 field centers. Some 3,200 attendees participated in project demonstrations and meetings, and 5,980 participated in 2-5 day training courses or shorter seminars. Project extensionists recommended better animal husbandry practices and diagnosed and treated alpaca illnesses. Due to improved genetic stock and better nutrition and shearing, average fiber production per alpaca rose 45% and fleece fineness increased. Selective breeding nearly eliminated animals of mixed coloring with low value fiber. Mortality rates declined 47% in adult animals and 30% in young ones.



Improved genetic stock is introduced to the Bolivian Altiplano

Production and Sales In 1997, 66,780 kg of fiber was purchased, graded, washed, and combed, resulting in production of 50,086 kg of tops of superfine adult and thick quality. Over 44,000 kg of tops were sold in foreign markets (Italy, Peru, Japan) for \$416,600. An additional 9,470 kg of byproducts were sold for \$17,800, and 2,542 kg of yarn was sold in the local market for nearly \$52,400. Over 1,400 herder families sold an average of 45 kg of fiber to merchants, AIGACAA representatives, or directly to the plant.

Replication In 1997, the methods and technologies developed by this project were replicated in a livestock repopulation project managed by AIGACAA in the northern area of Iruya and in the Ayopaya Province, Cochabamba. Approximately 1,100 improved alpacas were selected from Hatos de Piques and Sijama and for herd expansion in these areas. The sale benefited 113 families.

Share Value In 1997, 4,015 shares of stock in the company were revalued based on cumulative profits. The value of each share increased from \$25 to \$30.60.

Shearing Techniques Alpacas are sheared every other year. Previously, herders used tin lids for shearing, which was uncomfortable for the animals, yielded non-uniform fiber, and took more labor time than better methods. AIGACAA imported spring-loaded shears for sale at cost, but budgetary limitations precluded importing enough for all potential buyers. About 40% of herders in the project area now use spring-loaded hand shears.

Fiber Processing and Marketing This project relied on market channels to assist producers by creating a for-profit business, the *Compañía de Productos de Camelidos* (COPROCA), to purchase, process, and market fiber. Since it began operations in January 1995, COPROCA has sold over US\$1,267,500 of alpaca products, mainly tops exported to Italy. COPROCA's \$1.6 million plant began operations in January 1995 at El Alto. Operating one shift a day, its capacity was 88,000 kg of alpaca tops per year.

Impact of Credit A 1996 evaluation found that 449 producer families have improved pastures and acquired new animals, increasing average meat production per animal by 33% and fiber production by 45%. Before receiving credit, loan recipients reported an average net income from livestock of \$578/year. These same households reported netting \$813/year from all livestock over the most recent year, a 41% increase. Since borrowers might

have benefited from other project services before receiving credit, their total income gains from the project exceed those since receiving the loan

Services Provided In 1997, 360 camelid producer families were provided animal health services 3,400 animals received treatment for parasites (cumulative total is over 98,000 sheep, llama, and alpacas), 1,576 animals were treated for infections, and 1,530 animals were provided supplemental vitamins

Critical Acclaim UNDP highlighted this as one of two model projects for the International Year of Poverty Alleviation Former Bolivian President Gonzalo Sanchez de Lozada described it as "the country's best development project"

Environmental Benefits In 1997, environmental impact monitoring indicated that 24,255 ha of pasture land had been improved, and 5,935 ha of praries had been recovered with irrigation as a direct result of project activities Over 6,000 km of irrigation canals were built as a result of the project

Challenges

Cost Recovery Cost recovery for services to herders is expected to increase gradually The project charged producers for the cost of veterinary inputs, but did not recover the costs of staff time for technical assistance If the sale price for inputs had included a margin to cover distribution costs, more herders could have been served Indirect mechanisms proved useful in covering part of the costs of technical assistance that historically had been provided for free For example, some of the technical assistance cost was recovered through profits on loans

Single Commodity Project Focus Conflicted with AIGACAA's Broader Orientation Some conflict arose from the focus on a single commodity (alpaca fiber) within a membership organization that had a broader orientation (all camelids) Some producers wanted assistance in the marketing of other alpaca products such as meat, hides, and fertilizer AIGACAA also faced pressures from members who wanted services expanded to include llamas

Lessons Learned

Importance of Expertise EnterpriseWorks' prior experience in wool fiber production and processing in Guatemala helped in designing an effective marketing strategy for alpaca fiber exports, and raw fiber sales on the Bolivian market

Importance of Selecting the Right Local Institution The existence of a well-established producers' association with respected leadership complemented the new for-profit processing company and avoided the usual problems of government extension services The partnership between an international NGO and a local producers association allowed greater flexibility and responsiveness As a producers' association, rather than an intermediary NGO, AIGACAA had to respond to the most urgent needs of its members

Importance of Flexibility to Meet Changing Market Demand Bolivia alpaca producers have a comparative advantage in production of a wide array of natural color fiber In response to changing market conditions, the project cut back plans to import white alpacas and purchased various colors and grades of fiber at different prices that changed over time

Competitive Purchase Prices and Market Responsiveness The processing company paid competitive prices for raw fiber because herders will not sacrifice immediate income out of loyalty to their association With help from international consultants, COPROCA established mechanisms for continuous tracking of market trends and potential customers

Combining Credit with Technical Assistance This project demonstrated the synergistic effect of combining credit with other interventions. AIGACAA denominated the loans in U.S. dollars, charged positive real rates of interest to cover the program's administrative costs and maintain the revolving loan fund. This avoided the decapitalization AIGACAA experienced in a previous loan program during the country's hyperinflationary period. An additional capital infusion would enable AIGACAA to offer alpaca production credit to more members as well as nonmembers and allow use of loans for llama production.

Long-term Sustainability of Systems Future sustainability of the technical service delivery system will depend on converting the relationship between the producers and project extensionists to one of clients and service enterprises.

Production Efficiencies With sufficient raw fiber availability, COPROCA could double tops processing capacity by adding a second shift per day. Expansion from semi-finished tops to the next level of processing (spun yarn) was initially done through subcontracting to reduce risks, but COPROCA plans to develop this capacity now that tops production and marketing are established and its management capacity has developed. COPROCA is seeking donor funding to establish its own yarn spinning mill. The potential profit from yarn is \$3/kg, triple that from tops. However, adding a spinning mill with a capacity of 5,000 kg/month (on one shift per day) would require a \$400,000 capital investment and increase operating complexity.

Selected Sources for Further Information

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- Olivares Mirtha and Valeria Budinich. 1996. *Evaluacion de Impacto del Proyecto Produccion y Procesamiento de Fibra de Alpaca*. Washington, DC: EnterpriseWorks Worldwide.

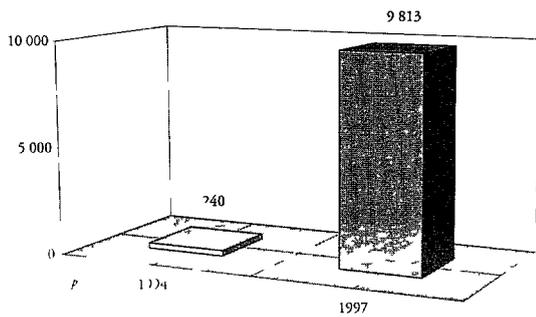


Coconut Products

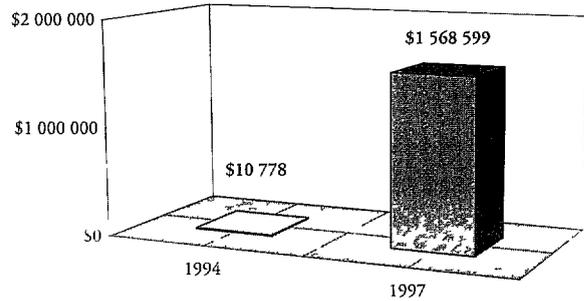
Coconut Products

Cumulative total monetary benefits and the number of economic participants from 1994 through 1997

Economic Participants



Cumulative Total Monetary Benefits



Philippines Coconut Project

June 1992 - June 1996

Project Overview

Three-fourths of coconut farmers in the Philippines produce low-quality copra (dried coconut) with a high moisture content, which sells for a low price, spoils rapidly and results in poor quality final products after processing. Traditional kilns for drying copra result in underdrying because of their slowness and high labor requirements in tending, and charring of some of the copra due to uneven heat distribution. This project promoted local processing of coconuts so that small-scale farmers could add value to their products. The purposes were to 1) develop enterprise modules that local NGOs could use in identifying small-scale processing opportunities for coconut farmer cooperatives, and 2) establish a Coconut Processing Test and Training Plant (CPTP) for research and training that would continue after the project ended.

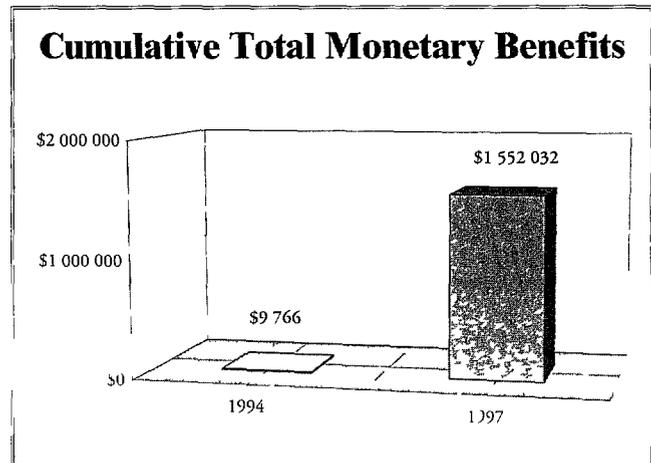
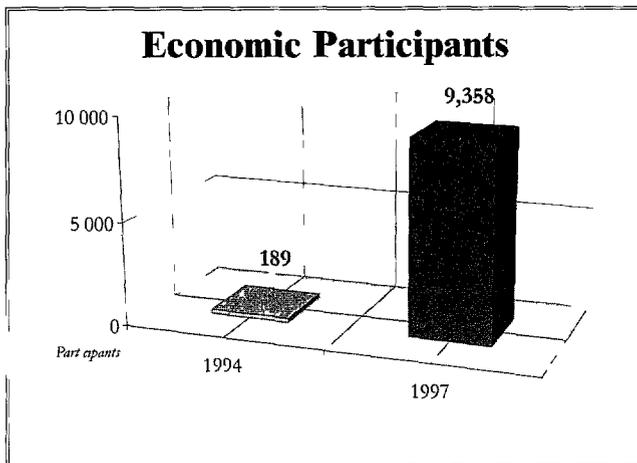
Project Partners

- ATI/Philippines (ATI/P)
- Marinducare Foundation, Inc [Philippines]
- University of the Philippines at Los Banos (UPLB)
- Department of Trade and Industry [Philippines]

Funders

- USAID/Philippines
- Development Bank of the Philippines
- Department of Trade and Industry [Philippines]
- Land Bank of the Philippines

Budget \$359,410, Expended 97%



Objectives and Targets

- The project was expected to establish 5 new processing enterprises benefiting 500 or more coconut farmers
- The project was to help at least 3 NGOs implement their own projects to assist coconut farmers in other locations

Accomplishments

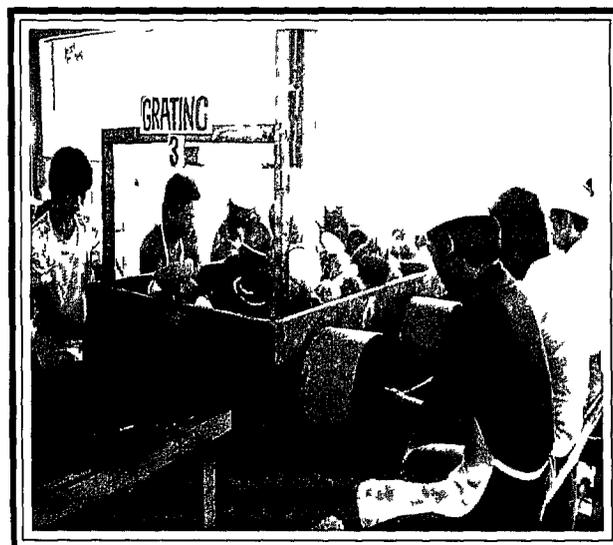
Research and Training Facility Established The CPTP was constructed and managed by the University of the Philippines at Los Banos. The CPTP has been operating on its own funding for 3 years. It has tested 29 enterprise development modules and found 5 appropriate for small-scale producers.

Recommended Enterprise Opportunities The five recommended enterprise opportunities were 1) copra drying using an improved kiln, 2) coconut oil production using the fresh-dry method, 3) snack food production from wet coconut processing, 4) high-value charcoal production from carbonization of coconut shells in an improved kiln, and 5) decortication of waste coconut husks into coir fiber and coir dust. The Los Banos multi-crop dryer, an improved technology, dries copra in 5-6 hours (compared to 24 hours with a traditional kiln) and does not require tending.

The fresh-dry method for small-scale coconut oil starts with better quality copra, that is ground in a hammermill and then run through a motorized expeller. The resulting edible oil only requires simple deodorization and a second pressing produces oil that can be used in small-scale soap making. The byproduct cake is used as a livestock feed. The fresh-dry method has a lower oil extraction rate than the large-scale dry process.

With the small-scale wet process, fresh coconuts can be processed into a wider variety of products in addition to coconut oil, but the trade-off is a lower oil extraction rate. The coconut meat (rather than copra) is separated, grated, and pressed into coconut milk. The coconut milk can either be sold as a final product or processed further into coco jam and nata de coco. The coconut water inside the fresh nut can also be sold. The pressed coconut meat contains fiber, protein, and fat and may be fed to livestock or used in macaroons. Coco jam is prepared by adding brown sugar to coconut milk and concentrating the mixture over a low heat. Nata de coco is a gelatinous snack food formed through bacterial action on diluted coconut milk.

The traditional method of making coconut shell charcoal in an earth pit or mound has a low yield and produces low quality charcoal that is used as a fuel for household cooking or cottage industries such as blacksmiths. Three types of improved kilns that can yield 1 kg of charcoal for every 2.7 to 3.7 kg of coconut shells have been developed in the Philippines, while producing the same amount of charcoal in a traditional kiln might take 5 to 6 kg of coconut shells. This charcoal can be sold in lump form, but it may be more profitable to granulate it before sale. Granulation also produces a byproduct, charcoal dust, which can be briquetted for sale as a cooking fuel. The highest value market for charcoal is as an input in manufacturing activated carbon for water purification and other pollution control processes. See the Philippines Coir Project description for information on coir fiber and coir dust production.



Coconut processing in the Philippines

Coconut Processing Enterprise Benefits 36 coconut processing enterprises were established, benefiting more than 2,300 households. Over \$335,000 was earned from sales of a variety of products including oil, seedcake, raw nata, copra meal, shell and husks.

Information Dissemination ATI/P prepared a resource manual for NGOs interested in assisting small-scale coconut processing enterprises.

Challenges

Processing A large proportion of coconut farmers sell copra (dried coconut) rather than whole coconuts, but few are involved in further processing of the copra. Most farmers use traditional kilns and three-quarters of the farmers produce poor quality copra that has a moisture content above 12 percent. Large oil mills generally do not immediately process the copra they buy so they can have an inventory for year-round production of coconut oil. In storage, copra with a moisture content above that level becomes rancid faster and is more susceptible to aflatoxin infestation. When rancid copra is processed, the crude coconut oil has a high level of free fatty acids that must be removed through costly chemical refining. Aflatoxin, a strong human carcinogen, remains in the byproduct cake, making it unsuitable as a cattle feed. Also, the distribution of heat in the traditional kiln is uneven, causing some of the copra to be scorched even as the bulk is under-dried. An improved kiln design has been developed at the University of the Philippines-Los Banos. In addition, alternative methods of processing coconuts into various other products are available.

Raw Material Supply Major typhoons adversely affected 4 of the 5 cooperative enterprises in their first year of operations. While the processing facilities sustained little or no physical damage, the supply of coconuts for processing was dramatically reduced. As a result, the enterprises had to suspend operations or produce far below capacity for 6-12 months. In 1997, the amount of copra traded declined as much as 40% from the previous year due to insufficient raw material supply. Additionally, competition for raw materials has increased rapidly as new traders entered the industry.

Insufficient Working Capital and Product Demand In 1997, two coconut oil mills were unable to meet production targets due to insufficient raw material supply and a lack of adequate working capital. The nata de coco processing enterprise operated sporadically because of lower than expected demand. In response, ATI/P developed financial and operational assessments for the enterprises. ATI/P also helped the two oil mills and the nata de coco processing enterprise prepare loan requests, and the nata de coco processing enterprise received a line of credit from a local development bank.

Lessons Learned

Linkages with Regional or National NGOs Essential To make business development services for small-scale coconut producers more cost effective, ATI/P linked up with local NGOs that have a regional or national outreach. Working with provincial-level NGOs only provides limited replication opportunities and these smaller organizations generally require more technical assistance from ATI/P.

Access to Credit Lack of financing has been a bottleneck for small-scale enterprises and has delayed start-up by a year or more. While credit is readily available for microenterprises in the Philippines, financing for small-scale enterprises that require a large amount of capital, \$10,000-\$50,000, is more difficult to obtain. ATI/P is working with financial institutions to convince them that small-scale coconut processing enterprises managed by farmer associations can be creditworthy.

Member Interest and Enterprise Sustainability Enterprises owned and operated by farmer groups may face pressures from their members to raise material prices above market levels, undermining the profitability and long-term sustainability of the enterprises

Site-Specific Factors Affecting Enterprise Opportunities The 5 coconut processing modules identified by ATI/P are only viable under certain conditions. For example, small-scale coconut oil mills are generally viable only when located at least 100 km from a large scale mill, 3-phase power lines exist, and the local market exceeds 25,000 people.

Selected Sources for Further Information

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- Basaen, Ines, 1996, Appropriate Technology for Small-Scale Producers: Terminal Evaluation Report, Washington DC, EnterpriseWorks Worldwide

Philippines Coir Project

September 1995 - December 1998

Project Overview

To earn more money from their crop, small-scale coconut farmers dry coconut meat and sell it to oil mills as copra. Prior to this project, many farmers often viewed the left over coconut husks as waste material and burned it to get rid of it. Through this project, farmers learned to use coir — the fiber extracted in decortication of coconut husks. It is used to produce mattresses, brushes, cordage, door mats, erosion control materials and handicrafts sold on the domestic and export markets. Coir dust, a byproduct of the decortication of coconut husks is also sold as a substitute for peat moss in horticultural uses.

This project is one component of a larger project that also provides business development services for small-scale rattan producers in the Philippines. ATI/Philippines assists other nongovernmental organizations in scaling-up community based coir enterprises especially those working with indigenous people in the uplands.

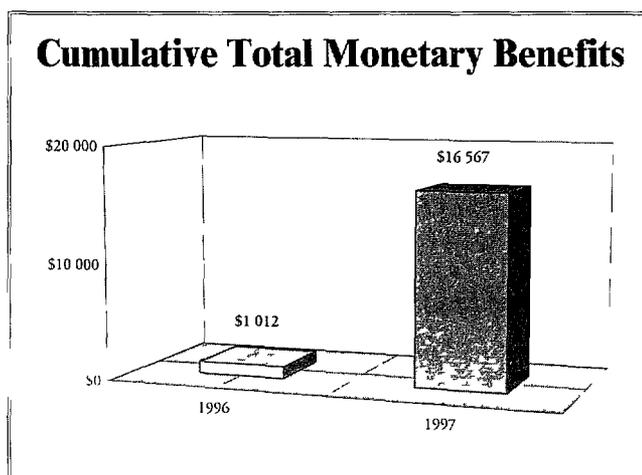
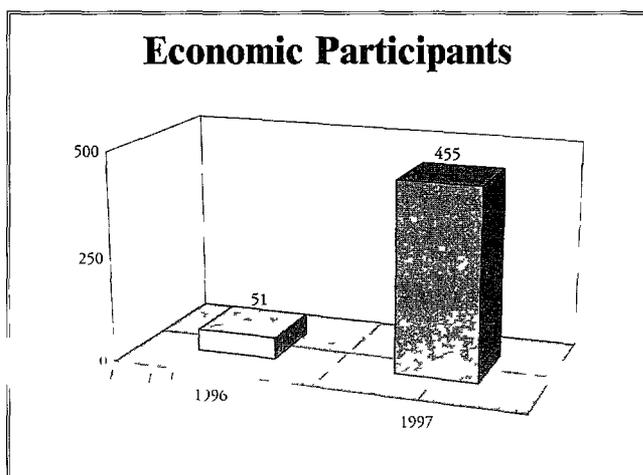
Project Partners

- ATI/Philippines (ATI/P)
- Ugnayang Smaahan ng mga Magsasaka sa Quezon (UGMA) – Farmer's Network in Quezon
- Pambansang Kilusan ng mga Samahang Magsasaka (PAKISAMA) – National Coalition of Farmer Organizations
- Organization for Rural Development (ORD)
- Samahan ng mga Magsasaka sa Lopez (SAMALO) – Farmer's organization in Lopez

Funders

- Philippines-Australia Community Assistance Program (PACAP)
- USAID/Philippines
- Organizing for Rural Development (ORD)
- Ford Foundation

Budget \$121,200, Expended 74%



Objectives and Targets

- Demonstrate the viability of commercial processing of coir
- Strengthen the enterprise management capabilities of small scale coir processors by providing organizational management and technical services
- Create national awareness of the needs of small scale coir processors in the area of business development services by establishing networks and linkages among strategic groups and individuals
- Leverage financial resources and improve producer skills for small-scale coir enterprises



Drying decorticated coconut husk fiber in the Philippines

Accomplishments

Enterprise Established ATI/P provided technical support and assistance in business management to SAMALO, UGMA PAKISAMA and ORD and obtained financing for these groups. SAMALO (a member of UGMA and PAKISAMA) established a coir decortivating enterprise. This enterprise located in Lopez currently has 23 workers. In 1997, the local government in Lopez selected SAMALO as the best cooperative of the year.

Raw Material Procurement In 1997 SAMALO focused on increasing the supply of raw materials from nearby farmers. Over 400 farmers are collecting raw materials and are benefiting from this project. SAMALO purchased the husks from nearby farmers and arranged to pick the husks up on a regular schedule. SAMALO was able to buy an adequate supply of husks from farmers within Lopez.

Enterprise Sales SAMALO sold 2,500 kilograms of coir dust and about 29,000 kilograms of coir fiber in 1997.

Promoting SAMALO's Agenda SAMALO lobbied to block the logging of productive coconut trees by landlords. The campaign to stop the cutting of coconut trees for lumber has intensified now that the husk decortication has generated profits which flow back to the tenant farmers.

Challenges

Management SAMALO's coir enterprise had some problems due to the low level of education of its managers and workers. There was resistance in the cooperative to hiring a professional manager from outside the group due to fear of losing control or being exploited and a reluctance to pay managers competitive salaries because of uncertainty over profit margins. As a result, the cooperative had difficulty finding sufficiently qualified workers and managers in the rural area near the processing plant.

Capitalization The purchase of a decortivating machine and mechanical baling press constitutes approximately 60% of the enterprise's fixed capital and the total fixed capital requirement was relatively high for a community-based agro-industrial project in the Philippines. Less expensive machines were available, but none as well-built and efficient as the machine purchased.

Lessons Learned

Screening Criteria ATI/P is developing criteria for screening groups under consideration for assistance and tailoring assistance to the needs of each organization. ATI/P can then provide assistance to those groups best able to benefit from the services in the long-term.

Enterprise Viability Small-scale coir fiber processing is only viable when the enterprises are close to medium-scale fiber manufacturers willing to buy this product. Transport charges for this product are relatively high in the Philippines. If small-scale coir fiber enterprises have to transport the produce to distant domestic markets or international markets, the price may not be competitive with Sri Lankan and Indian coir.

Working Capital Requirements Entrepreneurs and development projects often underestimate the amount of fixed capital needed and the amount of time required for training.

Selected Sources for Further Information

- Cunningham, Patrick (ed) 1996 Coconut Coir Processing in the Philippines: An Analysis of the Subsector, Washington, DC: EnterpriseWorks Worldwide



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El Salvador Coffee Project

January 1995 - December 1998

Project Overview

Coffee is the top export in El Salvador, comprising about 30% of the total value of the country's exports and 7% of the Gross Domestic Product. EnterpriseWorks is assisting seven coffee processing cooperatives belonging to a union of cooperatives in El Salvador and their member farmers to add value to their coffee through improved production, processing and marketing. The El Salvador project is EnterpriseWorks' first major activity in this commodity area, but it is intended to be part of a larger regional initiative projected to include Costa Rica, Guatemala, Honduras, Mexico, Nicaragua and Panama.

The participating cooperatives market gourmet coffee in two stages of processing: parchment and green coffee. To make *parchment coffee*, the mature red coffee cherries are processed to remove their outer covering. While there are several ways in which this can be done, a wet process is superior to the dry process. *Green coffee* is produced by drying the parchment coffee and cleaning and grading the beans. The next step in processing is *roasting* the green coffee and, if desired, grinding it. Although limited amounts of roasted coffee are exported by some Latin American countries, most of the roasting is done by the major coffee companies in industrialized countries. Some coffee is also roasted in the producing countries for the domestic market. The coffee groups in this project do not roast their coffee before sale. The two main varieties of coffee are *robusta* and *arabica*. Mainstream coffees are made from robusta or a blend of the two varieties. Gourmet coffees, like those in this project, are made from arabica, the better quality variety grown at higher altitudes.

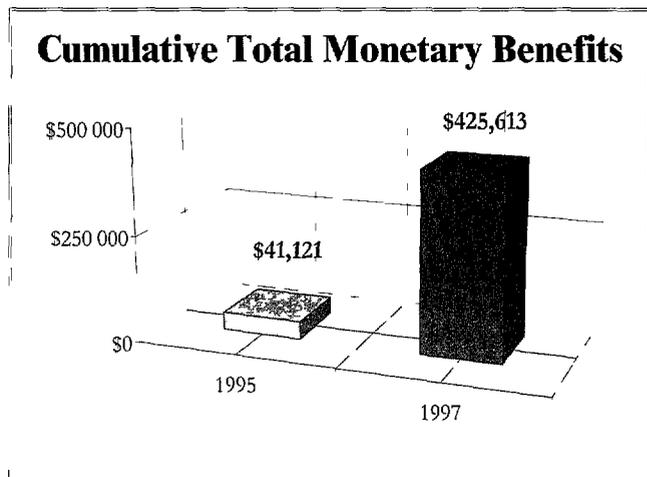
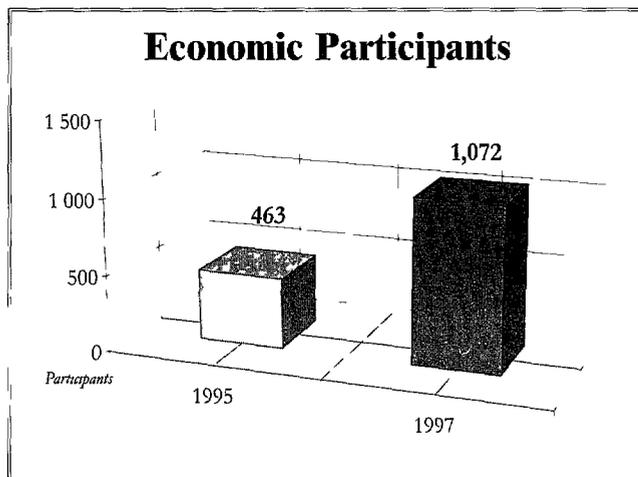
Project Partners

- Union de Cooperativas de Cafetaleros de El Salvador (UCAFES - Coffee Producers Cooperatives Union of El Salvador)
- PROCAFE [El Salvador]
- Grano de Oro Coffee Cooperative [El Salvador]
- AT/El Salvador

Funders

- Inter-American Development Bank (IDB)
- European Union (EU)
- Rotary Club of Stowe, Vermont [USA]
- PROMOCAFE [El Salvador]

Budget \$2,078,500, Expended 64%



Objectives and Targets

- Increase incomes of small-scale farmers by adding value to conventional and gourmet coffees locally,
- Generate or solidify employment opportunities in coffee processing,
- Strengthen cooperatives by providing credit and improving marketing
- Reduce pollution from coffee processing by recycling water and treating pulp for use as organic fertilizer



Sorting coffee cherries in El Salvador

Accomplishments

New Facilities, Equipment, and Renovations The project 1) built a new warehouse and biological control laboratory for the *Jucuapense* Cooperative, 2) established a new processing plant, warehouse, mechanical dryer, and water treatment system for the *Grano de Oro* Cooperative and 3) upgraded the *Los Nonualcos* Cooperative's plant to increase coffee processing yields, improve quality and reduce production costs and water consumption. A Rotary Club grant leveraged by EnterpriseWorks funded construction of a new roaster at the *La Union* Cooperative.

Training and Technical Assistance EnterpriseWorks and PROCAFE helped the cooperatives improve credit management and coffee marketing and developed a computerized system for accounting and tracking coffee purchases, processing, sales and deliveries.

Building Strategic Alliances Among Cooperatives The project encouraged cooperatives that had the necessary facilities to process coffee for others that were too small or lacked the resources to take on this function themselves. This collaboration increased the capacity use rate of the existing processing plants and enabled more farmers to benefit from adding value to their raw coffee before sale. Four cooperatives sold their coffee collectively in 1997.

Increase in Production Coffee sales through the project tripled in the 1997 season, compared to 1996. The efficiency of processing was improved since it only took 5.23 kg of coffee cherries to produce 1 kg of green coffee, instead of the 5.8 kg of cherries required before the project. In addition, coffee bean damage in processing was virtually eliminated.

Credit PROCAFE provided credit and technical support to the participating cooperatives. In 1997, 222 coffee farmers received loans for working capital or fixed capital. None of the loans were in arrears at the end of 1997. The project helped convince other financial institutions to reduce the interest rate on loans to coffee producer groups.

Publicity In 1997, EnterpriseWorks began production of a video to publicize the project.

Environmental Impact Coffee processing wastes can be a major source of water pollution because of their high biochemical oxygen demand. EnterpriseWorks helped the cooperatives reduce discharges of solid and liquid wastes by processing the waste coffee pulp into organic fertilizer for the coffee farmers. In addition, water re-use and treatment have reduced water consumption in coffee cherry pulping and washing by two-thirds and decreased land and water pollution. Use of the new organic fertilizer saves farmers \$17 per 100 lb of coffee harvested. In addition, farmers have been trained to use chemical fertilizer more efficiently and adopt integrated pest management to increase production and reduce costs. While reducing environmental impacts, PROCAFE encouraged farmers to grow 170,000 coffee seedlings to renew planting on 57 hectares of land.

Challenges

Fund Sourcing Participating cooperatives found it difficult to obtain counterpart funds to pay value-added taxes on equipment and construction of the facilities. Since the IDB does not allow use of its funds to pay these taxes, project activities were delayed until other funds could be generated for the purpose.

Reluctance to Mediation Charge Loan Fees Initially, UCAFES was reluctant to charge member cooperatives loan fees. However, the IDB requires charging loan fees to cover administrative costs not recouped in the interest rate.

Diversity of Producer Scale and Interests While this project primarily targeted small-scale farmers and cooperatives, larger producers have more influence in the Cooperatives Union and their interests often diverge from those of small-scale producers.

Domestic Sales of Ground-Roast Coffee Domestic sales of ground-roast coffee were below expectations due to insufficient information on the local market.

Lessons Learned

Financing In the past, coffee cooperatives in El Salvador have relied on short-term working capital loans (one year or less) despite the relatively high interest rates on these loans. Failure to make timely repayments of these loans kept some cooperatives from obtaining financing the following year. EnterpriseWorks helped the participating cooperatives obtain loans and conduct demonstrations (e.g., coffee processing or planting of shade trees), and helped them to seek longer-term credit for fixed capital investments. As a result of this assistance, the participating cooperatives were able to acquire additional equipment and train their staff using their own financial resources.

Collaboration Among Cooperatives As a result of the project, the participating cooperatives have established strategic alliances for financing, processing, and marketing. The local cooperatives are also encouraging members to exchange information on business experiences. Member farmers have become more knowledgeable about the sales value and profitability of their coffee and the best ways to market it.

Selected Sources for Further Information

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- Amaya, Gilberto and Jose Gemeil 1997 Regional Program for Small-Scale Coffee Producers Washington, DC EnterpriseWorks Worldwide

Guatemala Coffee Project

April 1997 - March 1999

This pre-impact project is the first funding collaboration of EnterpriseWorks Worldwide with a major transnational company that buys products processed by groups of small-scale producers. The initial contribution from Starbucks funded the capital costs of establishing improved processing plants ("beneficios") for two coffee producer groups in Guatemala. The two groups, Las Flores and Los Corteces, are members of ASPECAGUA and are located in the Jalapa area. The farmers in these groups grew gourmet coffee (*arabica*) but only had rudimentary processing facilities before the project.

Project Partners

- Asociacion de Pequeños Caficultores de Guatemala (ASPECAGUA - Association of Small-scale Coffee Producers of Guatemala)
- Asociacion Nacional de Cafe (ANACAFE - National Coffee Association [Guatemala])

Funder

- Starbucks Coffee Company

Budget \$75,000, Expended 75%^a

Accomplishments

ANACAFE and EnterpriseWorks designed new facilities, which use the wet process to produce parchment coffee from the coffee cherries (see the El Salvador Coffee Project). The facilities use the latest agro-industrial technologies for processing plants of their size and use environmentally sound processing practices. Construction of the two facilities began in August of 1997 and was completed by November of 1997. Each facility cost about \$37,500 and has a production capacity of 90,000 lb of coffee per year (the coffee processing season extends over part of two calendar years). The two facilities are expected to improve the incomes of at least 213 smallholder coffee farmers. The benefits will grow over time because the first two groups have made a commitment to repay the cost of the facilities with interest at 21%/annum to a revolving loan fund that will then be able to help other groups of small-scale coffee producers in Guatemala.

While Starbucks did not purchase coffee from these two groups during the first processing season under the project due to quality concerns that needed to be addressed, it has agreed to either buy coffee from the groups produced during the 1998-99 processing season or help them find other buyers. EnterpriseWorks is discussing the possibility of extending the partnership with Starbucks to include gourmet coffee producers in Mexico and is seeking funding from the Inter-American Development Bank for a multi-country coffee program in Central America.

^aThis is the Starbucks contribution and excludes EnterpriseWorks in kind contribution for technical assistance and administration.



Dairy and Other Livestock

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India Dairy Project

April 1994 - March 2004

Project Overview

EnterpriseWorks and several leading Indian development institutions have begun establishing commercial enterprises to supply low-cost molasses-urea products (MUPs) as a dairy cattle feed supplement in Gujarat, India. MUPs increase the efficiency of feed utilization by ruminant livestock for greater animal productivity and reduced methane emissions. This project focused on cows and water buffalos raised for milk production.

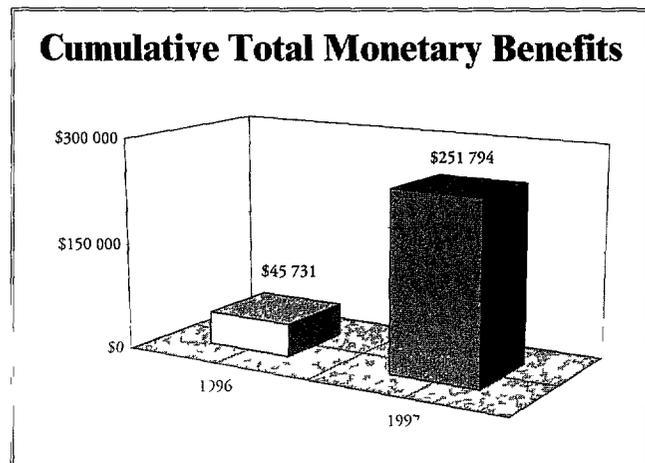
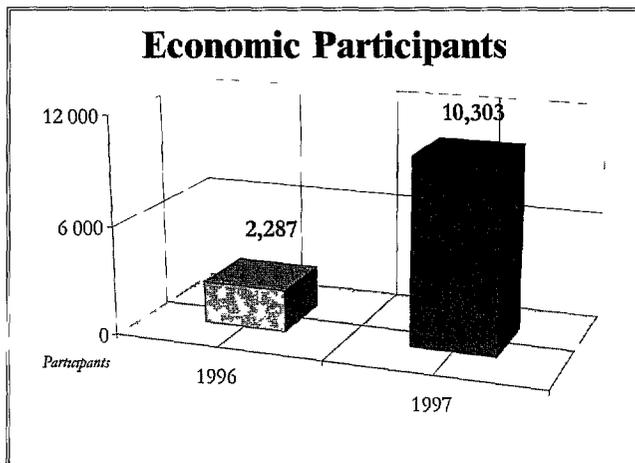
Project Partners

- AT/India
- National Dairy Research Institute (NDRI) [India]
- Self-Employed Women's Association (SEWA) [India]
- Bharatiya Agro-Industries Foundation (BAIF) [India]
- National Dairy Development Board (NDDB) [India]
- Dairy Development Unions (DDUs) [India]

Funders

- Trans-Alta Corporation [Canada]
- AES Warrior Run, Inc [U S]
- U S Environmental Protection Agency (EPA)
- Rockefeller Foundation [U S]

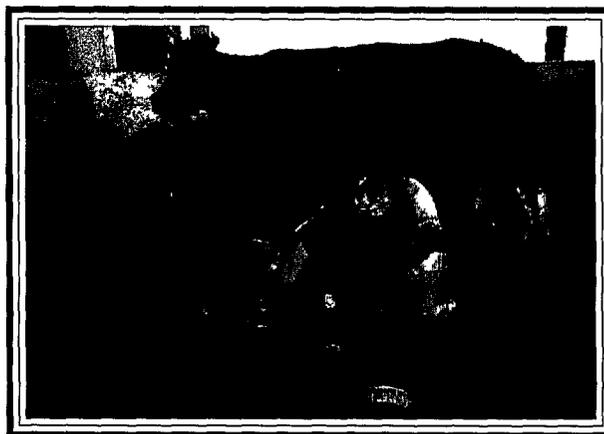
Budget \$3,002,379, Expended 43%



Objectives and Targets

The project's objective was to establish a reliable commercial supply of high-quality reasonably priced MUPs over a ten-year period. Project components included

- A research program that will 1) develop MUP production process efficiencies, 2) assess the trace mineral content of the typical diet of dairy cows and water buffalo to identify mineral deficiencies and develop optimal product formulations, and 3) identify cost-effective methods of packaging and dispensing MUPs,
- A production program to improve the efficiency of existing cattle feed plants and construct new commercially viable MUP production enterprises for the DDUs,
- An intensive marketing and extension program to recruit and train village-based MUP sales agents. The sales goal for 1997 was 273 000 kg of MUPs. The project's long-term goal is to reach 850,000 families involved in milk production.



Increased milk production is one benefit of MUPs consumption

Accomplishments

Sales In 1997, 1 052,000 kg of MUPs were sold — an increase of nearly ten fold over 1996 sales and 285% over the target for the year. The project benefited over 10,000 dairy livestock producers with over 7,500 cows.

Training Eight training programs were held for MUP marketing agents and coordinators. Village women's meetings were held to discuss nutrition and veterinary care for dairy cows and buffalo.

Producer Income Gains MUP supplementation allowed small-scale dairy producers to increase their income by 10 percent.

Product Development and Manufacturing Improvements In 1996, the project promoted large molasses urea block production and changed the formulation, shape and size to make them more acceptable to the animals and more convenient and less costly for dairy farmers. The animals licked the blocks when they wanted to and there was no way to ensure that they obtained the economically optimal amount of the supplement. In 1997, the project switched to molasses-urea granules based on farmer requests for feed that could be measured and mixed into the animals' feed ration. That same year EnterpriseWorks designed a new, more cost-effective MUP production technology that allows eight times the production capacity per eight-hour shift while reducing processing costs by one-third. The first commercial use of this new technology will be in 1998.

Commercializing the Product Initially, the MUP sales agents received a salary from the project because commission-based sales would have been impractical for a new product with uncertain demand. It would have been difficult to recruit and retain sales people who were only paid on a commission basis, but by the second half of 1997, MUPs had gained wider acceptance and the project was able to raise the price 15% to recover more of the costs. By the end of 1997, 117 of the 204 marketing agents no longer required a salary subsidized by the project.

Challenges

Research and Development R&D was needed to make the blocks more palatable to the animals and develop a more convenient form of the product

Supply Constraints Until 1997, the project faced a challenge in producing a sufficient quantity of MUPs. Subsequent technical modifications in the production equipment increased production to 12 metric tonnes per day and production was instituted around the clock

Bureaucratic Delays Registering AT/India with the government of India took nearly 6 months and grant negotiations then required another 8 months. Also, government approval of NDRI's participation took almost a year, delaying establishment of the methane monitoring lab

Negative Publicity Campaign from Competitor The success of the MUP marketing campaign jeopardized sales of a widely used calcium feed supplement sold by a large transnational corporation. Since the MUPs contain calcium in addition to other nutrients, farmers feeding MUPs to their animals no longer needed the supplement supplied by the other company. That company launched a negative publicity campaign aimed at reducing MUP sales. With the help of local veterinarians and the milk cooperative union staff, the AT/India marketing team was able to overcome this obstacle and increase MUP sales in 1997

Difficulty in Recruiting Women and Sales Agents The project had difficulty finding women and married couples to serve as sales agents since this is not the kind of job that women usually take. However, in villages where SEWA was active, women are more likely to take up these roles. The project hired three women extension coordinators to travel and meet village women to discuss MUP use and sales opportunities. In these meetings, village women can share their experiences with MUPs with project staff, and ask the DDU veterinary doctor questions

Project Staff Involved in Production Originally, AT/India project staff mainly focused on MUP marketing, but they have recently become involved in supervising daily production and ensuring quality control. Although the project was not designed in this way, AT/India was obliged by farmers' needs to take a larger role in product research, development, and production to maintain quality standards and deliver the product to farmers in a timely manner

Project Coordination EnterpriseWorks has served as a catalyst to bring together the major dairy sector institutions operating in Gujarat, including government agencies, quasi-governmental organizations, and NGOs. Reaching formal agreements, coordination of tasks, and facilitating the cooperation of the project partners which have their own working styles and agendas proved to be a major challenge. In 1997, the project's original design was changed to allow AT/India to take the lead on technology development, with ancillary support from the NDDB

Lessons Learned

Commercializing a New Product Systems Takes Time It took longer than expected to receive necessary government approvals, conduct vital product research and development, and organize test marketing and commercial sales. The project was able to make its first significant sales in 1997

Zimbabwe Livestock Project

October 1995 - September 1998

Project Overview

This research project was designed to test the effects of adding sunflower seedcake (SFSC), the byproduct of processing oil from sunflower seeds in a ram press or motorized expeller, to the diets of dairy and beef cattle and poultry in Zimbabwe. The feeding trials will examine the effects of SFSC on animal health and milk or meat production as well as the amount of methane (a gas that can contribute to global warming) produced by cattle. The nutritional value and mycotoxin content of the seedcake was to be tested under a variety of storage conditions. Mycotoxins (such as aflatoxin) are substances produced by certain types of fungi that may have harmful effects on animal health. The project research findings are to be disseminated through workshops for agricultural extension staff, scientific publications, training materials, and in-country networks in Zimbabwe and Tanzania.

Project Partners

- Appropriate Technology Zimbabwe (ATZ)
- Natural Resources Institute/Agro-Processing and Livestock Divisions (NRI) [United Kingdom]
- Henderson Research Station [Zimbabwe]
- University of Zimbabwe/Chemistry Department

Funders

- U S Environmental Protection Agency (EPA/Global Change Division)
- U K Department for International Development (DFID, formerly Overseas Development Administration)

Budget \$437,627, Expended 85%

Objectives and Targets

This project was designed to conduct 3 feeding trials, one each for dairy cattle, beef cattle, and poultry. The research will involve 35 dairy cattle, 25 beef cattle, and approximately 80 chickens.

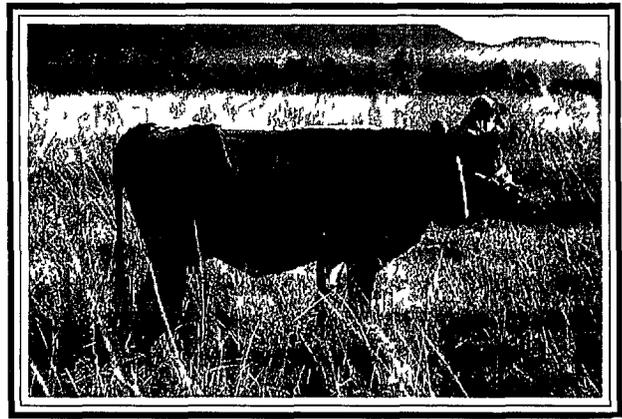
Accomplishments

Number and Location of Research Partners Since initially too many organizations were to be involved in the research activities of this project, it was later agreed that two of the organizations would not have a direct role in the research stage. The research was originally expected to be done in two countries — Tanzania and Zimbabwe. To reduce costs and simplify logistics, it was decided that all of the research would be conducted in Zimbabwe.

Training Provided A Washington State University consultant trained technicians at the Henderson Research Station and University of Zimbabwe in ruminant methane monitoring methods.

Trials with Dairy Cattle Preliminary trials with dairy cattle in late 1996 confirmed that the nutrient intake of the cows was similar to subsequent estimates calculated from a nutritional analysis of the feeds for animals of similar live weights.

Feeding Trials with Beef Cattle Feeding trials with beef cattle began in late 1997. These trials examined the cost-effectiveness and methane production associated with feeding various sunflower seedcake and maize rations compared to the fodder typically fed to beef cattle. Livestock farmers benefit in two ways. First, they can raise their livestock to a marketable weight faster at a lower cost. Typically, cattle lose weight in the dry season in Zimbabwe when fodder and feeds are scarce and the animals have to gain it back again later (an inefficient use of feed). Second, by bringing beef to the market 8-10 months earlier than most other livestock producers, farmers can obtain a higher market price per kilogram. The methane emissions from beef cattle are reduced because the amount produced per live animal decreases when they do not have to make up for lost weight. In addition, since the cattle can be processed at an earlier age, each animal produces methane for a shorter time.



Seedcake rations increase cattle meat and milk production

Challenges

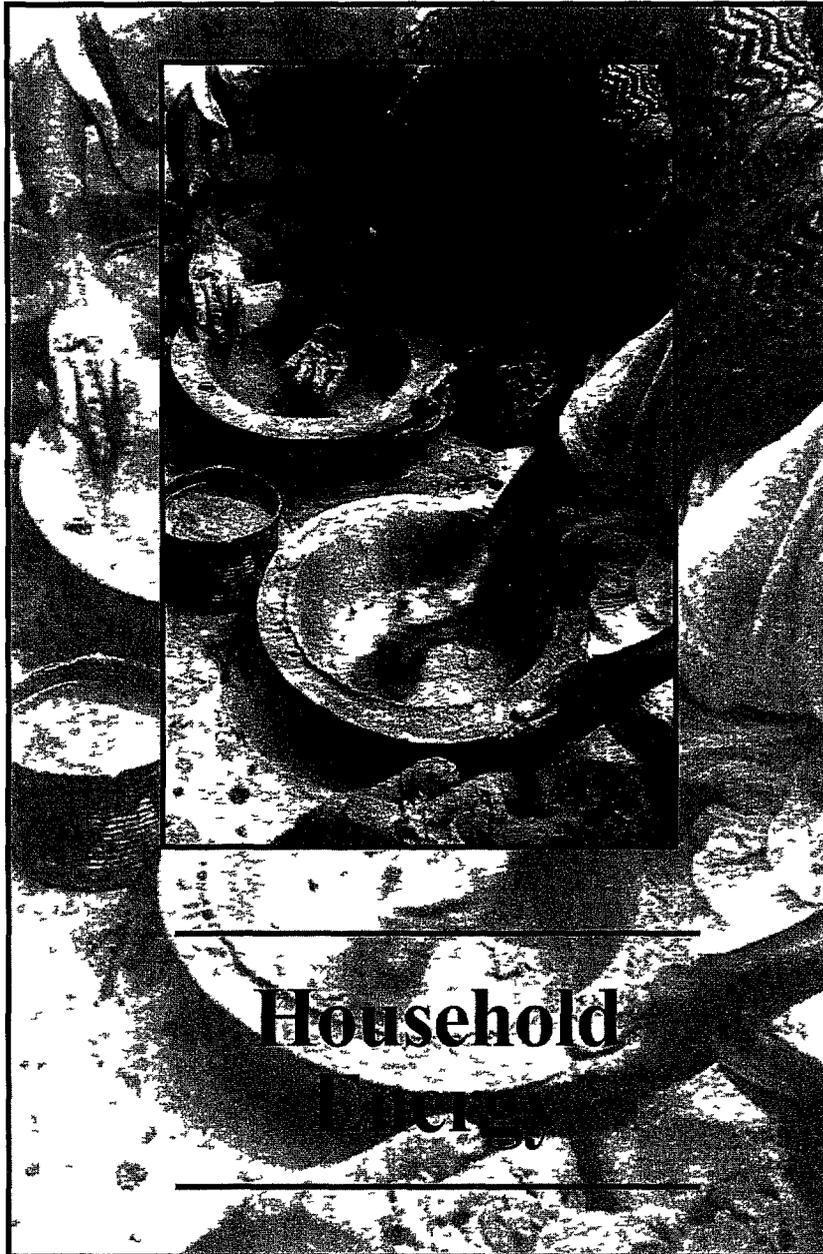
Coordination with Partners Having multiple organizations involved in project implementation and management made communications, logistics, and accountability difficult at best. Three of the partner organizations underwent key staff changes in 1996, which made coordination of project activities difficult. In 1997, the participating organizations agreed to keep each other better informed of progress and changes in staff responsibilities.

Delays Analysis of the dairy cow methane emission trial results was late because of the schedule of a key consultant. Also, the poultry trials originally scheduled for 1997 were delayed until January, 1998 due to a scarcity of baby chicks in Zimbabwe.

Lessons Learned

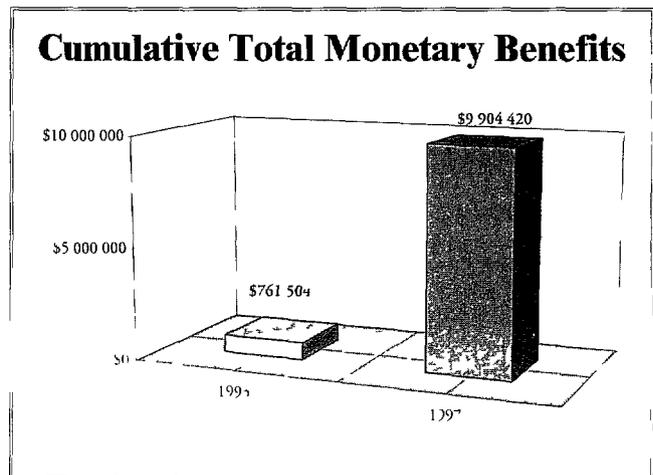
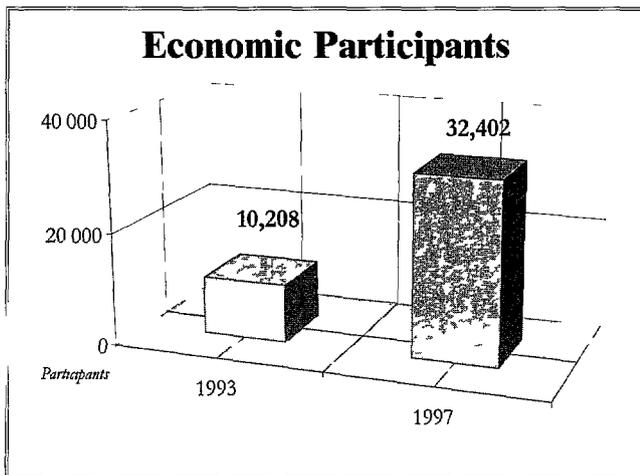
Technology Adaptation Carrying out ruminant methane monitoring in a developing country required more assistance than had been anticipated. This technology was relatively new in the United States and had only been tested in one developing country prior to the project. The knowledge gained in this project will make it easier to establish similar methane monitoring in other countries.

Determine the Optimal Amount of Seedcake in Livestock Diets The optimal amount of seedcake in the diet of each type of livestock needs to be established, especially for non-ruminants. Due to the high oil content, too much seedcake can adversely affect the health of animals and will not produce the desired increases in productivity.



Household Energy

Cumulative total monetary benefits and the number of economic participants from 1993 through 1997



Mali Household Energy Project

June 1996 - September 2002

Project Overview

The household energy component of the Mali Technology Transfer Project is modeled on earlier EnterpriseWorks projects in Kenya and Senegal. This component seeks to generate economic and environmental benefits through commercial dissemination of the "Sewa" stove, a fuel-efficient charcoal stove for household cooking. This stove has a fired ceramic liner attached to a metal cladding with a mix of cement and ash. Sewa is the local language (Bambara) name for the stove known in Senegal as the diambar and in Kenya as the ceramic-lined jiko (see Senegal Household Energy Project).

The Mali project initially gave away a small number of stoves imported from Senegal to households that agreed to participate in the field testing. These tests found an average charcoal savings of 44% over the traditional all-metal stove which translated into a cost savings of \$61 per year for a typical household in Mali. ATI/Mali then imported ceramic production equipment from England and helped a local entrepreneur construct a kiln and drying sheds for the ceramic stove liners.

Project Partner

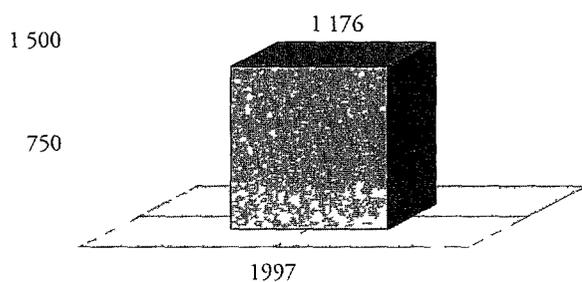
- ATI/Mali

Funder

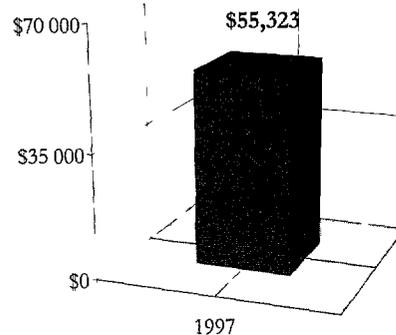
- USAID/Mali

Budget \$2,158,000, Expended 6%

Economic Participants



Cumulative Total Monetary Benefits



Objectives and Targets

- Formulate a durable clay mixture for the ceramic liners and help one entrepreneur establish a liner production facility,
- Train artisans to make the metal cladding for the stove,
- Commercial sales of at least 6,000 improved stoves resulting in a total savings of \$366,000 in charcoal costs over a two-year period (two years is the expected life of the stove if it is the principal stove in use)

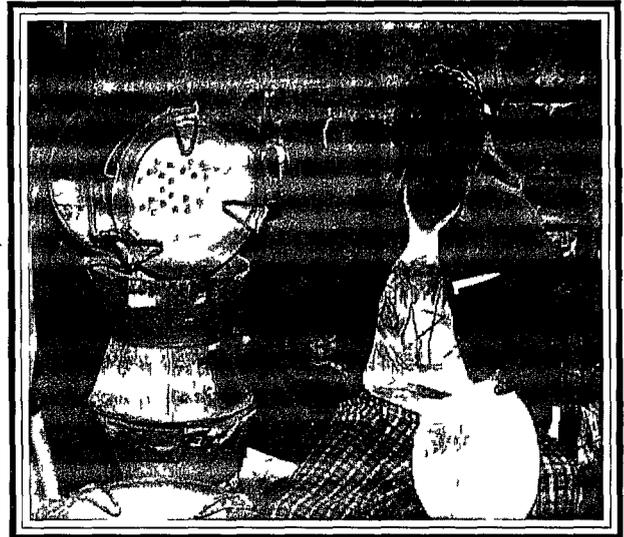
Accomplishments

Stove Production Established With technical assistance from EnterpriseWorks consultants and a loan from ATI/Mali, a local entrepreneur began production of ceramic liners for the stoves. This entrepreneur will repay the loan through a small fixed payment per liner sold. ATI/Mali trained metal artisans to make the cladding for the stove. Production of the stove began in April 1997.

Sales Over 1,100 stoves were sold in 1997. Four sizes of the stove were produced ranging from a small one for making tea (\$2.52) to a large size (\$6.73).

Consumer Savings Consumers using the stoves saved over \$55,000 in charcoal costs in 1997 (or use the annual allowable cut of 188 ha of plantations).

Environmental Benefits The charcoal savings in 1997 would eliminate the need to clearcut 42 hectares of natural forest or allow the annual harvest from 188 hectares of plantations to be devoted to other uses.



An artisan in Mali assembles a Sewa stove

Challenges

Difficulties with Ceramic Liner Production In 1997, technical problems in the identification of a suitable clay mix that can withstand repeat heating without cracking delayed commercial sale of the stove and the project's planned publicity campaign for the stoves. Over half of the liners were lost due to cracking during drying and firing, sometimes after only a few uses. In 1997, ATI/Mali brought over a Kenyan stove liner producer to help resolve these problems.

Lessons Learned

Importance of Product Development and Quality Control Since the reputation of a technology can be negatively affected for a long time if unsatisfactory products get distributed, all technical problems should be ironed out and quality control mechanisms put in place before commercial sales begin. ATI/Mali provided technical assistance to the liner producer for an extended period and covered his operating costs until the technical problems were solved. This flexibility proved vital in maintaining the motivation of the partner and the long-term viability of the enterprise.

Senegal Household Energy Project

April 1991 - February 1998

Project Overview

This component of the Senegal Technology Transfer Project was designed to promote the use of a fuel-efficient, ceramic-lined charcoal stove (the "Diambar") for household use. An adaptation of the Kenyan jiko, the Diambar consists of a bell-bottom shaped cladding made of scrap metal and a fired clay liner held in place by an insulating layer of cement and ash (the vermiculite used in Kenya was not available in Senegal). The liner reduces heat loss and its perforated floor serves as a grate. The standard model Diambar is larger than the jiko because the average family size is larger in Senegal and the Diambar's height was also increased for greater convenience in cooking. Small metal hinges were added to hold the Diambar's liner in place as well as curved handles to make the stove easier to carry. Some other design changes were made by medium-scale ceramics enterprises and informal sector metal artisans to make fabrication of the stove faster. Several sizes and variants of the Diambar stove design are in use. EnterpriseWorks is also commercializing these stoves in Mali.

Project Partner

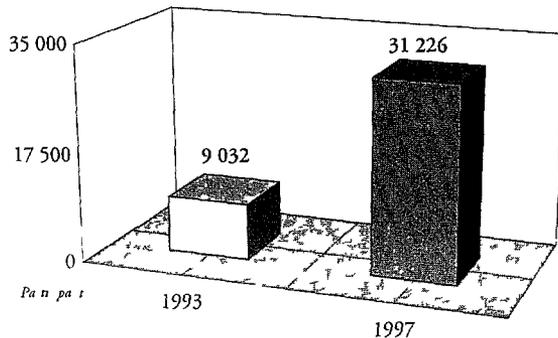
- ATI/Senegal

Funders

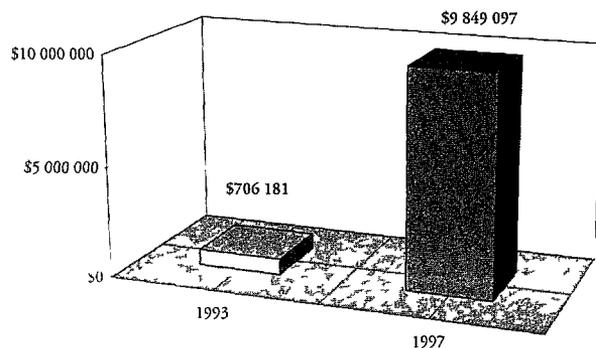
- USAID/Senegal
- The Embassy of the United Kingdom to Senegal

Budget \$1,207,747, Expended 100%

Economic Participants



Cumulative Total Monetary Benefits



Objectives and Targets

- Reduce charcoal consumption in cooking through more fuel-efficient stoves. Improved stoves save households money, slow deforestation, and generate income for the enterprises making the stoves.
- Develop and commercialize a fuel-efficient stove for households to cook with wood.
- The target for stove sales in 1997 was 6,600.

Accomplishments

Stove Sales In 1997, over 9,200 stoves were sold for a cumulative total of nearly 31,000. The project worked with women's groups to sell stoves. In 1997, there were 130 sellers of the stove (including 120 women, and 10 men). The project expanded geographically beyond Dakar to include Thies, Kaolack, and St. Louis.

Stove Models There are two designs of charcoal stoves — the original bell-bottom shaped stove developed in Kenya and a conical shaped one that is slightly cheaper but less stable when foods are vigorously stirred. The charcoal stoves are sold in 4 sizes ranging from a small model for preparing tea to a very large stove for commercial food preparation or schools. The woodstove comes in two sizes.

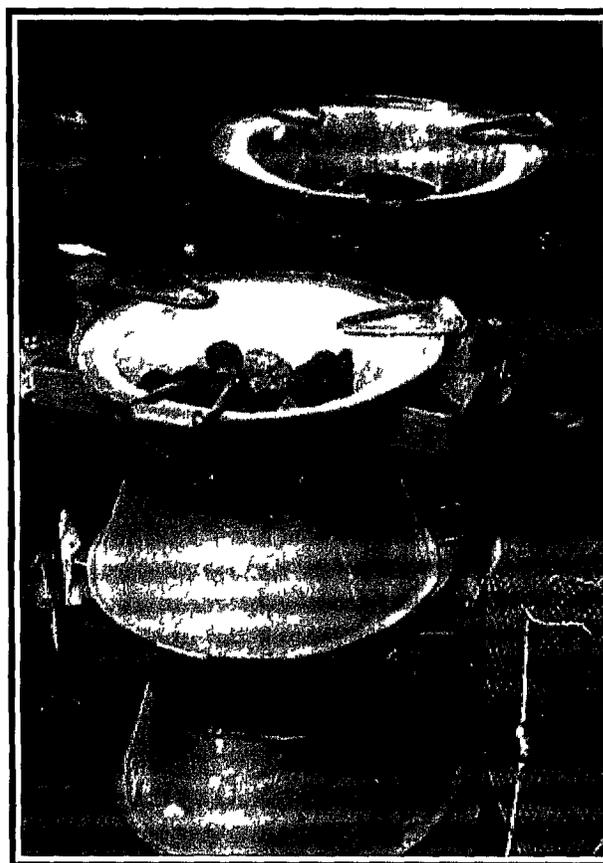
Training Provided The project trained 43 metal artisans in production of the stove claddings and two pottery makers in liner making.

Marketing The market for the stove consists of existing users of charcoal in urban areas. Project promotional efforts informed consumers about the potential savings with the charcoal stove despite its higher initial cost. The project also relied on radio and television ads to develop the market. Initially, the project gave away a small number of stoves to representatives of women's groups for field testing and promotional purposes.

Informal Credit Arrangements Many women's groups use a revolving savings and credit arrangement known as a 'tontine' that allows all members of the group to accumulate the cash needed to buy a stove over time.

Consumer Savings On average, use of a Diambar stove for a full year saves \$97 in charcoal purchases. Since the Diambar lasts 2-3 years with typical use, the savings greatly outweigh the stove cost.

Positive Environmental Impact of Stove Use For every 1,000 stoves in use for a year, 570 tons of charcoal are saved, eliminating the need to clear-cut 57-60 hectares of forested land and reducing carbon dioxide emissions by 1,718 tonnes. The Diambar woodstoves decrease cooking time by 30% over traditional stoves and save 50% on fuelwood consumption.



The Diambar stove

Challenges

Liner Production Capacity and Cost The main bottleneck to increasing Diambar stove sales was the limited production capacity for the ceramic liners, not buyer demand. Higher wage rates and the lack of competition in the medium-scale ceramics industry in Senegal have kept the price of stoves higher than in Kenya.

Lessons Learned

This project built on lessons learned from prior USAID and EnterpriseWorks projects in Kenya and work by CARE in Sudan and Togo. Unlike the previous projects, EnterpriseWorks chose to work directly with the private sector producers and sales agents in Senegal, rather than relying on an NGO to promote the technology and this proved to be a more efficient and sustainable approach. Other lessons learned include:

- While most stove projects have used cooking demonstrations for groups of people to build demand for the stoves, this project found that radio and television advertisements can be a more effective way of stimulating sales.
 - Informal sector vendors and women's groups proved effective in introducing and marketing the new stoves.
 - The *tontines* for financing stove purchases worked well.
 - The existence of two producers of stove liners and 35 artisans producing the metal claddings helped increase the supply and moderate the price. EnterpriseWorks also enabled cost reductions through stove design modifications.
 - Since no funds were available for working capital loans to stove manufacturers and sellers in the first phase of the project, project credit was not essential in commercializing this technology. However, the second phase of the project authorized a small revolving loan fund for stove producers and sellers. The loans were administered by a producer's association and the additional working capital has helped expand production and sales.
 - The prospects for commercialization of more fuel-efficient stoves are better if the fuel is purchased than if it is collected for free. Charcoal is a purchased fuel, while wood is often collected for free depending on its scarcity in the area, household incomes, and the perceived value of labor time.
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Selected Sources for Further Information

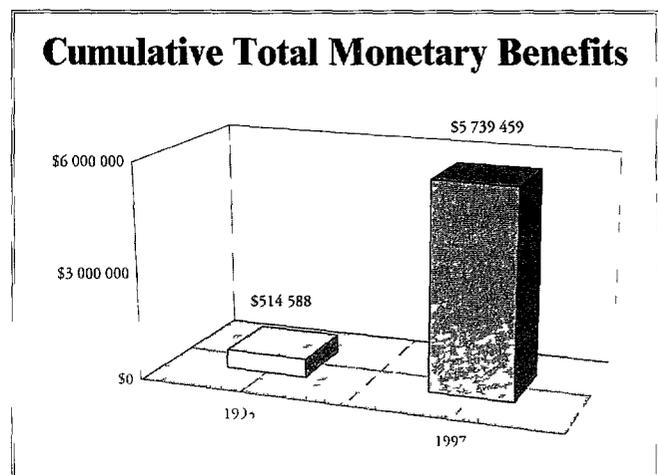
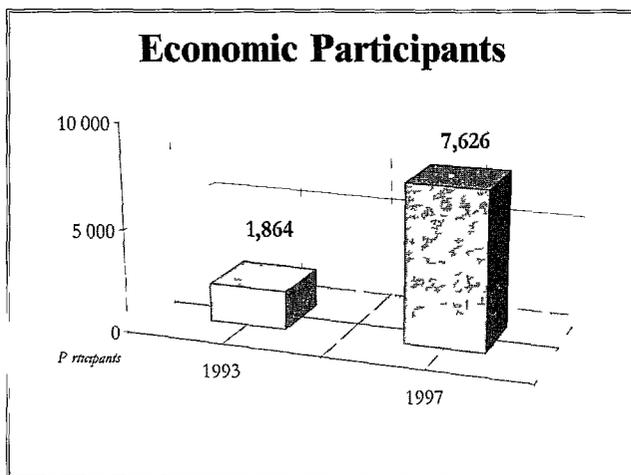
- Hyman, Eric, Jas Singh, and Edward Lawrence 1995 "The Commercialization of Efficient Household Charcoal Stoves in Senegal." *Science, Technology, and Development* 14, No. 1 (1996) 1-20.
- Allen, Hugh 1991 *The Kenya Ceramic Jiko: A manual for stovemakers*. London: Intermediate Technology Publications.



Market Gardening

Market Gardening

Cumulative total monetary benefits and the number of economic participants from 1993 through 1997



Mali Market Gardening Project

April 1995 - September 2002

Project Overview

Market Gardening is one component of the Mali Technology Transfer Program, which also includes oilseed processing and household energy activities. This component, which builds on a previous EnterpriseWorks project in Senegal, will establish commercial production and marketing of the standard Bielenberg treadle pump. The Bielenberg treadle pump is an inexpensive, foot-powered device for low-lift irrigation from groundwater at a depth of less than 7-8 meters or rivers and lakes. The pump greatly reduces the labor requirements for fruit and vegetable production, enabling farmers with uncultivated land to expand their planted area, since water lifting and distribution by hand with a bucket and sprinkler is one of the most time-consuming tasks.

The treadle pump was designed by EnterpriseWorks Engineer Carl Bielenberg, who modified the Jenkins pump (an adaptation of the Bangladesh treadle pump) to make it easier to manufacture in Africa using locally available materials and to require minimal repairs, which are often difficult to obtain or costly in rural Africa. The design changes also eliminated the need for farmers to add parts to the pump and made it more durable. ATI/Mali markets the pump under the brand name "Ciwara", which means "strong" in the local language.

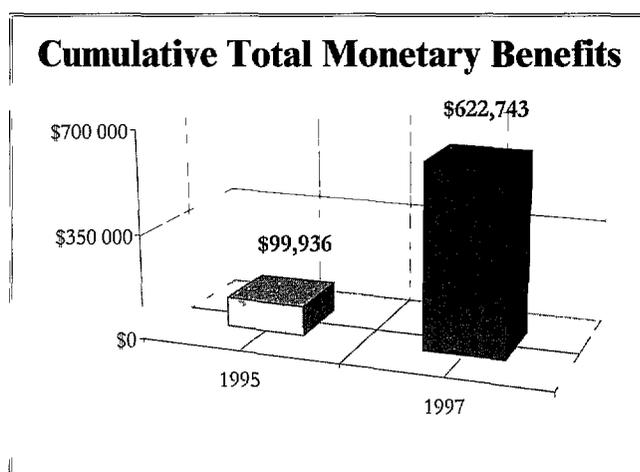
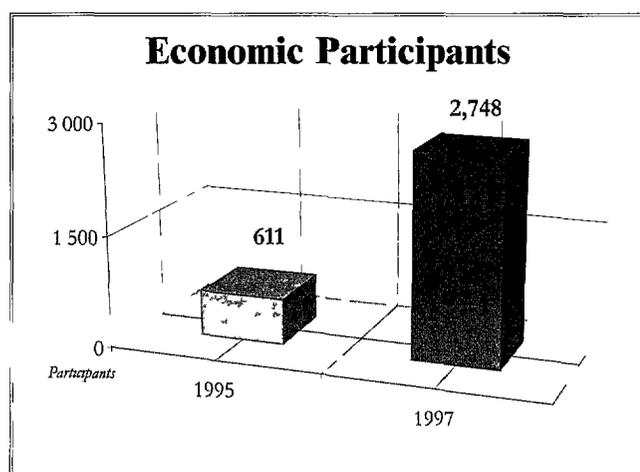
Project Partners

- ATI/Mali
- Natugo (Self-Help)

Funder

- USAID/Mali

Budget \$1,652,097, Expended 19%



Objectives and Targets

- Increase Ciwara pump production by training 4 new manufacturers,
- Sell at least 400 treadle pumps to market gardeners,
- Generate \$1,230,000 of income for pump owners over the expected life of the pumps purchased (at least 5 years),

- Design and test a pump for lifting water from depths greater than 7.8 meters
- Establish the feasibility of alternative onion production methods for possible further expansion
- Determine the technical and market potential for low-cost hand-augured tubewells for irrigation
Install 100 of these wells on a commercial basis



Demonstrating the treadle pump in Mali

Accomplishments

Pump Commercialization ATI/Mali identified and trained local pump manufacturers, provided production tooling, and helped develop the market through village demonstrations and mass media advertising. In 1997, 374 pumps were sold, for a cumulative total of 904 through this project (excluding the 200 pumps sold in the pilot project in Mali).

The retail price of the pump was \$143. New pump manufacturers were established in Segou, Sevare, Gao and two more in Bamako in 1997. The project conducted 5 training sessions and dozens of village demonstrations. It publicized the pump on regional radio stations in Mali and prepared a three minute television documentary in 1997 for future airing.

Income Generation In 1997, the new operating treadle pumps generated nearly \$323,000 in producer income gains in 1997 from additional fruit and vegetable sales. Over a 5-year period, these pumps would increase farmers' net incomes by over \$1,496.

Pump Research In response to farmer and manufacturer requests, ATI/Mali staff developed the Ciwara II, a suction only pump that can lift groundwater from a depth of up to 20 meters. With one operator, this pump can lift 2.25 cubic meters per hour from a depth of 12 meters. This design combines two Segou pumps on a single treadle pump chassis. The Segou pump, usually operated as a handpump, was promoted in Mali for household drinking water by Catholic missionaries. Field testing and commercialization of the Ciwara II began on a limited basis in 1997.

Onion Sets Introduced As was done in the earlier Senegal project, ATI/Mali explored the feasibility of introducing onion production from sets, rather than seeds. Onion sets are small bulbs that a farmer grows from seeds and harvests at an early stage of growth for subsequent replanting to grow table onions. Onions raised from sets mature up to two months faster than those grown from seed, allowing farmers to bring table onions to market when prices are high before the bulk of the crop is harvested. In 1997, ATI/Mali trained five farmers to grow onions from the sets. These farmers planted 1,495 square meters of sets and harvested 1,536 kg of table onions. The onions were sold in December at an average price of nearly \$0.42/kg, a 200% increase over the price in April when onions are most plentiful. These farmers earned an average of \$100 of additional gross income by growing onions from sets.

Low-Cost Tubewells Hand-dug, cement-lined wells for irrigation are too expensive for many market gardeners in Mali. Hand-augured tubewells, a technology developed by the ATI/Niger project manager, are small-diameter tubewells lined with PVC pipe that are drilled by hand using low-cost, locally manufactured tooling. Where conditions are suitable, tubewells cost 50-67% less than cement-lined wells and can be installed in a fraction of the time. ATI/Mali staff constructed the augurs from local materials and trained two installation teams in Niono. These teams installed nine tubewells in 1997 as a pilot test.

However, climate and soil conditions were not suitable for this technology in the project areas. The installation teams had difficulty establishing them in the rocky, clay soils of the pilot test area. For example, one took 4-5 days to install at a cost of \$227—not a large savings over a dug well. Moreover, the recharge rates in the tubewells were too low for market gardening use, but they could be sufficient for smaller quantities of water needed for domestic household users.

Development of Other Pump Models ATI/Mali responded to the needs of farmers who cannot use the Bielenberg treadle pump (because their groundwater sources are too deep) by developing the Ciwara II model.

Challenges

Range of Technology Needs Although the hand-augured tubewells did not turn out to be suitable for market gardeners in Mali (unlike Niger where soils are sandier) this technology could be used to obtain household drinking water. Differences in climate and soils, cropping systems, and input and product prices make it necessary to develop and promote a range of technologies for market gardening across and even within countries. A needs-based approach is required instead of a technology-push approach.

Lessons Learned

Treadle Pump Advertising Radio advertisements were a powerful tool in stimulating pump sales in Mali and the project plans to run more in the future.

Feasibility of Tubewells The technical feasibility of using tubewells for irrigation in Mali should have been assessed before budgeting resources for implementation of this technology.

Selected Sources for Further Information

- Bielenberg, Carl and Hugh Allen 1995 How To Make And Use the Treadle Irrigation Pump London Intermediate Technology Publications
- Hyman, Eric, Jas Singh, and Edward Lawrence 1997 “Building the Capacity of the Private Sector to Commercialize Technologies for Small-Scale Irrigation in Senegal ” Science, Technology, and Development 15, No 1 63-91
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Senegal Market Gardening Project

April 1991 - February 1998

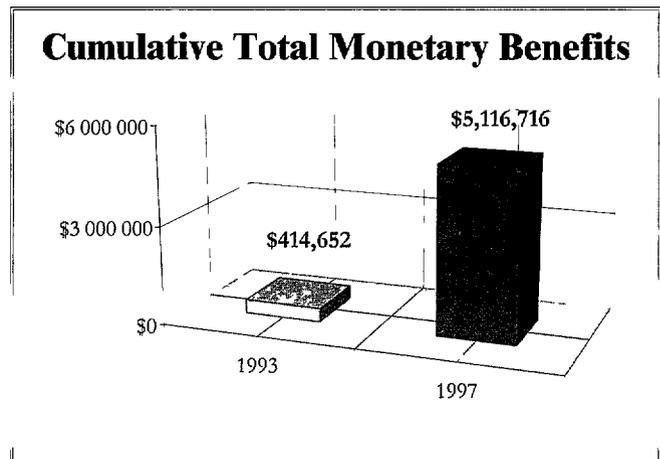
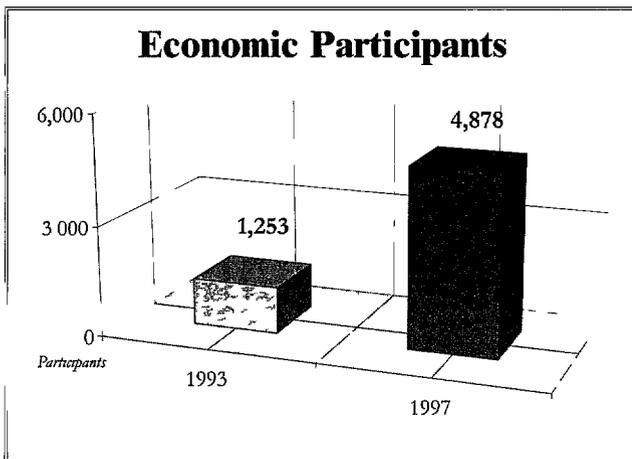
Project Overview

The purpose of this component of the Senegal Technology Transfer Project was to increase the income of small-scale vegetable and fruit farmers using manual irrigation pumps and a variety of other technologies including wrapped screens for wells, hand-augered tubewells, floating row covers, and onion sets. Most market gardeners in Senegal have arable land that is not used because the labor time required for lifting and distributing water for their crops by hand limits the area they can plant. By saving labor time, an irrigation pump allows farmers to increase their planted area. Use of a pump may also boost crop yields if it enables farmers to provide their crops with a greater amount or better distribution of water. The treadle pump is an inexpensive, foot-powered device for low-lift irrigation from either surface water or wells, which was developed in Bangladesh. Hand-augered tubewells are a fast and inexpensive way to tap groundwater for irrigation. The wrapped screen is a perforated, geotextile-wrapped pipe installed in the bottom of an existing well to increase the water recharge rate.

Funders

- ATI/Senegal
- USAID/Senegal

Budget \$1,493,170, Expended 89%



Objectives and Targets

- Produce and sell 1000 treadle pumps, 300 wrapped screens, and 500 row covers,
- Provide technical and financial management training to at least 100 manufacturers and sales agents associated with these technologies

Accomplishments

Income Increases The additional production generated by the treadle pump through increases in the cultivated area and yield per unit area averaged nearly \$800

Economic Impact of the Pumps Since the manual pumps allow farmers to expand their cultivated area by re-allocating labor from water lifting and distribution to other market gardening tasks, farm income increased without causing any net labor displacement. The treadle pump has reduced the average irrigation time to 4.1 hours per day, allowing the typical user to increase the planted area by as much as 40 percent.



Using the treadle pump

Many farmers along the Senegal River were interested in a large treadle pump model that has a greater water lifting capacity than the Bielenberg pump. A project technician helped one of the Bielenberg pump manufacturers design a large version of this pump.

Sales and Prices In 1997, 226 treadle pumps, 75 wrapped screens, 68 hand-augered tubewells, and 3,675 floating row covers (2-m lengths) were sold. The retail prices were \$76 for the standard Bielenberg pump, \$93 for the large Bielenberg pump, \$109 for the handpump, \$59 for a wrapped screen (installed), \$252 for a hand-augered tubewell, \$4.21/kg of onion sets, and \$0.30 per floating row cover.

Wrapped Screens On average, farmers using the wrapped screen have doubled the recharge rate of their wells, allowing them to expand their cultivated area, increase vegetable yields, and/or lengthen the growing season. Two manufacturers were trained to produce and install wrapped screens in 1997. New equipment allowed the installation of wrapped screens without descending to the bottom of the well.

Demonstrations Demonstrations of onion set use took place in 15 locations, 175 kg of sets were planted in an area of 2,410 square meters. The floating row covers were demonstrated with 100 farmers in 10 zones, and it was shown that they increased cabbage and tomatoes transplant survival from 52% without floating row covers to nearly 86 percent. The association of treadle pump manufacturers also began demonstrations of the pumps on their own without participation of the project staff.

Hand-augered Tubewells The hand-augered tubewell requires manually drilling a borehole in the earth and inserting pipe to reach the water source. Tubewells with a depth of 12 meters and a drawdown rate of 7,000 liters of water per hour can be installed in 10 hours in favorable sites.

Manufacturing The diambars are relatively easy for the informal sector workshops to manufacture, and the project sold the manufacturers jigs and fixtures to improve the quality and rate of production.

Provision of Credit The pump manufacturers provided suppliers credit to allow market gardeners to finance purchase of pumps without imposing an administrative burden on the project for collection of loan repayments. The usual arrangement was for the farmer to give the manufacturer a down payment of one-third of the cost of the pump and pay the balance after the next harvest, 3 to 4 months later. Because of religious constraints, no stated interest rate was charged on these loans, but farmers received a discount for paying in cash in full at the time of purchase.

Partner Investment Pumps sold in Senegal through 1997 were expected to generate total net income gains of \$8.9 million over their expected lifetime, at a cost to the project and beneficiaries of just \$1.2 million, a ratio of \$7.41 in benefits for every \$1 invested.

Increased Efficiency Floating row covers decrease the need for pesticides and result in faster growth and healthier seedlings. Onions can be harvested earlier when sets are planted instead of seeds, enabling farmers to get a better price since onions are less available on the market at that time.

Positive Environmental Impacts Because the wrapped screens and hand-augered tubewells tap relatively small amounts of groundwater from rain-fed aquifers near the surface (or surface water in the case of pumps) they avoid the negative environmental impacts commonly associated with large-scale irrigation projects. Foot or hand-powered pumps do not require costly and nonrenewable diesel fuel.

Oilseed Processing The Senegal Technology Transfer Project is also promoting oilseed processing with the ram press. In 1996, it trained two potential manufacturers of the press and encouraged sesame production in four areas. The expected sesame harvest in these areas is 120 tonnes.

Lessons Learned

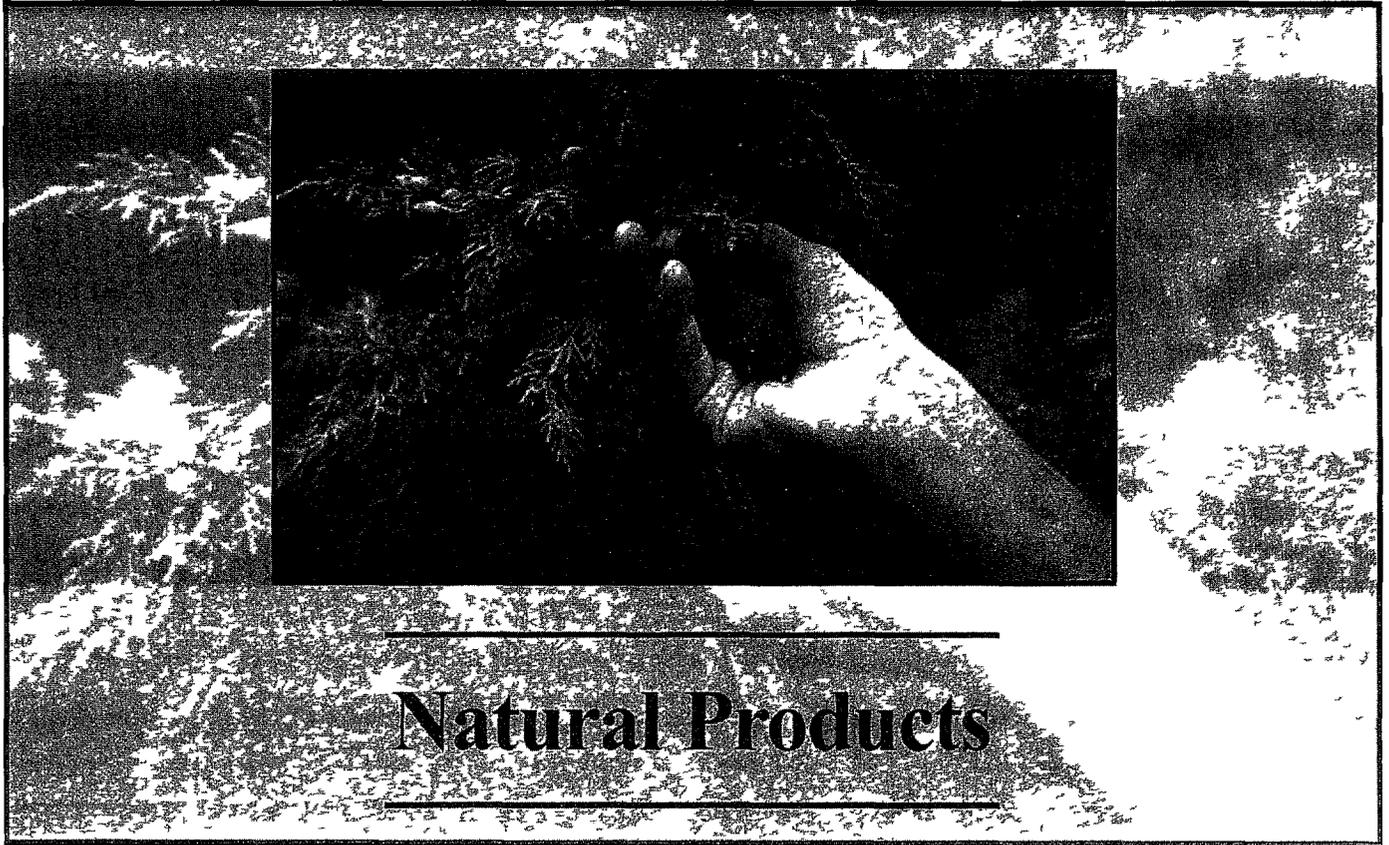
Involvement of the Private Sector Prior to this project, EnterpriseWorks had begun disseminating the Bielenberg treadle pump in Mali and Cameroon through NGO partners. Senegalese manufacturers had to take responsibility for identifying their own customers, providing supplier credit, handling distribution, and making repairs. EnterpriseWorks worked directly with private sector producers in Senegal through its own local office rather than intermediary NGOs. In fact, EnterpriseWorks recommended that manufacturers avoid too much reliance on NGOs and government programs for sales due to the short duration and unsustainability of their programs, time disparity between expressions of interest and actual orders, reliance on subsidies that discourage other potential customers from paying the full market price, and weak extension systems. EnterpriseWorks helped the manufacturers and sales agents establish a profit-making system for commercial production and distribution of pumps to farmers long after EnterpriseWorks' involvement ended.

Supplier Credit Manufacturers who provided supplier credit for pump purchasers increased their sales, had good loan repayment rates, received feedback from users, and obtained sales from neighboring farmers. The project developed manufacturer associations for low-cost management of a revolving loan fund.

Promotion For a limited time, the project restricted training to one workshop per geographic area. Later, increasing competition allowed cost reductions and prompted design improvements. Promotion, mass media, and demonstrations also boosted sales.

Selected Sources for Further Information

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- Hyman, Eric, Jas Singh, and Edward Lawrence. 1997. "Building the Capacity of the Private Sector to Commercialize Technologies for Small-Scale Irrigation in Senegal." Science, Technology, and Development 15 No. 1: 63-91.

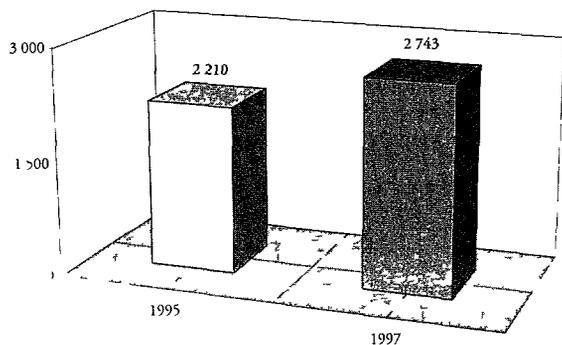


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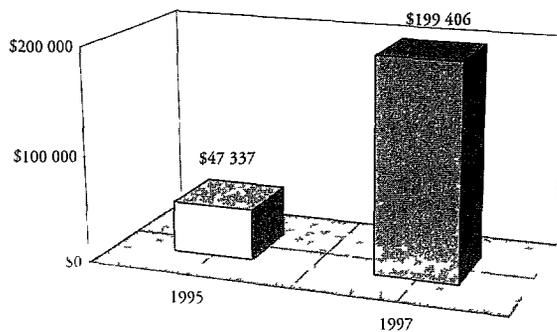
Natural Products

Cumulative total monetary benefits and the number of economic participants from 1995 through 1997

Economic Participants



Cumulative Total Monetary Benefits



India Tasar Silk and Wild Honey Project

September 1995 - August 1998

Project Overview

This project was designed to help communities in the Tungnath region of Chamoli District in the Uttar Pradesh state conserve local biodiversity by harvesting tasar silk and wild honey in an economically and environmentally sustainable manner. This project is testing the hypothesis that communities will conserve natural resources and, consequently biodiversity, if they are given effective control over the resources, economic incentives to maintain sustainable resource stocks, and technical assistance.

This project is promoting two types of enterprises — tasar silk production and beekeeping. Tasar silk is produced by the *Antheraea proylei* silkworm, which feeds on the leaves of tasar oaks that are relatively abundant in the temperate forests of the Garhwal Himalayas. Individual silkworm growers harvest the oak leaves from communal forests and feed them to silkworms in central rearing facilities. This is the first time a tasar silk project has been undertaken in the temperate zone of India.

Beekeeping and honey production provide supplemental income for farmers that is consistent with conservation of forests and other plant resources. This is the first honey project carried out in India with an indigenous bee species, *Apis cerana*.

Project Partners

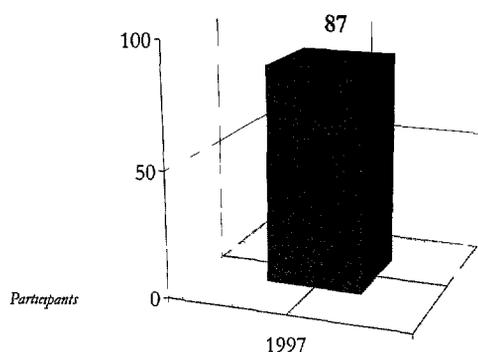
- AT/India
- Kumaun University Department of Botany
- EDA Rural Systems

Funder

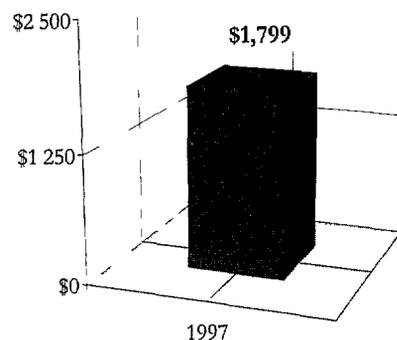
- Biodiversity Conservation Network (BCN) [USA]

Budget \$616,358, Expended 83%

Economic Participants



Cumulative Total Monetary Benefits



Objectives and Targets

- Establish two community-owned companies — one producing tasar oak silk and another processing honey. After 5 years of operation, the two companies are expected to generate at least \$547,000 in revenues and benefit 3,800 producers.
- Develop the local capacity for managing selected common property resources through village institutions.
- Conduct applied biological research and participatory monitoring techniques for biodiversity impacts, and,
- Influence government policies to allow for more local management of forest resources.



Silk spinning in the Garhwal Himalayas

Accomplishments

Tasar Silkworm Rearing and Silk Reeling In 1997, the project produced nearly 183,000 silkworm cocoons. Silkworm rearing time was cut by 11 percent. The percentage of cocoons suitable for use in the 'grainage' (the facility for silkworm egg production) increased by 33 percent. The project also expanded its geographic reach to include several villages in the nearby Mansuna valley.

Beekeeping and Honey Processing Honey production was less than expected due to an insufficient number of the indigenous bee colonies and the relatively low honey yield in the cold climate of Garhwal. After experimenting with various bee box designs to increase productivity in the cold season, the project decided to link with upland summer beekeepers and beekeepers in the lower plains who would build up colonies and maintain the bee boxes during the winter.

Companies Registered Two companies were legally registered in 1997 — Chamoli Tasar for silk production and Devbhumi Madhu Pvt. Ltd. for honey production.

Challenges

Inadequate Supplies and Facilities Expansion of the honey production enterprise was constrained by limited supplies of *Apis cerana* bee colonies. Construction and operation of basic facilities such as a cocoon preservation center, a grainage center for production of silkworm eggs, and a honey processing plant were hindered by an unreliable electrical supply. In 1997, temporary facilities were established for honey processing and silkworm cocoon preservation.

New Type of Bee Boxes In the high altitude Tungnath region, it is too cold most of the year for single-walled bee boxes. Double-walled boxes are now being used for the bees, which has improved honey production.

Viral Disease Diminished Silkworm Cocoon Supply The second silkworm cocoon crop produced in late 1996 was affected by a viral disease that killed 75% of the young silkworms. Since many silkworms died during the cocoon-spinning process, producers were left with a large supply of incompletely formed cocoons of little or no value. This reduced the crop from the expected 150,000-200,000 cocoons to 44,000 cocoons. In 1997, project consultants studied the causes of this disease and recommended preventive measures for subsequent crops.

Local Resource Management Forests in the Garhwal Himalayas are under state government control. The state government retains royalties on forest product extraction and use of land for animal grazing, and collects fines and other fees. In 1997, the project began negotiations with the government about delegating some management responsibility relating to project activities to local community groups.

Lessons Learned

Establishing Quality Controls Project staff must ensure that future silkworm crops are disease free. A consultant from the Central Silk Board (CSB) provided technical support to the project staff and village development workers. Project staff purchased the highest quality disease-free layings (dfls, also known as silkworm seeds) available and were careful to maintain hygienic conditions in the silkworm rearing centers. The local silkworm eggs produced from the diseased cocoon crop of 1996 were kept separate from egg sheets purchased from the CSB and other suppliers to reduce the risk of spreading silkworm diseases.

Monitoring Resource Sustainability In 1997, the project conducted biological monitoring activities to determine sustainable harvesting rates for three species of tasar oak (*Quercus semicarpifolia*, *Q. himalayana*, and *Q. incana*). But the findings were not conclusive. A project team concluded that the *Q. semicarpifolia* oak variety was not regenerating enough in the project area due to indiscriminate breaking of branches for fodder and trampling of seedlings by livestock. The team developed a conservation awareness program to educate villagers to change their practices.

Selected Sources for Further Information

- Biodiversity Conservation Network. 1996. Annual Report: Stories from the Field and Lessons Learned. Washington, DC: World Wildlife Fund.

Indonesia Resins, Bamboo, and Rattan Project

January 1996 - December 1998

Project Overview

The purpose of this project was to develop environmentally sustainable livelihoods for people living in a designated Participatory Forest Management Area (PFMA) in West Kalimantan (Borneo). In 1990, the Indonesian Department of Forestry began a 10-year Social Forestry Development Project (SFDP) that established a community-based forest concession in the area. Over 17,000 people live in the 102,000 ha forest concession. This area is notable for having many rare or endemic species of wildlife threatened by hunting and habitat loss, including orangutans, flying lemurs, tarsiers, and hornbills.

EnterpriseWorks and the partner organizations identified opportunities for giving PFMA residents an economic incentive for woodland conservation through sustainable use of forest resources. Two enterprise activities were selected—collection and processing of tree resins and the harvesting of bamboo and rattan for weaving mats for handbags and other handicrafts. Prior to this project, rattan and bamboo from the PFMA were not commercially traded, but were made into traditional household tools and woven items.

The project focused on two types of resins from *Dipterocarp* trees. Known locally as damar and copal, these resins were traditionally burned for light in Indonesia. They are now used in industrial production of paint, varnish, perfumes, and boat sealants. The resins can either be harvested from the forest floor or the tree can be tapped for the liquid sap. Originally, the bamboo and rattan were to be woven into mats and then sold to a private company in Jakarta for fabrication into handbags. The project's activities included market research, business planning and technical assistance for processing enterprises, training the natural product collectors to harvest a sustainable quantity of the resources and avoid undesirable environmental impacts, and establishment of systems for monitoring the harvested resources.

Project Partners

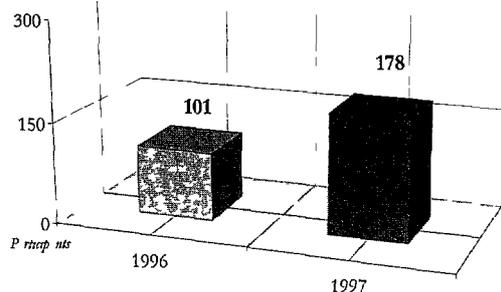
- Yayasan Dian Tama (YDT) - Prime Light Foundation [Indonesia]
- PT Piluss - Piluss Ltd Co [Indonesia]
- PD Dian Niaga - Light Trade Trading Co [Indonesia]
- Social Forestry Development Project (SFDP) [Indonesia]
- Lembaga Pengelolaan Kawasan Hutan Partisipatif (LPKHP - Participatory Forest Management Institution) [Indonesia]

Funder

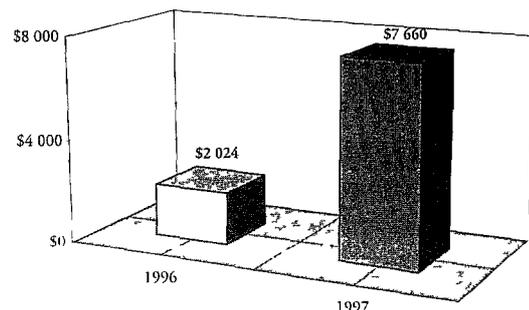
- Biodiversity Conservation Network (BCN)

Budget \$466,249, Expended 49%

Economic Participants



Cumulative Total Monetary Benefits



Objectives and Targets

- Harvest process and market resins bamboo and rattan sustainably through village level enterprises develop the local capacity to conduct biological and socioeconomic monitoring and encourage national and local policies and mechanisms for sustainable extraction of selected natural products
- The targets for 1997 were production of 6 000 handbags by PT Piluss collection of 25 tons of resin per month and conducting 3 training sessions to help the 200 mat weaving families improve the quality of their product



Basket weavers in West Kalimantan, Indonesia

Accomplishments

Training and Technical Assistance In 1997, 251 villagers in eleven villages received training in rattan basket weaving, 28 resin collectors were trained to use more sustainable tapping techniques, and 12 people trained to do biological monitoring of the harvested resources. Training also focused on raw material selection, the use of molds in handbag production, sustainable harvesting of rattan and bamboo, and business management. The project completed an inventory of the natural resource base and resource monitors measured the growth and yields of bamboo, rattan, and resins.

Resin Collection and Processing In 1996, 23 tons of solid resin were collected, graded, sorted, and washed by villagers living in the project area. In late 1997, 18 of the 23 tons of damar resin in inventory from the previous year were sold for a total of \$1,882. Processed resin sales were delayed because the permit required for taking them out of the PFMA was not obtained until September, 1997. Prices for resin vary by grade, which corresponds to the color.

Resource Management No resin tapping was done in 1997 since the SFDP did not want to authorize the extraction of more resin until the PFMA cooperative was officially established.

Handbag Production In 1997, 178 producers were involved in bamboo and rattan processing and marketing. The weavers produced 1 870 mats and grossed over \$3 200 from their sales. The handbag enterprise identified target markets, purchased handbag finishing equipment, and trained workers. However, the economic turmoil in Indonesia in 1997 caused the domestic market for handbags to collapse and Japanese buyers were not satisfied with the quality and available quantity. As a result, the handbag producer stopped using the mats and it did not buy any from weavers in 1997. Other markets for the mats were found since handicraft producers used them for tissue holders, folders, and placemats.

Challenges

Balancing Production with Sustainable Harvesting The project tried to ensure sustainable extraction rates for resins, bamboo, and rattan, but there is still uncertainty about the growth and regeneration rates of these resources. It will take at least 1-2 years of additional biological monitoring to estimate the future resource supply more accurately. In particular, there are concerns about rattan supply.

Production Levels The handbag business faced problems due to the low mat production capacity, quality control in handbag assembly, and non-uniformity of the mat designs

Regulatory Delays It took over a year to obtain a one-time permit from the SFDP for selling the resins collected in 1996 to buyers outside of the PFMA. The resin inventory was sold in 1997, but new resin collection was suspended because the SFDP did not want to approve further sales until the resin collectors were organized into an officially registered cooperative

Political Instability and Forest Fires The deteriorating political situation and severe forest fires in Indonesia disrupted project activities. Smoke from the fires restricted travel, curfews and ethnic conflicts in West Kalimantan slowed outreach, and the local currency depreciation made it more costly and difficult to purchase the imported materials for handbag production

Lessons Learned

Assessment of the Natural Resource Base and Policies Natural product resource availability and government policies and regulations for natural product collection and extraction should be thoroughly investigated early in the process of identifying enterprise opportunities and business planning

Creation of a Marketing Company YDT established a for-profit marketing company, PD Dian Naga. This organizational structure can be important in encouraging an entrepreneurial spirit

Environmental Benefits As a result of the new opportunities for earning income from mat weaving, some of the producers have stopped using unsustainable slash and burn agricultural techniques. Also, prior to the project wild rattan was collected from the forests, but no one planted rattan. Now, in some areas such as Terusan, villagers have planted rattan that will be ready for harvesting in 7 years

Selected Sources for Further Information

- Biodiversity Conservation Network 1996 Annual Report: Stories from the Field and Lessons Learned Washington, DC World Wildlife Fund

Nepal Essential Oils Project

January 1995 - January 1999

Project Overview

This project was designed to test the hypothesis that natural product collectors can manage common-property resources in a sustainable manner if they have a long-term economic incentive to do so. The project purpose was to establish local processing facilities, simple resource monitoring systems, and strengthen community-based institutions. The principal product is an oil extracted from the roots of jatamansi through steam distillation. Also known as spikenard, jatamansi (*Nardostachys grandiflora*) is a perennial in the Valerianaceae family. Jatamansi oil is used in cosmetic and pharmaceutical products. The processing facilities will diversify production to include essential oils from other plant products such as juniper berries, sugandhawal (*Valeriana jatamansi*), and sunpati (*Rhododendron anthopogen*). The distillation process also produces a byproduct called marc (the solid residue left after distillation).

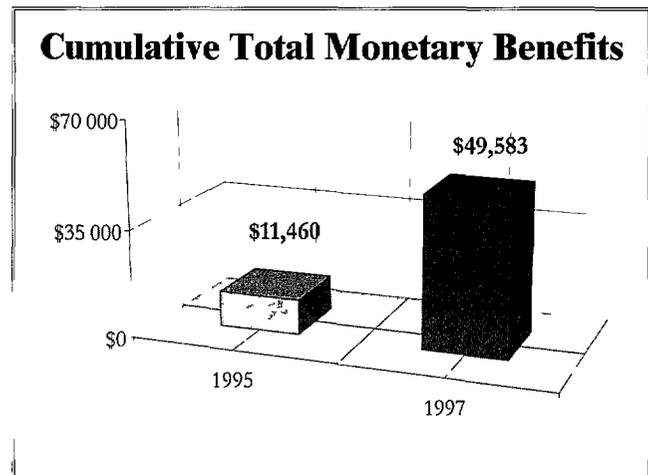
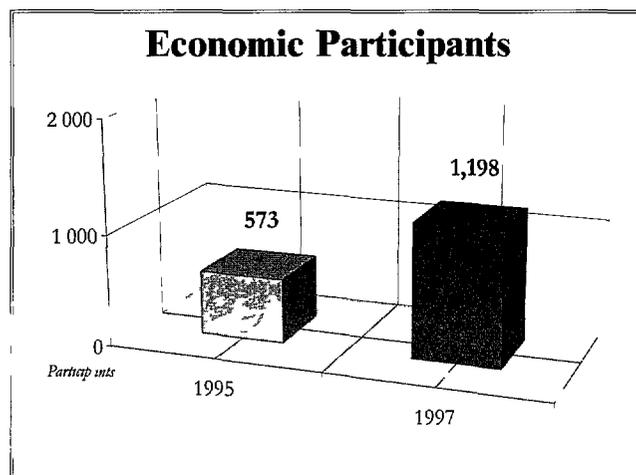
Project Partners

- Asia Network for Small-Scale Agricultural Bioresources (ANSAB)
- Humla Conservation Development Association (HCDA)

Funder

- Biodiversity Conservation Network (BCN)

Budget \$825,085, Expended 78%



Objectives and Targets

- Develop local capacity for management of common-property resources by village and district institutions, sustainable harvesting, processing, and marketing of the products while conserving biodiversity, simple, applied biological research and monitoring of the impact on biodiversity, and implementing an educational program to build a conservation ethic

Accomplishments

Establishment of Processing Plants The project has established two processing facilities in Rodikot and Kurilla. Both factories produced jatamansi oil, juniper oil, valerian oil (Valeriana jatamansi), anethogen oil (Rhododendron anethogen), and marc. Each factory employs 5 workers.

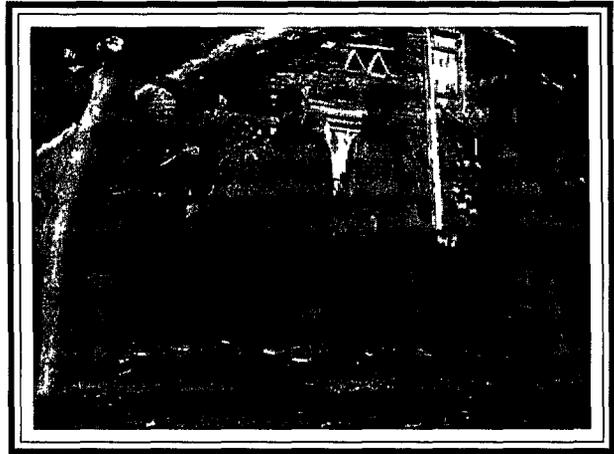
Company Established Humla Oil, the company established by the project, is owned by HCDA and Community Forest User Groups (CFUGs). In 1997, the company retained its previous relationships with buyers and developed new domestic and international market linkages.

Marketing and Sales The majority of Humla Oil's products were purchased by brokers for the Indian market. Smaller quantities were shipped to an exclusive distributor in North America — Phoenix Aroma & Essential Oils, Inc. Cumulative 1997 sales were over \$24,000 for dried jatamansi root, jatamansi oil, and marc. Approximately 198 kg of jatamansi oil were sold to European buyers, generating over \$20,000.

Monitoring Completed Biological monitoring teams completed their inventory and regeneration studies in the project area for commercially utilized plant species, primarily jatamansi, and to a lesser extent juniper, sunpati, and katuki (a medicinal plant).

Local Control Over Forest Management Communities in the project are becoming aware of the benefits of receiving forest management responsibilities from the national government — the ability to retain royalty payments on products harvested from community forests. Otherwise, the national government would receive these royalties. The transfer process requires community groups to 1) prepare a constitution, 2) map the area, and 3) prepare a management plan. In 1997, one community received royalty payments for the forest products collected from their lands. As word spread, HCDA received many requests from other villages for help in establishing community-owned forests, and this helped improve the organization's profile in Humla. HCDA has added another forester in Humla to assist communities with this process.

Literacy Classes In 1997, the project conducted basic literacy classes in the project area and produced conservation education materials.



Villagers weighing jatamansi roots collected in the remote Humla District of Nepal

Challenges

Quality Control The greatest challenge faced by Humla Oil has been ensuring that suppliers provided raw materials that meet its specifications. Humla Oil had set requirements for raw material acceptance (minimal debris mixed with the raw materials), but the buyer at one of the processing plants was pressured into accepting substandard material.

Lessons Learned

Institute Quality Control Measures Quality control standards should be established and applied strictly for raw material purchases. Plant workers and community groups should receive training on the quality specifications.

Resource Encroachment HCDA warned the community that Humla Oil would not purchase plant products from one community unless the encroachment on another community's forests stopped. The company instituted new internal management and purchasing practices to help prevent this problem from recurring.

Selected Sources for Further Information

- Biodiversity Conservation Network 1996 Annual Report: Stories from the Field and Lessons Learned
Washington, DC: World Wildlife Fund

Philippines Rattan Project

June 1994 - December 1998

Project Overview

EnterpriseWorks is helping partner organizations scale-up and improve services for small-scale producers of rattan and other natural forest products (NPs). Rattan refers to various species of climbing forest palms that have long, slender, tough stems. One of the most valuable forest products exported from Asia, rattan is used to make furniture, handicrafts, baskets, traps, cordage, food dyes, cloth, twine and medicine. In 1994, the rattan industry in the Philippines employed 115,000 workers and generated \$275 million in annual revenues. This activity is one component of a project providing business development services for small-scale coconut processors and other natural product producers (see Philippine Coir Project). The project has also assisted producers of abaca fiber, handicrafts, cut flowers, and wild honey.

Project Partners

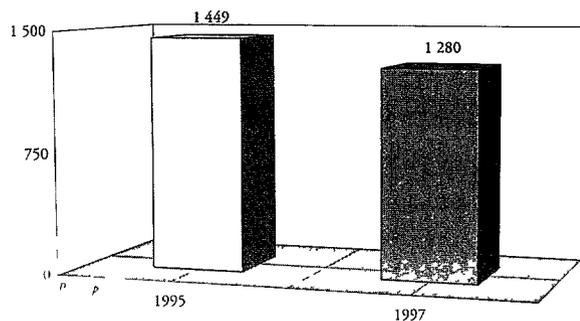
- ATI/Philippines (ATI/P)
- Sugbu Rattan Workers Cooperative, Inc (SRWCI) [Philippines]
- Nagkakaisang mga Tribu ng Palawan (NATRIPAL - United Tribes of Palawan) [Philippines]
- Upland NGO Assistance Committee (UNAC/PBSP Upland Marketing Program) [Philippines]
- Technology and Livelihood Resource Center (TLRC) [Philippines]
- Fr Vincent Cullen Tulungan Learning Development Center (FVCTLDC) [USA] [Philippines]

Funders

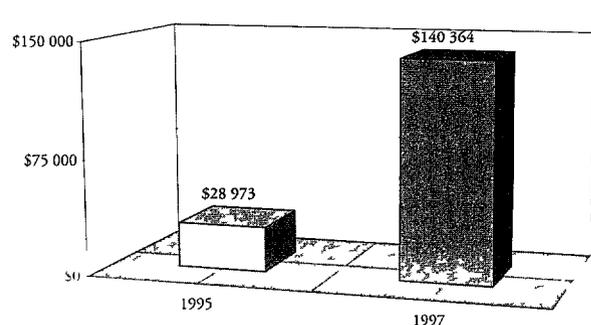
- Ford Foundation [USA]
- Small Enterprise Education and Promotion Network (SEEP) [USA]
- Food and Agriculture Organization of the United Nations (FAO)

Budget \$128,700, Expended 73%

Economic Participants

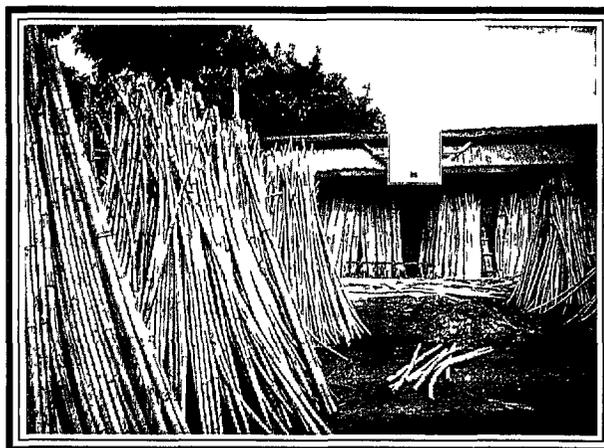


Cumulative Total Monetary Benefits



Objectives and Targets

- Strengthen the enterprise management capabilities of rattan gatherers and processors through organizational management and technical services
- Create national awareness of the needs of small-scale rattan gatherers and processors by establishing networks and linkages among rattan producers, processors, markets, and public sector agencies
- Leverage financing for small-scale rattan enterprises



Rattan collected for processing in the Philippines

Accomplishments

Technical and Managerial Assistance In 1997, ATI/P provided technical and managerial support to the Sugbu Rattan Workers Cooperative Inc (SRWCI) a furniture manufacturer in Cebu. This support included business management assistance, development of business plans for expansion, sourcing of working capital, and marketing. In response to the increasing demand from foreign buyers and changing market conditions, SWRCI was able to increase its production during the year by 33% through improved budgeting, greater efficiency of operations, and better scheduling of production.

ATI/P has also contacted seven other groups representing approximately 50,000 rattan collectors and processors and found strong interest in receiving business development services. In particular, groups expressed a need for management assistance which had been lacking in prior governmental projects. In 1997, three of these groups received assistance from ATI/P.

National Rattan Conferences ATI/P co-sponsored rattan producer conferences with UNAC/PBSP in 1995 and 1996 to help small-scale producers establish linkages with organizations and companies.

Other Natural Products Enterprises Women's Access Inc (WAI) a network of community groups in the Benguet Province on Northern Luzon represents 10,000 collectors and processors of dried and cut flowers, wild honey, and handicrafts. ATI/P is assisting WAI in enterprise development so that it can generate enterprise opportunities for its members even after its association with this project has ended.

In 1997, ATI/P began a new partnership with the FVCTLDC, an NGO that assists the Higanon tribe in Northern Mindanao in abaca handicraft manufacturing. Abaca is a plant in the banana family that produces a fiber that can be processed into Manila hemp. ATI/P will help this group improve its management capability, set prices for its products, and track the socio-economic impact of its services.

The EDU of NATRIPAL plans to work with other natural products besides rattan since rattan processors are dealing directly with buyers on their own. NATRIPAL sees a need to diversify products for sustainability of wild rattan resources. Other natural products under consideration are honey, almaciga resin, and bamboo handicrafts.

Challenges

Sustainability of Forest Services Other factors such as logging and conversion of forest land to agriculture place continuing pressures on forest resources. It remains to be seen whether rattan can be harvested sustainably.

Lessons Learned

Provide Appropriate Services Rattan collectors and processors often need assistance to improve business management and record keeping. This assistance has to be provided in a culturally appropriate manner that allows the enterprise to compare its performance with other similar enterprises and meet the requirements of funding agencies, lending institutions, and potential investors.

Screening Criteria ATI/P has found it important to develop criteria for screening groups requesting assistance and tailoring assistance to the needs of each organization.

Selected Sources for Further Information

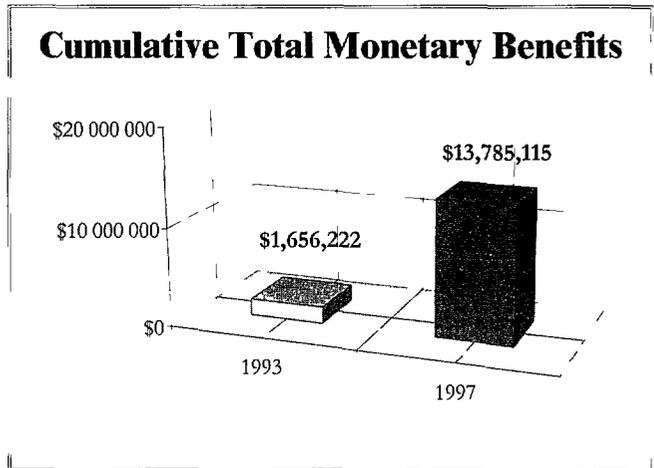
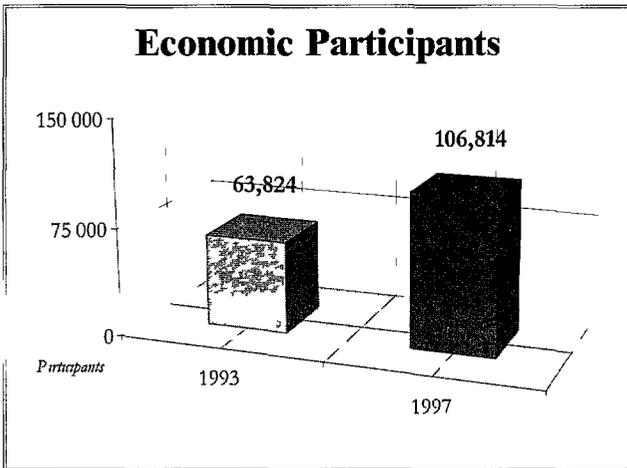
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- Kilmer, Gary, et al 1994 Rattan Processing in the Philippines: An Analysis of the Subsector Washington, DC: Appropriate Technology International
- Koontz, Ann 1996 "Business Planning for Business Development Services", in Moving Forward: Tools for Sustainability and Expansion, edited by Elaine Edgecomb, Candace Nelson, and Julie Redfern. PACT Publications for the SEEP Network
- Hyman, Eric 1997 "Subsector Analysis: Theory into Practice," Appropriate Technology 24, No. 1: 9-11



Oilseeds and Staple Foods

Oilseeds and Staple Foods

Cumulative total monetary benefits and the number of economic participants from 1993 through 1997



The Gambia Oils Project (CRS)

January 1995 - December 1997

Project Overview

This pilot project was designed to boost women's income through small-scale service pressing of sesame seed and improve the food security of women and children through greater consumption of the edible oil produced and other foods purchased with the increased income. The project was implemented by Catholic Relief Services (CRS) with initial technical support from EnterpriseWorks. Prior to this project, CRS had promoted sesame cultivation for export and local processing in motorized expellers. Expellers have a much higher capital cost than the ram press as well as high operating costs for diesel fuel, repairs and maintenance. Because of the capital cost, expellers could not be located in every village so users had to travel farther to reach them. In recent years, low export demand for Gambian sesame seed resulted in large stocks of unsold seed for the women's groups. CRS became interested in village installations of the ram press as a way of increasing the accessibility of sesame processing services. Researchers from Virginia Polytechnic Institute assessed the impact of the press on the nutrition of women and children.

Project Partners

- Catholic Relief Services (CRS)
- Virginia Polytechnic Institute, Department of Human Nutrition, Food and Exercise (VPI)

Funders

- USAID/Gambia
- Thrasher Foundation

Budget \$172,214, Expended 100%

Accomplishments

Prior Experience with Oilseed Processing A decade ago, CRS began providing diesel expellers in the Gambia. A total of 15 were installed and they were managed by a Sesame Growers' Association. At the peak of sesame cultivation, 56,000 women grew this crop, but the amount of sesame produced declined as the expellers broke down and were not repaired. Many sesame producers were too far from an expeller to use it on a regular basis.

Ram Press Establishment In 1996, an ATI/Senegal technician trained some Gambians in ram press production and 40 presses were placed in 32 villages by the end of the year. The ram press locations were chosen by the Sesame Growers' Association on the basis of sesame production, distance from operating expellers, and village management capacity. The project trained women to operate and maintain the press, and monitor seed throughput and oil production.

Nutritional Impact VPI conducted a 15-month nutritional study with 80 families from the 32 villages with ram presses and a control group of 40 families in villages that lacked a ram press or an expeller, but were within the service area of an expeller. The study was based on reported food consumption and measurements of body weight and growth. Over 70% of the sesame oil produced in the ram press was reportedly used for the processing households' own consumption. Households in villages with a ram press consumed 44% more oil than the control group in the second pressing season of the year, and 25% more in the subsequent lean season before the next harvest. Before introduction of the ram press, children in villages that were relatively far from an expeller only consumed 54% of the food calories recommended by the United Nations Food and Agriculture Organization compared to 71% for the control group children. Subsequently, children in villages with a ram press consumed

119 more calories per day than those in the control group during the worst of the lean season. Food consumption continued to be higher for children in villages with a ram press throughout the study period.

Women's Groups Strengthened Women were already organized into sesame farmer groups when the project began. However, money earned from the ram press user fees went to the local village group instead of the National Sesame Growers Association, providing an additional incentive for growing more sesame and increasing the cohesiveness of the village groups.

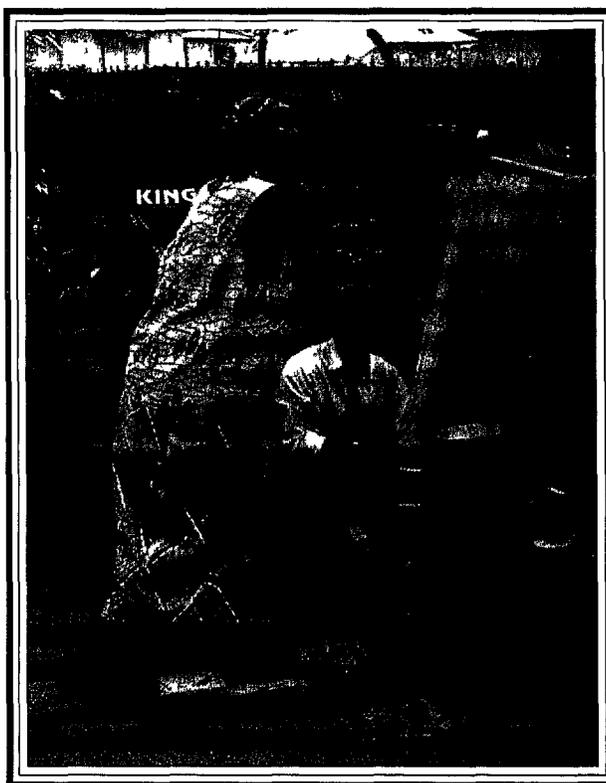
Challenges

Political Risks When the democratically elected government of the Gambia was overthrown, USAID suspended new financial aid in the country, precluding EnterpriseWorks from using its USAID Cooperative Agreement funding to provide further technical assistance to CRS.

Lack of Sufficient Resources The project did not have sufficient resources to expand beyond the initial 40 ram presses. CRS staff and government agricultural extension agents involved in the project were already busy with other tasks.

Weight of the Press Although women often complained about the exertion required to operate the ram press, 60% of the women in villages without a motorized expeller still preferred using the local ram press due to its convenience, transport cost savings, lower use fees, and ability to defer payment through an informal credit system.

Choice of Sesame Varieties for Planting Brown or white varieties of sesame can be processed in the ram press, but only the unprocessed white seeds have a good export market potential. A preliminary analysis indicated that a woman could get roughly equal returns from growing brown or white sesame because of the higher transport costs for selling white seed to export buyers and the extra value added in processing brown seed into oil.



Gambian woman processing sesame seed with the ram press

Lessons Learned

Quality Control About 28% of the ram presses made in the Gambia had quality control problems due to poor welding. This problem could be solved by further technical assistance for manufacturers, a stronger quality control role by CRS staff, or importation of presses from Tanzania or Zimbabwe.

Technical Assistance for Press Users Service press users do not always follow the recommended practices for preprocessing and pressing sesame. The oil extraction rate from sesame can be increased by heating the seed over a fire for 5 minutes before processing or letting them dry in the sun for a half hour. The oil yield also depends on proper adjustment and operation of the presses. The Sesame Growers Association provide follow-up training to press users.

Selected Sources for Further Information

- Jawneh, Alhaji, et al 1996 A Report on the First Season of Sesame Pressing Using the Ram Press with Women-Led Monitoring Banjul, the Gambia Catholic Relief Services
- Silva-Barbeau, Irma, et al 1997 "The Direct and Indirect Impacts of Sesame Oil Production on the Nutritional Security of Women and Children The Experience with Women-Led Monitoring of a Ram Press Technology in the Gambia Paper presented at the 16th International Congress of Nutrition, Montreal, July 27-August 1, 1997
- Prehm, Marilyn and Irma Silva-Barbeau 1996 Annual Report for the Small-Scale Sesame Oil Production A Means to Improved Child Nutrition Security Project Blacksburg, VA Virginia Polytechnic Institute

Mali Oils Project

January 1996 - September 2002

Project Overview

The oilseed processing component of the Mali Technology Transfer Project began in late 1995. Through this component, the project will train manufacturers to produce and market the ram press, primarily for processing sesame seed. The model being promoted is the large Bielenberg press (50-mm piston diameter) which has greater capacity and higher cost than the models EnterpriseWorks is currently promoting in East and Southern Africa. In Mali, the ram press is marketed under the brand name "Gneleni", for a clever, hard working female character from Malian folklore. Although sesame cultivation was previously widespread in Mali as a condiment in cooking and an export crop, currently the domestic oilseed processing industry is based on cottonseed.

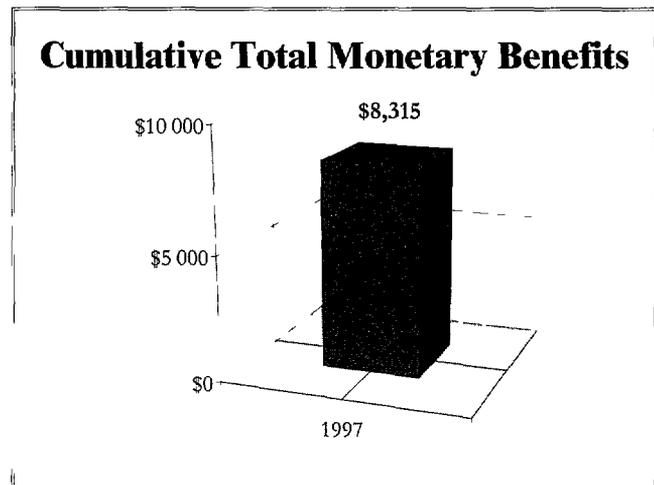
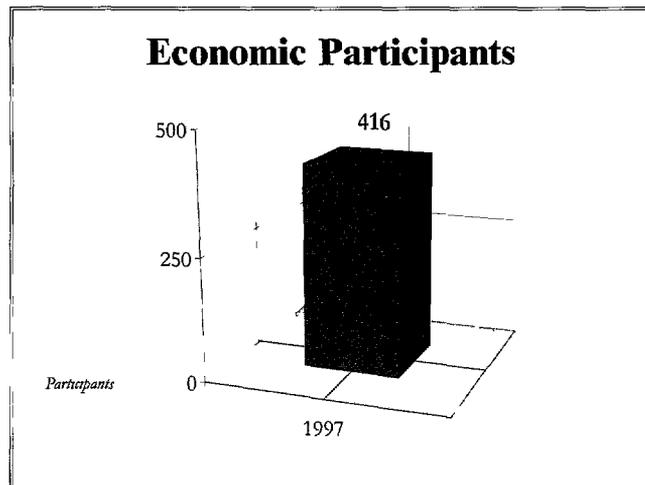
Project Partner

- ATI/Mali
- Natugo (Self-Help)

Funder

- USAID/Mali

Budget \$1,280,630, Expended 20%



Objectives and Targets

- The 1997 sales target was 66 ram presses
- Two new press manufacturers were to be trained in Northern Mali around Mopti and San

Accomplishments

Sales Forty eight presses were sold in 1997 close to three quarters of the year's target. A total of 64 presses have been sold to date. Sales in the new project zones in the North fell short of expectations due to insufficient pressing seed supply and an underdeveloped market for sesame oil. Approximately \$7 000 worth of sesame and jatropha oil was produced in 1997. Jatropha oil is used in soap making and can also be used as a substitute for diesel fuel in motorized grain mills (see Senegal Jatropha Project).

Northward Expansion In 1997 the project continued promoting the ram press in Koulikoro and expanded to Mopti and San. One new manufacturer was trained near Mopti.

Seed Distribution In 1997, the project distributed more than one metric ton of planting seed to farmers in zones with a relatively good potential for sesame cultivation in order to increase the supply of pressing seed and reduce its price (which was higher in this region than elsewhere in Mali because of sesame exports to neighboring Burkina Faso). In Central and Southern Mali, sesame seed prices were low enough to make processing profitable.



Pressing sesame seed into cooking oil

Challenges

Better Project Siting Needed Due to insufficient rainfall the sesame crop around Mopti was extremely poor in 1997. Press owners in this zone could not obtain affordable pressing seed and many of the presses there were idle as a result. Even in a normal rainfall year sesame is a marginal crop in Mopti. The San and Koulikoro regions are better suited to oilseed cultivation but San's proximity to the border also made it difficult to buy pressing seed there.

Production Costs In 1996 a buyer from nearby Burkina Faso encouraged farmers in the San region to grow more sesame by promising a good specific purchase price. However the export purchases did not materialize. As a result farmers could not sell sesame at a favorable price that year and they then planted less sesame in 1997. Export buyers did purchase sizable amounts of sesame in 1997 boosting the price of pressing seed and reducing its availability for ram press owners. Press owners in San who brought the higher-priced pressing seed had difficulty selling the oil at a sufficient profit in 1997. This problem may continue to be an obstacle to press promotion in this region.

Local Market for Oil Not Well Developed Sesame oil remains an unfamiliar product in all 3 of the project zones. Sesame oil from the ram press sold at a higher price than refined cottonseed oil, because it was perceived to be a better tasting product by the minority of rural households in Mali willing to pay a higher price for cooking oil. Sesame oil sold well in some villages but not in others nearby either due to the higher cost or newness of the product. Most of the oil sold to date has gone to specialty markets in Bamako or to educated professionals in larger secondary towns. The project plans to expand efforts in marketing sesame oil including a radio campaign promoting sesame oil consumption and directing potential buyers to ram press owners.

Lessons Learned

Solving Pressing Seed Supply Constraints EnterpriseWorks oilseed processing projects in East and Southern Africa have found that it is necessary to promote cultivation of suitable types and varieties of oilseeds before marketing the press. In Mali, more efforts are needed to promote sesame cultivation and help producers market oil. Although a technology may be suitable for one country or a region within the country, a geographic analysis is needed before deciding to promote it in other areas.

Mozambique Oils Project (CARE)

October 1994 - March 1998

Project Overview

This project implemented by CARE with EnterpriseWorks technical assistance is a replication of our projects in Tanzania, Uganda, and Zimbabwe. The purpose of the project was to increase the incomes of smallholder oilseed farmers and ram press owners in Nampula Province and make low-cost cooking oil available to rural consumers. A key difference between this project and the others was its initial emphasis on importing ram presses from Zimbabwe rather than establishing local manufacturing in Mozambique. The feasibility of local manufacturing was to be explored later after the effective demand for ram presses had been demonstrated. The project was expected to provide agricultural extension services for oilseed cultivation, increase production and distribution of certified planting seed, and sell ram presses.

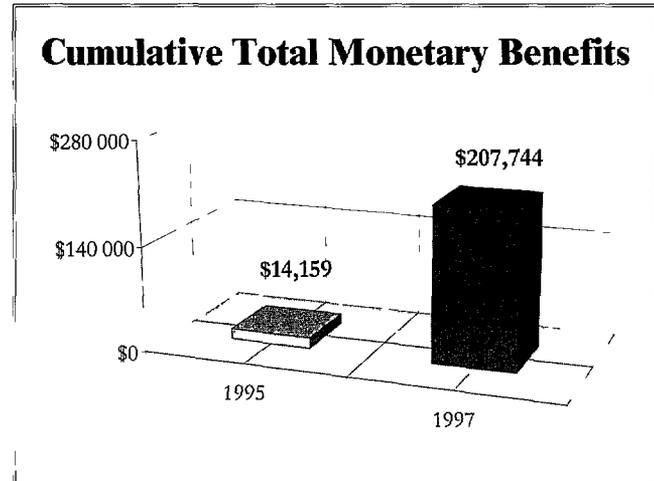
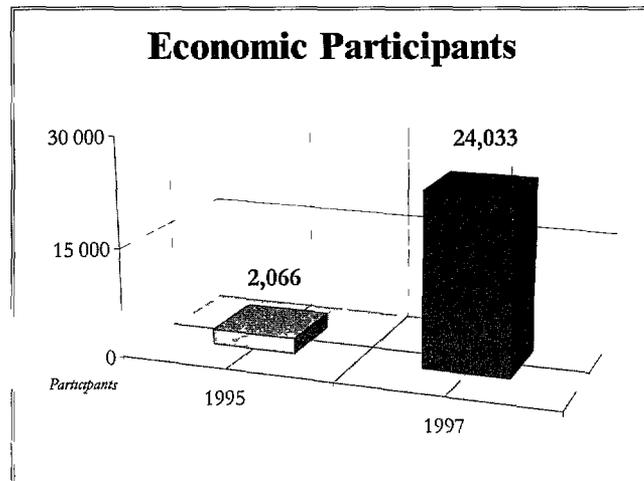
Project Partner

- CARE/Mozambique

Funder

- CARE/Mozambique
- USAID/Mozambique

Budget \$242,914, Expended Incomplete Data



Objectives and Targets

- The project's objectives were to increase sunflower and sesame seed production,
- Develop a market for oilseeds through the creation of oil pressing microenterprises,
- Create a local facility for producing sunflower and sesame planting seed that maintains the genetic characteristics of the varieties,
- Support other organizations working in the oilseed subsector, and,
- Eventually transfer activities to the private sector,
- The target for ram press sales was 400 by the year 2001

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Accomplishments

Outreach By late 1997 the project had reached 147 communities in eight districts of Nampula province. Project activities included seed multiplication and distribution, encouraging farmers to plant sunflower and sesame and providing them with extension services, importing presses from Zimbabwe, training a manufacturer in Mozambique to make the press, press distribution and sales, and ensuring the availability of spare parts.

Oilseed Production and Distribution To increase the availability of suitable types of planting seed, the project worked with district stores and government agencies, parastatals, and other NGOs that promote oilseed cultivation. It also encouraged press owners to grow their own oilseeds and contract with other local farmers to augment their pressing seed supplies. For the 1996/97 planting season, the project sold 15 tonnes of sunflower seed and 2.5 tonnes of sesame seed at a subsidized price. In 1997, nearly 15,500 farm households grew sunflower and 1,000 grew sesame. It was estimated that 37% of the sunflower growers were women.

Profitability of Oilseed Cultivation The average production of oilseeds per farm household was 150 kg, which brought in \$26 in additional cash income per year. CARE produced a financial analysis comparing cultivation of oilseeds with other crops. Per hectare, sunflower was the second most profitable crop for smallholders, after cotton. Sesame was less profitable than sunflower but much more profitable than maize and groundnuts. More than 80% of the sunflower seed production was sold directly to enterprises with ram presses.

Ram Press Sales In 1997, the project distributed 207 presses to a private sector wholesaler in Nampula who placed them on consignment with retailers in various parts of the province. Through September of 1997, 67 of these presses had been sold for a cumulative total of 171. All of the presses sold in time for the 1997 oilseed processing season were the BP-30 model imported from Zimbabwe. This was the first year that Agro-Alfa in Maputo, Mozambique manufactured ram presses but it did not deliver presses to the project area before the 1997 pressing season began. Agro-Alfa produced the Appro-TEC/Kenya model.

CARE/Mozambique set the retail prices for the ram presses. The price of the BP-30 press sold on credit was \$281 including an 8% commission for the wholesalers. The retail price was lower for cash sales. CARE will be re-examining the price structure in 1998 so that the private sector has a sufficient profit incentive while the press remains affordable for buyers.

Credit In 1997 CARE provided credit to 59 of the 67 ram press buyers. The loans were administered through the district stores which paid the wholesalers in installments as the repayments were received. About 47% of the borrowers were late in making loan repayments as of the end of November of 1997, but none of them were seriously in arrears.

Oilseed Processing There were 157 operating ram presses in 1997 since 14 were temporarily out of use. Twenty-six percent of the households producing oilseeds were service press customers and they produced an average of 22 liters of oil. The oilseed pressing season in Nampula lasts about 7 months. Only 9% of the oilseed growers produced oil solely for their own household consumption. Nearly 89% of the seed processed was the Black Record variety, an open-pollinated, soft-shelled sunflower with a relatively high oil content of around 40 percent. Another 7% of the throughput consisted of hard-shelled sunflower varieties and 4% was sesame. It takes about 4.0 kg of Black Record to yield about 1 liter of oil while it would take 6.4 kg of hard-shelled sunflower seed varieties (such as Peredovic or Saona).

Income Gains Including service pressing, these enterprises produced nearly 109,000 liters of oil with a market value of over \$142,000. About 90% of the oil produced was sold immediately and almost all of it was consumed in rural areas. About 65% of the seedcake was sold and revenues from seedcake sales amounted to \$5,700. CARE estimated that the cost of a ram press could be recouped in less than 2 months of oilseed processing, which is impressive for a machine with a 3 to 5 year expected life.

Challenges

War-Damaged Infrastructure This project faced a special challenge because of the magnitude of refugee resettlement, economic dislocation, and infrastructure destruction left in the wake of some 18 years of war in Mozambique. The project did not begin until political stability was achieved and supplies of imported food aid oil had been cleared from the market. Livestock populations remained well below previous levels, reducing the demand for oilseed cake as an animal feed.

Pressing Seed Supply After the main harvest season, the price of the seed increases and it becomes harder to find. Most press owners lack the working capital needed to buy a full pressing season's worth of oilseeds right after the harvest when the price is lowest and availability is greatest. The cost of buying, transporting, and storing pressing seed is a problem for many press owners at first. Once they accumulate some capital by selling cooking oil, this becomes less of a problem.

Lessons Learned

Importance of Demonstrating New Technology Bringing presses to villages to demonstrate their potential proved very important in stimulating sales.

Credit as a Critical Factor in Ram Press Adoption The availability of credit helped convince entrepreneurs and smallholders to adopt the new technology.

Selection of Project Areas Oilseed production and processing took root most readily in areas where cash crops such as cotton and tobacco were commonly grown.

Selected Sources for Further Information

- CARE/Mozambique 1997 Results Report Viable Initiatives for the Development of Agriculture (VIDA), October 1996 to September 1997. Maputo: CARE/Mozambique.
- Laker-Ojok, Gimoro and Robert Strauss 1996 Oil Press Enterprises in Nampula (OPEN), Evaluation of Phase I. Nampula: CARE and EnterpriseWorks Worldwide.

Senegal Oils Project: Jatropha

April 1995 - December 1998

Project Overview

This pre-impact research project was designed to assess the feasibility of using oil extracted from the seeds of *Jatropha curcas* — the physic nut (pourghere in French and pinnoncillo in Spanish) — as a diesel fuel substitute in small motorized grain mills and village electric generators. *Jatropha* is a tall perennial Euphorbia shrub planted throughout the tropics as a living fence or windbreak around farm fields. The project was also to encourage *jatropha* planting and harvesting, build and test a prototype motorized expeller for extraction of the oil, and conduct trials of the seedcake as fertilizer.

Project Partner

- ATI/Senegal

Funder

- Biomass Users Network

Budget \$86,989, Expended 80%

Objectives and Targets

- Assess the feasibility of substituting *jatropha* oil for diesel fuel in village grain mills,
- Demonstrate the use of low-cost, Indian diesel engines to reduce the cost of motive power,
- Demonstrate other applications of *jatropha* oil in village electrification and motorized expeller extraction of *jatropha* and edible oils,
- Test the use of *jatropha* oil as an automobile fuel

Accomplishments

Technology Adaptation In mid-1997, ATI/Senegal technicians began endurance testing of a diesel-powered grain mill fueled by *jatropha curcas* oil. Project technicians also modified a Lister engine from India to operate on *jatropha* oil to test its durability in villages where there is a strong demand for grain milling. A third engine will be modified for use in a village electric generator.

Jatropha Planted In 1997, ATI/Senegal contracted with two nurseries to produce a total of 10,000 *jatropha* seedlings, and distribute them to local farmers free of charge. Approximately 15,000 of the shrubs were planted at a unit cost to the project of \$ 08. ATI/Senegal purchased nearly six tons of *jatropha* seed from village groups, processed it in the ram press, and used the oil for engine testing and soap making. Approximately 1,000 liters of oil were produced from this seed and at \$ 50/liter. The project identified villages where there were already significant plantings of *jatropha* and there might be interest in extracting *jatropha* oil for diesel fuel substitution.

Soap Production Although not one of the original objectives, the project initiated small-scale soap production from *jatropha* oil in several locations. Using *jatropha* oil for a significant share of the rural demand for soap would require a vast increase in cultivation of this shrub. While production of soap from the oil was profitable, it was valued less than its use as a diesel fuel substitute. Because *jatropha* is planted as a windbreak protecting other

crops and given the amount of uncultivated land available in Senegal, jatropha could be grown without significantly reducing production of other crops



Nursery owner Bave Fall growing jatropha seedlings for sale to other farmers. Fall remembers when jatropha was the principal hedgerow plant in Senegal

Challenges

Multiple Tasks and Funding Progress was slowed by time constraints of the ATI/Senegal staff already busy with multiple activities in the Market Gardening and Household Energy Projects. It was also hindered by the small amount of available funding for the Jatropha component, and slow progress in obtaining additional donor funding.

Poor Quality Seed Project staff were unable to extract much oil from several hundred kilograms of jatropha seed purchased by ATI/Senegal. Possible reasons for the low oil content of this seed include the harvesting of immature seed, pest damage, and sale of old seed harvested the year before and kept under poor storage conditions. The age of the plant and soil conditions may also affect the oil content, but these factors have not yet been studied systematically. To retain the seeds' oil content, farmers need to allow the seed to mature and then remove it from the fruit before drying (which takes more labor time).

Lessons Learned

Economics of Pressing Seed The economics of using jatropha oil for soap or a diesel fuel substitute depend on the quality of seed pressed. Fair quality seed yields only half as much oil as the best quality seed, but requires as much labor to press. Processing jatropha in the CAPU press for diesel fuel substitution only proved profitable when at least 1 liter of filtered oil (obtained from 4 kg of the seed) cost \$0.10/kg or less. With an extraction rate of 1 liter of oil per 5 kg of seed, jatropha processing was only profitable when the seed cost no more than \$0.08 a kilogram.

Both of these calculations were based on a cost of \$0.05/kg of seed for labor, ram press depreciation and repairs, and a value of \$0.03/kg for the byproduct seedcake.

Larger Ram Press Models May be Best Suited to Jatropha Extraction The ram press model with a 50-mm piston diameter may be better suited to jatropha oil extraction than the smaller models preferred by many small-scale edible oil processors. Nevertheless, the CAPU press which has a 40-mm diameter piston can be modified to improve its oil extraction rate with jatropha.

Seedling Production and Distribution Existing small private and public sector nurseries could produce large quantities of jatropha seedlings in Senegal, but farmers need better incentives for planting it and better communication to ensure that the transplanting is done properly and in suitable locations.

Encouraging Jatropha Planting While little jatropha is currently grown in Senegal, it used to be the principal hedgerow species planted, providing another incentive for farmers to grow it besides for oil production. Some farmers recall its durability as a living fence and the perceived healing properties of its sap. The project could encourage older farmers more familiar with jatropha to convince village chiefs, religious leaders, and younger farmers to plant it. Planting jatropha as a windbreak can increase yields of other crops and it can keep out grazing animals.

Post-Harvest Treatment of Seeds To reduce post-harvest losses of the seeds or their oil content, jatropha seeds should be promptly removed from the fruit, air dried, and properly stored

Selected Sources for Further Information

- Bielenberg, Carl 1996 Field Report on Ram Press Testing, Manufacture, and Dissemination for Jatropha and Sesame in Senegal and Mali Washington, DC EnterpriseWorks Worldwide
- Bielenberg, Carl 1996 Progress Report on the Testing of a Lister 8/1 Diesel Engine on Jatropha Curcas Oil Washington, DC EnterpriseWorks Worldwide

Tanzania Oils Project

November 1985 - July 1998

Project Overview

This project is promoting small-scale oilseed processing through training of ram press manufacturers, users, and repair artisans, and commercial sales of the press and suitable varieties of planting seed. EnterpriseWorks' Engineer Carl Bielenberg invented the ram press in late 1985 and commercial production began first in Tanzania in mid-1986 under a prior project. Since then, several smaller models that are cheaper and easier to make, or better adapted to specific oilseeds, have been developed by EnterpriseWorks' staff, consultants, project partners, and outside engineers. These manual presses can be used to process sunflower, sesame, groundnuts, coconut, safflower and other oilseeds. The ram press allows farmers and rural entrepreneurs to capture the value-added from processing oilseeds for local markets. Press owners do commercial pressing of seed they grow or purchase and service press other farmers' seed for cash or an in-kind charge. The byproduct seedcake is a good animal feed that can be sold or fed to the families' own livestock, increasing the animals' productivity.

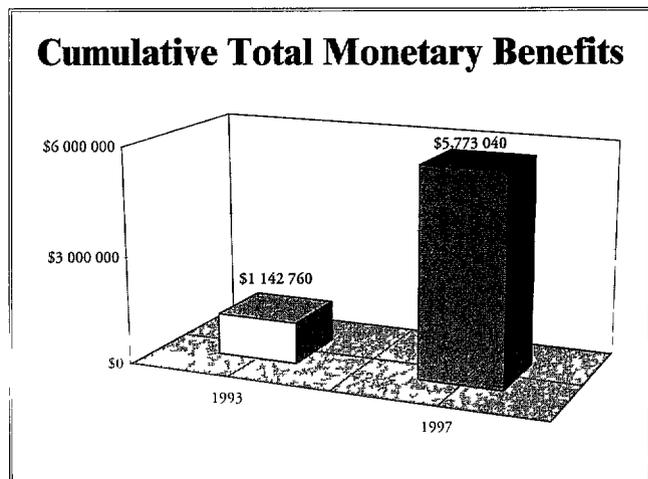
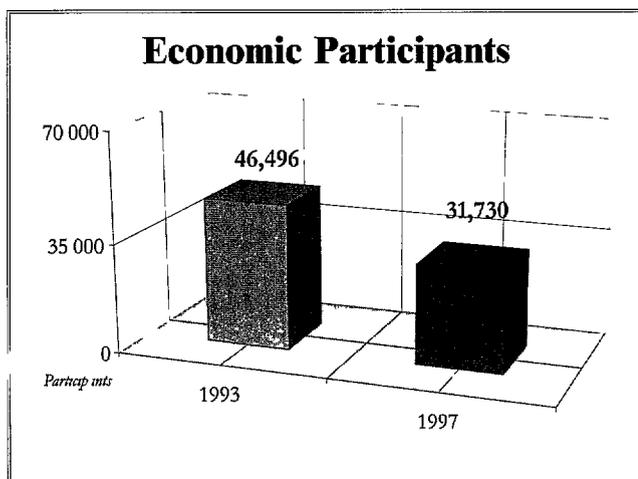
Project Partners

- ATI/Tanzania
- Small Industries Development Organization (SIDO)
- Centre for Agricultural Mechanization and Rural Technology (CAMARTEC)

Funders

- National Income Generation Programme (NIGP) [Tanzania]
- Tanzania-Swiss Trust Fund
- Food Industry Crusade Against Hunger (FICAH) [USA]
- USAID/Washington Africa Bureau
- International Development Research Center (IDRC) [Canada]
- Lutheran World Relief (LWR) [USA]
- USAID/Global Bureau/Office of Women in Development

Budget \$1,406,686, Expended 53.2%



Objectives and Targets

- Over a three year period beginning in July of 1995 the project's target was to sell 5 000 new presses. Each press was expected to benefit an average of one owner, 2.7 part time workers, and 15 service pressing households,
 - The project expected to buy 10 tons of planting seed from lead farmers for subsequent sale,
 - Ram presses continue to be produced by small-scale workshops in Tanzania but a new model mass manufactured in Zimbabwe will be imported in the future at a lower cost and better quality
-

Accomplishments

Press Sales In 1997 202 presses were sold. Since mid-1986 over 2,000 ram presses have been sold in the country. The most frequently sold model in Tanzania can process 14 kg of sunflower seed or 4 kg of sesame seed per hour. In 1997, 30 shops sold the press and 51 sales agents had been recruited.

Training The project trained staff from 12 NGOs to promote the ram press and it trained 51 rural press repair artisans in 1997.

Demonstrations T-Press field managers and sales representatives held 145 demonstrations with an average attendance of 100 villagers, farmers, agricultural extension workers, rural artisans and sales outlets. These one day demonstrations covered use and maintenance of presses, clarification of oil, uses of seedcake, oilseed farming practices and business management for seed processing enterprises.

Marketing of Oil and Seedcake Product marketing has not proved to be any particular problem for edible oil in Tanzania but project interventions could assist in promoting more effective use of sunflower seedcake. EnterpriseWorks is conducting livestock feeding trials in Zimbabwe to study the effect of adding seedcake to the diet of various types of farm animals.

Product Diversification Although project efforts have concentrated on the distribution and sale of ram presses, technical and market testing began in 1997 for some new products including groundnut shellers, peanut butter mills, coconut graters, and water pumps.

Promotion In 1997, T-Press participated in several exhibitions, trade shows and workshops. Senior project staff participated in a documentary video sponsored by the NIGP. Retailers had posted 30 roadside signs advertising the ram press. The project produced promotional materials on sunflower farming, seedcake utilization, and ram press maintenance which were sold to farmers at cost.

Planting Seed Supply for the 1997/1998 Season The project had contracted with eight lead farmers for multiplication of sunflower seed using high-quality planting seed from the Msimba Foundation Seed Farm. Due to unfavorable weather in 1997 the lead farmers only produced 1,100 kg of planting seed for sale to the project. This seed was graded, treated and packaged for resale to other farmers for the 1997/1998 planting season.

Challenges

Climate In 1997 El Niño weather hampered East and Central Africa and Tanzanian farmers lost \$117 million in crop value as a result. Flooding kept farmers in the country (and also in Kenya, Ethiopia, Tanzania, and Somalia) from planting and some areas received 500 percent more rainfall than usual — or as much as eight inches in a single day. Unusually heavy rains in January/February were followed by drought and reduced crop yields. Excessive amounts of rain in October washed out crops and infrastructure.

Declining Purchasing Power of Smallholder Farmers and Higher Press Prices The extreme weather and a government ban on export of crops to neighboring countries reduced the income of Tanzanian farmers in 1997. At the same time, the project had to increase press prices by 34% to reflect the rising ex-factory cost of production and recover the full distribution costs. As a result of these two factors, the project sold only eight ram presses and 600 kg of planting seed in the last quarter of the year.

Increasing Competition for Pressing Seed Trade liberalization made it easier to import motorized expellers into Tanzania. Some of these expellers have been installed in areas previously served only by ram presses. Whether the expellers buy oilseeds for processing or offer service pressing, they can reduce the availability of pressing seed for pressing in the short-run. Over the long-term, price increases should stimulate farmers to plant more oilseeds or use more intensive growing methods. In some cases, some ram presses close to the expellers have been sold or relocated to more remote or poorer areas.

Lessons Learned

Institutional Sustainability To create a sustainable, commercial system for press production and distribution in the future after donor support ends, the project split into two entities. KAKUTE, a private company was to manufacture and wholesale presses. SUTEK, an NGO, was to support further development and commercialization of the ram press and other rural technologies and monitor impacts, tasks that the private sector would be unlikely to perform. It was hoped that the profits from the new company would provide some support for the NGO's activities in the future. However, at the low press sale levels in 1997, it was not possible to obtain enough cost recovery to sustain the private company and the division of responsibilities led to conflicts of interest between KAKUTE and SUTEK. KAKUTE is no longer associated with T-Press and agreed to change its name and produce other products instead of the ram press. Transition from a donor-funded project to a profit-making organization is much more complicated than simply changing pricing and distribution policies. To become a competitive company, new modes of operating and strategies are needed.

Need for Realistic Sales Goals The overly ambitious sales goal from July 1995 to June 1998 was based on the assumption that a lower cost, smaller table-top press would greatly expand the market for the presses and that full commercialization could be achieved rapidly. The project also hoped to buy a large stock of reasonably priced pressing seed, but this could not be accomplished in 1997 due to the extreme weather conditions.

Quality Control The project advised ram press manufacturers to use standardized materials and tooling to facilitate more rapid production and maintain the quality of the presses. Spare parts for the machines were produced and sold to sales outlets and rural artisans in preparation for the pressing season.

Selected Sources for Further Information

- Hyman, Eric, Errine Njiku and Jonathan Herz. 1997. Building the Capacity of the Private Sector in Rural Tanzania Through Promotion of Rural Small-Scale Oilseed Processing: An Evaluation of Phase I of the T-Press Project. Washington, DC: EnterpriseWorks Worldwide.

Uganda Oils Project

October 1993 - October 2002

Project Overview

This project aims to generate rural income and improve nutrition through the introduction of the ram press — a small-scale manual technology for oilseed processing. This project differs from EnterpriseWorks' other projects in this commodity area in its strong emphasis on targeting demobilized war veterans and women as beneficiaries and its extensive work in farming systems research for oilseeds. Favorable conditions for oilseed cultivation in Uganda allow two growing seasons for sunflower per year, but many farmers in the northern part of the country were not familiar with growing sunflower before the project. Consequently, this project set up demonstrations on the role of oilseeds in the cropping cycle and devoted much attention to planting seed multiplication and sale, and agricultural crop extension services.

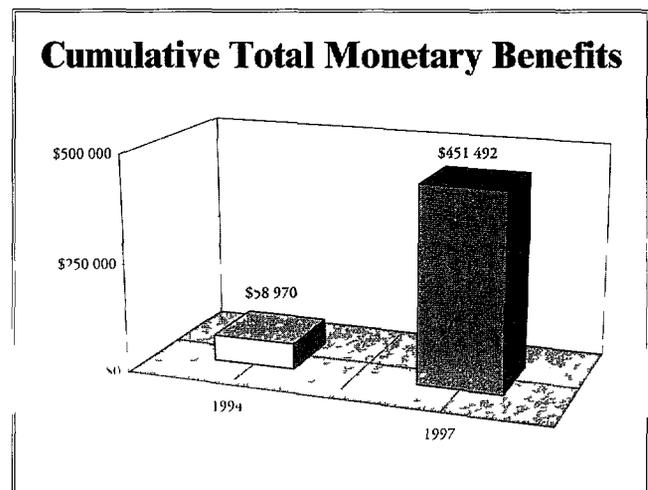
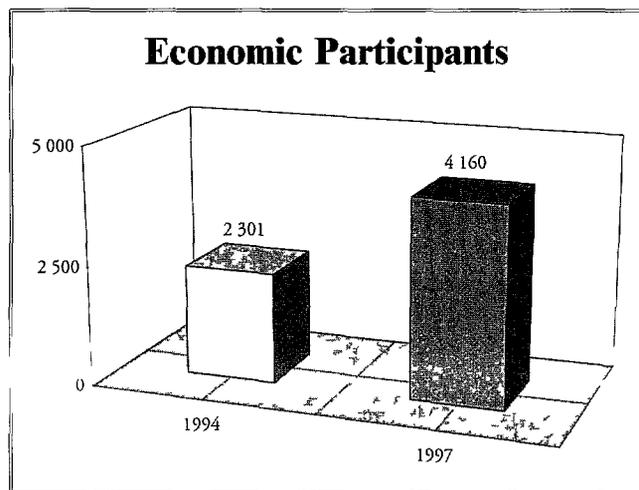
Project Partners

- AT/Uganda
- Northern Uganda Rural Oilseed Processors Association (NUROSPA)
- Uganda Oilseed Processors Association (UOSPA)
- Ministry of Agriculture (Uganda)

Funders

- USAID/Uganda
- DANIDA
- Uganda Oilseed Processors Association (UOSPA)
- McKnight Foundation [U S]
- Economic Development Fund Micro-Projects Program [European Union]
- Food Industry Campaign Against Hunger (FICAH) [U S]

Budget \$3,124,780, Expended 52%



Objectives and Targets

In 1997 this project had 3 main components. The main focus was on the U-Press project which promoted the ram press in the Lira and Apac Districts in Northern Uganda and later expanded into the Soroti and Kotido Districts. Two new components of the project were launched at the end of 1997 — the Farmer to Farmer Project, a four year project that began in October, and the Sustainable Agriculture and Food Based Enterprises (SAFE) Project, a three-year project that began in December. Due to lack of new funding, the participatory research activities and seed sales were suspended at the end of 1996, but will be revived in 1998 under the new Farmer to Farmer project.

The U-Press project's sales target was to sell 500 ram presses by the end of 1996 including 240 to veterans — part of the project funding from USAID/Uganda had a special goal of encouraging individual or group press ownership by demobilized war veterans. The McKnight funding placed special emphasis on helping women benefit from the technology.

AT/Uganda's Farmer to Farmer project has four major objectives:

- **Increase production of food security crops such as maize, beans, cassava and groundnuts in addition to sunflower.** The project is collaborating with 34 extension staff from 5 districts who will promote increased oilseed production, on-farm trials and demonstrations of improved varieties and production practices, farmer training and exchange visits, and farmer competitions and field days. This project is expected to benefit 60,000 individuals by increasing agricultural production and income.
- **Enhance access to improved agricultural inputs.** The project will help create a network of over 80 private sector agricultural input suppliers at the village level. The agricultural input suppliers will receive training in input supply management, credit for input inventories, marketing and assistance, and advice from the extension staff. In addition to selling sunflower seed, these stockists will also sell improved varieties of maize, beans, groundnuts, farming tools, and other agro-processing equipment.
- **Reduce losses through improved post-harvest handling.** The project will work with the National Agricultural Research Organization's Post Harvest Unit to train extension staff and local artisans in improved post-harvest handling techniques and construction of improved granaries for crop storage.
- **Promote village-based agro-processing to add value to farmer's crops.** The project will promote village-based agro-processing through public information campaigns and establishment of rural suppliers. Activities under this objective will be conducted in collaboration with the SAFE project.

The SAFE Project has three major components:

- **Increase agricultural production.** This component will involve multiplication of disease-resistant varieties of cassava in the strife-damaged areas of Gulu and Kitgum for intercropping with beans, groundnuts, or sunflower. Planting seeds for maize, sunflower, beans, and groundnuts will be sold in the insecure areas to improve food security, especially for people who have been displaced by the insecurity.



Pressing soft-shelled sunflower seed

- **Increase incomes** The project will promote income-generating opportunities, including sunflower and sesame processing, shea butter processing, and grain milling. Income generating technologies will be provided to vulnerable and displaced groups on a subsidized matching grant basis.
- **Promote systems for sustainable development** AT/Uganda will develop the local capacity for production and marketing to supply seeds, technologies, and training to refugee centers and other places where displaced persons are concentrated.

Accomplishments

Sales In 1997, 107 ram presses were sold, for a cumulative total of 382 in use. Another 10 presses were given to sales agents. In addition, 5 treadle pumps, 8 groundnut grinders, 2 shea presses, and one motorized groundnut sheller were sold. The loan repayment rate for 1996-1997 was 100 percent.

Sale of Ram Presses to Women Increased There was a significant increase in women's participation in Uganda in 1996-1997 due to subsidies and specific efforts to target women in press promotion and follow-up. Seventy five percent of the new ram press owners in 1997 were women, raising the total proportion of presses owned by women to over 65 percent. Press sales to women were also encouraged by paying a small bonus to the project staff person who sold the most presses to women in each quarter.

Sales of Pressing Seed Sunfola is a soft-shelled sunflower planting seed variety with a high oil content. The project purchased new Sunfola planting seed from the Uganda Oilseed Processors' Association on short-term credit. In 1997, AT/Uganda sold 5,200 kg of the seed to farmers and repaid UOSPA. Due to funding constraints, AT/Uganda was unable to supply seed on credit to rural stockists as had been done in previous years.

Demonstrations and Training In 1997, AT/Uganda staff conducted 118 village-level press demonstrations reaching over 4,400 people in Lira, Apac, Soroti, Kotido, Masindi, Kapchorwa, Kasese, Mbale, Gulu, Kitgum, Kumi, and Pallisa. The vast majority of participants were representatives from 36 ram press owner groups (including 21 veterans groups). Since 1994, the project has trained 6 manufacturers, 16 repair artisans, 5 distributors, and 42 sales agents.

Press Manufacturing, Price Reduction, and Purchase Incentives Eighty-five BP-30 presses and 60 bucket filters were manufactured in Uganda in 1997. Due to the high cost of manufacturing the ram press in Uganda (which was higher than the cost in Tanzania or Zimbabwe), U-Press decided to import presses once the existing domestically produced stock was sold. It reduced the cash price of the domestically produced presses in inventory to \$197, reflecting the import price parity. In addition, donor funding allowed the project to subsidize purchases by veterans' and women's groups by 50% if the groups demonstrated a serious commitment by growing at least 1,650 kg of sunflower seed or 540 kg of sesame seed for processing. The "matching grant price" was \$88.50.

Pressing Seed Stocking System In mid-1996, AT/Uganda helped NUROSPA establish an oilseed stocking system to make pressing seed available at reasonable cost throughout the year. The price of pressing seed is lowest just after the peak harvest period and it rises substantially when out of season. However, most ram press owners lack sufficient working capital to buy a full year's worth of pressing seed at harvest time. As a result, the press owners had to pay a much higher price for seed or operate their presses at a lower capacity use rate. To make the system viable, other crops beside oilseed were purchased and resold. The other crops were made available to any buyer, but oilseeds were only sold to ram press owners.

Challenges

Damaged Infrastructure Portions of the project area where U Press was operating in Uganda have been seriously disrupted by years of civil unrest that resulted in poor infrastructure, depopulation of livestock, and limited development of the private sector system for agricultural input supply. These areas, however, have an excellent agronomic potential.

Severe Weather In 1997, El Niño weather brought a severe drought to Uganda during the first half of the year, followed by unprecedented unseasonably wet weather that washed out crops and caused extensive flooding and infrastructural damage. As a result, farmers concentrated on production of staple food crops and very little sunflower was planted. Press utilization rates dropped significantly due to lack of pressing seed.

Reorganization AT/Uganda faced serious financial and logistical constraints in 1997 that necessitated reorganizing its field operations, staffing pattern, and range of technologies.

Sunflower Plant Disease AT/Uganda has observed an increased incidence of sunflower plant diseases, especially fungal diseases. The agricultural extension staff informed farmers about appropriate control measures.

Low Yields Under typical smallholder farming practices in Uganda (intercropping and no use of fertilizer or irrigation), sunflower seed yields are much lower than their potential, but still relatively good due to high soil fertility and a favorable climate. The Ministry of Agriculture and AT/Uganda are trying to identify low-cost ways of increasing oilseed yields per day of labor time and per hectare.

Poor Infrastructure Northern Uganda has very poor infrastructure for transport and marketing and lacks a commercial system for distribution of planting seed or other agricultural inputs. When AT/Uganda stopped seed distribution efforts in 1997, there was a significant shortage of planting material. AT/Uganda is seeking to overcome this under the new Farmer to Farmer project.

High Price of Domestically Produced Ram Presses The cost of imported raw materials (especially steel), labor, and equipment for press manufacturing is relatively high in Uganda. As a result, the full retail price of Ugandan ram presses was double the price of Tanzanian presses in 1995. To reduce the press cost, AT/Uganda decided to import ram presses in 1997-98.

Lessons Learned

Pricing and Distribution To encourage a sustainable commercial system for press production and distribution, AT/Uganda increased the retail price of a domestically produced BP 30 in Uganda to \$316 in 1995, including a 15% tax. The manufacturers received \$247 per press. At the same time, AT/Uganda tried to shift responsibilities for sales to private distributors and sales agents. As a result, sales fell sharply in 1995. Sales rebounded in 1996 after the project bought out the manufacturer's inventories of domestically produced presses and absorbed the loss of charging an import parity based price. A marketing study done in 1996 recommended that AT/Uganda return to a policy of active market development by project staff working closely with a smaller number of sales agents.

Importance of Matching Grants in Stimulating Sales to Veterans Veterans' participation had been disappointingly low prior to the matching grants — a targeted subsidy for veterans and their wives or widows in 1996. Instead of being a purely giveaway program, the matching grants required the veterans to demonstrate a considerable commitment by growing the seed for processing before buying a press.

Credit Policy U-Press has followed a strict policy for loan collection. Due to loan defaults, 38 presses had to be repossessed out of the 114 sold through the end of 1995. While the ram press can generate significant profits at a reasonable capacity use rate, press owners often used the money for other purposes and then failed to make

the loan repayments. The high default rate reflects the prevailing poor attitude of borrowers toward credit from NGO or government programs in Uganda. A new sales policy established in 1996 encouraged cash purchases or completion of installment payments before delivery of the press and made loans contingent on press owners demonstrating that they had enough seed available for processing. The loan repayment period was reduced from 1 year to just 3 months. This policy change reduced the cost of loan collection and increased the repayment rate to 100% in 1996-1997. Repossessed presses were resold to press sales agents for demonstration purposes and use in their processing enterprises.

Feeding Trials The project conducted feeding trials of sunflower seedcake supplementation for local cows on 10 farms. Cows fed 3 kg/day of a mixture of 3 parts sunflower seedcake and 1 part rice bran increased their milk production by 23 percent. Feeding trials for pigs were compromised when farmers began feeding the pigs in the control group seedcake after seeing how well it worked. Feeding trials with poultry were impaired by an outbreak of Newcastle disease in both the control and the experimental populations.

Decentralization and Outreach In 1997, AT/Uganda expanded geographic and technological coverage to reach a greater number of beneficiaries, while reducing the costs per customer. By the end of 1997, AT/Uganda was operating in 7 districts across Northern and Central Uganda. With reduced donor funding available, U-Press closed its Lira and Soroti offices and decentralized activities to mobile teams. Each team, consisting of a technician/trainer and a driver, covered one or two contiguous districts.

Balancing Commercialization and Targeting of Beneficiaries EnterpriseWorks' objective of establishing sustainable, commercial technology dissemination had to be tempered in this case because of the donors' strong interests in assisting demobilized war veterans and women by subsidizing the press price. To stimulate sales, a three-way partnership is needed, including district extension staff to train farmers and stimulate demand, private sector traders to supply the required inputs and technologies, and AT/Uganda staff to provide follow-up and training and to coordinate sources of supply.

Selected Sources for Further Information

- Hyman, Eric and Jonathan Otto. 1996. Evaluation of Implementation Strategies and Partnerships of the AT (Uganda) U-Press Project. Washington, DC: EnterpriseWorks Worldwide.

Zambia Oils Project (AFRICARE)

October 1992 - December 1997

Project Overview

This AFRICARE project is a replication of prior EnterpriseWorks oilseed processing projects. EnterpriseWorks developed the technology and provided training and technical assistance to AFRICARE. This project was designed to increase rural incomes and employment through local, small-scale processing of oilseeds and produce low-cost cooking oil for rural consumers and animal feed from the byproduct seedcake.

AFRICARE promoted the “yenga press”, a ram press model similar to the BP-1 promoted in Tanzania (a predecessor of the BP-30). The Zambia project helped multiple informal sector manufacturers begin press production and then assisted in quality control. Project staff demonstrated the technology to farmers, trained repair artisans, and sold presses and planting seed. This project had to extensively promote soft-shelled sunflower varieties suitable for processing in the ram press because Zambian farmers previously grew the hard-shelled, low-oil varieties preferred for confectionery use and export for bird seed.

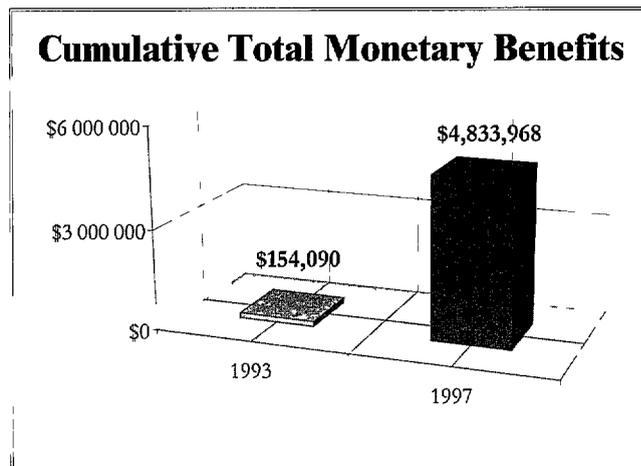
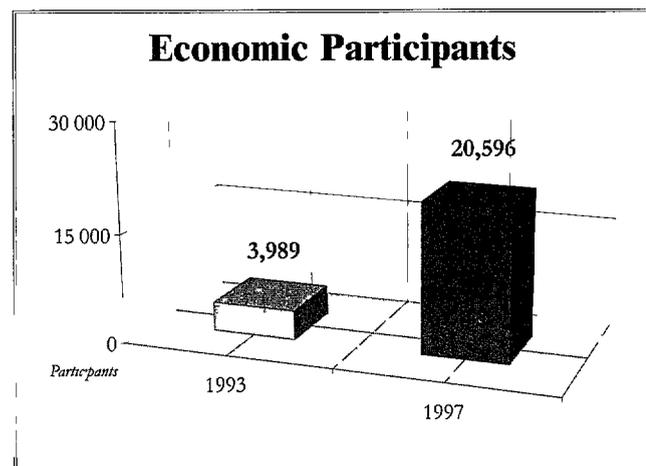
Implementing Agency

- AFRICARE/Zambia

Funders

- USAID/Zambia
- AFRICARE/Zambia

Budget \$2,248,723, Expended 100%



Objectives and Targets

- Increase edible oil production and consumption since the minimum amount of fats and oils needed for good nutrition is 17 kg per person per year. The average annual per capita consumption in rural Zambia is only 6.5 kilograms,
- Establish manufacturing of the ram press, promote sustainable small-scale oilseed processing, generate income and at least one salaried job per oilseed processing enterprise, and strengthen the capacity of local NGOs to assist the rural edible oil industry,
- Produce 60 tons of sunflower planting seed in 1996-1997

Accomplishments

Ram Press Sales In 1997 there were 3 active ram press manufacturers in Zambia and 468 presses were sold. Since the project began a total of 1,761 presses had been sold (excluding repossessed presses)

Oil Production and Income Press owners produced over 590 000 liters of sunflower oil in 1997 and approximately \$830,000

Jobs Created The ram presses in service generated work for over 1 700 owners, over 2 600 workers, and over 16 000 seed suppliers. An average of 44 service pressing customers also benefited per press (households which grew a small amount of seed for processing for their own oil consumption)

Sunflower Planting Seed Sales Over the life of the project, AFRICARE sold over 235 tonnes of sunflower seed in 2 varieties, Carina and Record

Commercialization and Sustainability Strategies To ensure sustainability after this project ended, AFRICARE's Smallholder Agricultural Mechanization Promotion (SAMeP) Project took over press promotion and marketing. SAMeP is involved with other technologies for small-scale farmers, including draft animal power and post-harvest processing. Under the SAMeP project, AFRICARE is developing business plans for wholesaling of agricultural equipment and is seeking working capital to purchase the equipment directly from the manufacturers for resale. Diversification into post-harvest processing equipment, such as the ram press, is expected to increase the profits of wholesalers and retailers. The new products will be marketed through the network of sales agents established by the oilseed processors project.

Promotion In 1997 the project continued a series of educational radio programs in English and 7 local languages to promote the press and increase oilseed production. Produced in conjunction with the National Agricultural Information Service (NAIS) the radio shows were heard by some 200,000 farmers.

Associations Formed The project helped organize two producer groups — the Sunflower and Yenga Press Association of Zambia (SYPAZ) and the Castor Growers Association of Zambia (CGAZ). SYPAZ, a group of more than 250 farmers and entrepreneurs, has the following goals: 1) increase the supply of seed for press owners, 2) improve the marketing of their oil, 3) market Yenga presses and planting seed, and 4) train new press owners. CGAZ was formed by a group of more than 250 castor bean farmers who previously exported unprocessed castor beans to Zimbabwe but concluded that farmers could earn much more money by pressing castor beans and exporting the oil. CGAZ has purchased a castor bean sheller and assessed potential markets for the oil in Africa, Europe, and the United States. Castor bean oil has many industrial uses including manufacturing of solvents, quick-drying materials, lubricants, perfumes, plastics, rubber, paint, inks, and cosmetics.

Challenges

Planting Seed Production Problems Earlier in the project sunflower seed growers encountered problems that caused a reduction in the harvest available for processing. These problems included fungal diseases, late planting, and late heavy rains during or shortly before harvest time.

Cost and Availability of Imported Steel The slow pace of economic liberalization in Zambia has resulted in a low rate of investment in manufacturing and a weak metal fabrication industry. Consequently, the raw materials for ram press production had to be imported (from Zimbabwe or South Africa) and this raised costs and caused delayed press production.

Pressing Seed Supply The biggest problem faced was insufficient availability of suitable seed for commercial pressing. Sunflower seed production in Zambia dropped from nearly 27 000 metric tonnes to less than 8,000 tonnes. The 1996/1997 growing season was an El Niño year. As a result, ram press owners faced increasing com-

petition for pressing seeds from large-scale oil mills. Rates of service pressing by ram presses were also relatively low. Press sales follow sunflower pressing seed production closely and press sales in 1997 were about half the number in 1996 due to the poor seed harvest.

Lessons Learned

Importance of Boosting Planting Seed Before Press Sales Production and marketing of suitable varieties of planting seed are as important as production and marketing of presses. Press sales increased rapidly when good quality sunflower became more available. When the project began, most of the sunflower seed grown in Zambia were hard-shelled varieties that cause rapid press wear and low oil extraction rates.

Advertising A higher project budget for advertising could have increased sales, particularly early in the project. Television and radio ads, banners for sales agents, and flyers were found to be most effective in stimulating sales, while the newspaper ads were the least effective. A monthly educational radio program also informed farmers about oilseed production and small-scale processing.

Sales Agents Setting up a network of private sector sales agents earlier, rather than using project staff to sell the presses, could have increased sales faster and reduced project costs. Then project subsidies for training, press delivery, and consignment sales could have been phased out earlier.

Credit Credit helped stimulate sales of this unfamiliar technology, but the administrative costs and loan default rate were too high. From October 1992 to September 1994, approximately 200 ram presses were sold on credit and 30% had to be repossessed. Another 40 presses that were to be repossessed could not be reclaimed. Although the loans carried an interest rate of 25% per year, this did not cover the cost of loan recovery and refurbishing repossessed presses for resale.

Variety of Oilseeds Ram press use rates can be increased by processing other types of oilseeds, such as castor beans. This will be especially true in 1998 and 1999 as markets for castor oil open up and the planted area for this crop increases. However, since castor seedcake is toxic, presses used for this purpose should be thoroughly cleaned before processing edible oilseeds.

Service Life of Ram Press Over 79% of the presses sold since the project began in late 1992 were still in operation in 1997. Presses sold in the first year of the project could have been in use for five pressing seasons.

Cost Effectiveness of Replication Projects As a replication, this project benefited from the prior experience of EnterpriseWorks in Tanzania and Zimbabwe. The Zambia project was able to ramp up sales more rapidly because the technology adaptation, development, and testing of strategies for production and distribution of the press had already been done elsewhere.

Warning Systems for Droughts Early warnings of El Niño drought were broadcast via the National Agricultural Information Service in July, 1997. Agricultural extension programs advised farmers to plant early to reduce the effects of the adverse weather conditions, but sunflower seed harvests were still much below normal.

Sustainability and Product Diversification AFRICARE's approach to ensuring sustainability after the oilseed processing project ended was to continue some promotion and marketing activities through another project that had a broader focus and longer duration. While diversification of the products may improve the cost-effectiveness of an NGO activity, it is not the same type of sustainability as enabling the private sector to take over.

Selected Sources for Further Information

- Otto Jonathan, David Musona and Evelyn Mwenya 1996 Mid-Term Evaluation Oilseed Processing Project Lusaka AFRICARE/Zambia
- Fischer Dieter 1998 Close-Out Report for the Zambia Oilseed Processing Project Lusaka AFRICARE/Zambia

Zimbabwe Oils and Staple Foods Project

August 1989 - March 2000

Project Overview

A replication and refinement of the Tanzania Oils Project, this was EnterpriseWorks' second major project in this subsector. The Zimbabwe project was designed to 1) help small-scale oilseed farmers or rural entrepreneurs increase their incomes through production of oil from sunflower and sesame seeds, 2) increase the supply of low-cost edible oil for rural consumers, and 3) increase livestock productivity by using the byproduct seedcake as an animal feed.

In its early years, the project trained multiple, small-scale manufacturers of the ram press in production of various models of the press that had been developed in Tanzania. The project also took on a major role in quality control and press marketing and distribution. It also trained buyers in the use of the press and held business management workshops, trained rural artisans to repair the press. Later, the project began moving toward a more commercial approach to press distribution by reducing subsidies and relying on private sector shops and sales agents to sell presses, rather than project staff.

The third phase, now underway, is emphasizing a new approach to press production – a partnership between EnterpriseWorks and one of the previous Zimbabwean manufacturers of the ram press to establish mass production of a new model for the domestic market as well as export. The rationale for this change in strategy is to lower press production costs through economies of scale, reduce the quality control problems inherent in working with multiple small-scale manufacturers in many different countries, and ramp up production for greater impact. The project also planned to introduce other agro-processing technologies.

Project Partners

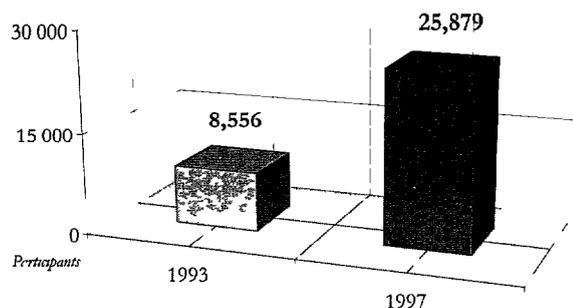
- Appropriate Technology Zimbabwe (ATZ)
- World University Services of Canada (WUSC)
- Africa Now [U K]

Funders

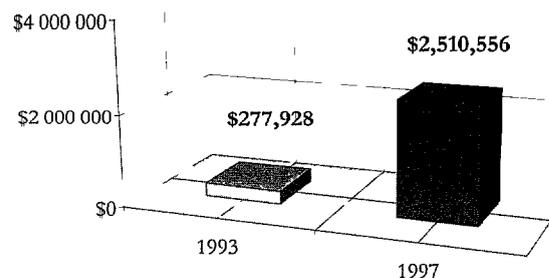
- USAID/Washington/Africa Bureau
- USAID/Washington/Microenterprise Office
- Africa Now [U K]
- Food Industry Crusade Against Hunger (FICAH) [USA]
- Canadian International Development Agency (CIDA)
- The Japanese Embassy

Budget \$751,068, Expended 87%

Economic Participants



Cumulative Total Monetary Benefits



Objectives and Targets

- Design a ram press model that facilitates mass production,
 - Establish a partnership with a private sector producer for mass production of the new model,
 - Create a distribution system for domestic sales and exports of the press
 - Diversify product lines for manufacturing and distribution,
 - Boost press sales to at least 1 120 in 1997 (including domestic sales and exports)
-

Accomplishments

Ram Press Design Changes In 1997, EnterpriseWorks Engineer Jonathan Herz developed the RAM-32 model to facilitate mass production. A punch press, specialty stamping dies, and production lathes are used to make this press rapidly and with greater standardization of parts and quality control. Preliminary tests indicated that the RAM-32 can produce 4-22% more oil from the same amount of seed as the BP-30 (but less of the seedcake, which is not as valuable as the oil). The new model can process seed using 8% less labor time. The RAM-32 is also easier to service than the previous models and has a more attractive appearance. It is too soon to judge the durability and reliability of the new model.

In 1997, the ex-factory price of the RAM-32 was \$82 50, which allowed it to be sold in Zimbabwe at a retail price 10% below that of the BP-30 and 28% less than the BP-40 price. The potential for further cost savings in the RAM-32 through changes in the design and production process were still being explored. Since the RAM-32 is lighter and smaller in size than the BP-30, more of the mass-manufactured presses can be transported in a truck or standard shipping container load, reducing transport costs. The delivered cost of exported RAM-32 presses will depend on transport distances and modes, tariffs, and distribution costs within the importing countries.

Delineation of New Organizational Roles In 1996, the project divested its press distribution functions to ZOPP Ltd, a for-profit business it created for wholesaling and retailing. The not-for-profit, nongovernmental organization Appropriate Technology Zimbabwe retained the pro bono functions that would be unlikely to be provided by the private sector. The NGO was to continue broader technology promotion and training, impact monitoring, and development and testing of new technologies for small-scale producers prior to their commercial production and distribution.

Ram Press Production and Distribution In 1997, five small-scale workshops in Zimbabwe were active manufacturers of the BP-30 and BP-40 models. EnterpriseWorks and one of the existing ram press producers in Zimbabwe, Shamen Engineering, formed a joint venture for mass manufacturing the RAM-32. The BP-30 model still dominated the market in Zimbabwe with two thirds of the ram press sales that year. One-sixth of sales were the new RAM-32 and another sixth for the larger BP-40. Within the country, 6 sales agents and 73 retail shops sold ram presses. The shops included the various outlets of 5 chain stores, two other hardware stores, branches of 3 NGOs, and a cooperatives union. Six rural repair artisans actively stocked spare parts and fixed ram presses in 1997.

Ram Press Promotion and Sales ATZ continued demonstrating its products at provincial agricultural trade shows, retail stores stocking the press, and during field visits. It also sponsored live radio advertisements where listeners could phone in questions and suggestions. A total of 289 ram presses were sold in Zimbabwe in 1997; an additional 27 RAM-32 presses were exported to countries that did not have EnterpriseWorks oilseed processing projects and 25 to other country projects discussed in this report. No information was available on export sales of the BP-30 and BP-40 by the small-scale manufacturers in Zimbabwe. A 14% drop in 1997 press sales was due to unfavorable El Niño weather throughout East and Southern Africa.

Seedcake Utilization EnterpriseWorks has been studying the nutritional value of sunflower seedcake as an animal feed in a related project (see the Zimbabwe Livestock Project). Once the best feed formulas for particular types of animals have been determined, ATZ plans to spread the word to livestock farmers and sell small mixers for preparing the feed formulations.

Peanut Butter Mills ATZ imported a small peanut (groundnut) butter mill from the Czech Republic and this rapidly became a popular item in Zimbabwe. These hand-operated machines are made of cast iron. Roasted nuts are crushed between the two plates of the mill. A total of 2,185 peanut butter mills were sold at a retail price of around \$80 in 1997. Most of the peanut butter mills are used by households as a kitchen appliance rather than a tool for a microenterprise. With heavy use the expected service life of the machine is 2 years, but it will last longer if used less frequently. When the main part, the buff, wears out it can be replaced and ATZ plans to sell the burrs.

Introduction of Other New Products In 1997, ATZ introduced several new products: a motorized ram press, hammermill, manual sheller for maize, seed planter, and steelyard weighing scale.

Challenges

Manufacturing The BP-30 ram press models were not in sufficient supply for a brief period during the second quarter of 1997 due to manufacturing constraints. Radio advertisements created a large demand which could not be met due to the amount of resources needed by the manufacturer to set up the mass manufacturing facility.

Binding Problems The seedcake tends to get stuck between the piston and cylinder. This is caused by problems in the alignment, surface finish, accuracy of dimensions, and the durability of key press components.

Pressing Seed Shortage Insufficient pressing seed availability was a major constraint to press sales. As a result, the project developed plans to organize contract farming of oilseeds to boost the availability of pressing seed.

Relationship With Distributors Distributors have resisted ZOPP's suggestion that they buy presses in bulk and maintain an inventory. Most placed an order only after a customer paid a deposit.

Unusual Weather Conditions A predicted drought associated with the El Niño weather phenomenon reduced ram press sales in 1997 by 10 percent. It also lowered planting seed and fertilizer sales.

Ram Press Tool Production Delay Full-scale production of the ram press by RAM Pvt. Ltd. was delayed due to the late delivery of over 20 press tools needed by April 1, 1997.

Economic and Political Instability The macroeconomic environment in Zimbabwe was unfavorable in 1997. The exchange rate for the Zimbabwean dollar declined and inflation increased. Political problems, including sporadic rioting, also occurred.

Export Sales High tariff rates may be limiting the potential of export sales. ATZ plans to advocate policy changes to reduce import duties for small-scale agro-processing equipment.

Lessons Learned

NGO Role in Making Technologies Available for Small-Scale Producers NGOs can play an important role in developing new technologies for microenterprises because the private sector does not have a strong economic incentive to do research that can benefit low-income producers. Private companies often find it difficult to ensure that they will be able to prevent others from copying the results of their work without compensation and they face high transaction costs and risks in making and promoting new products.

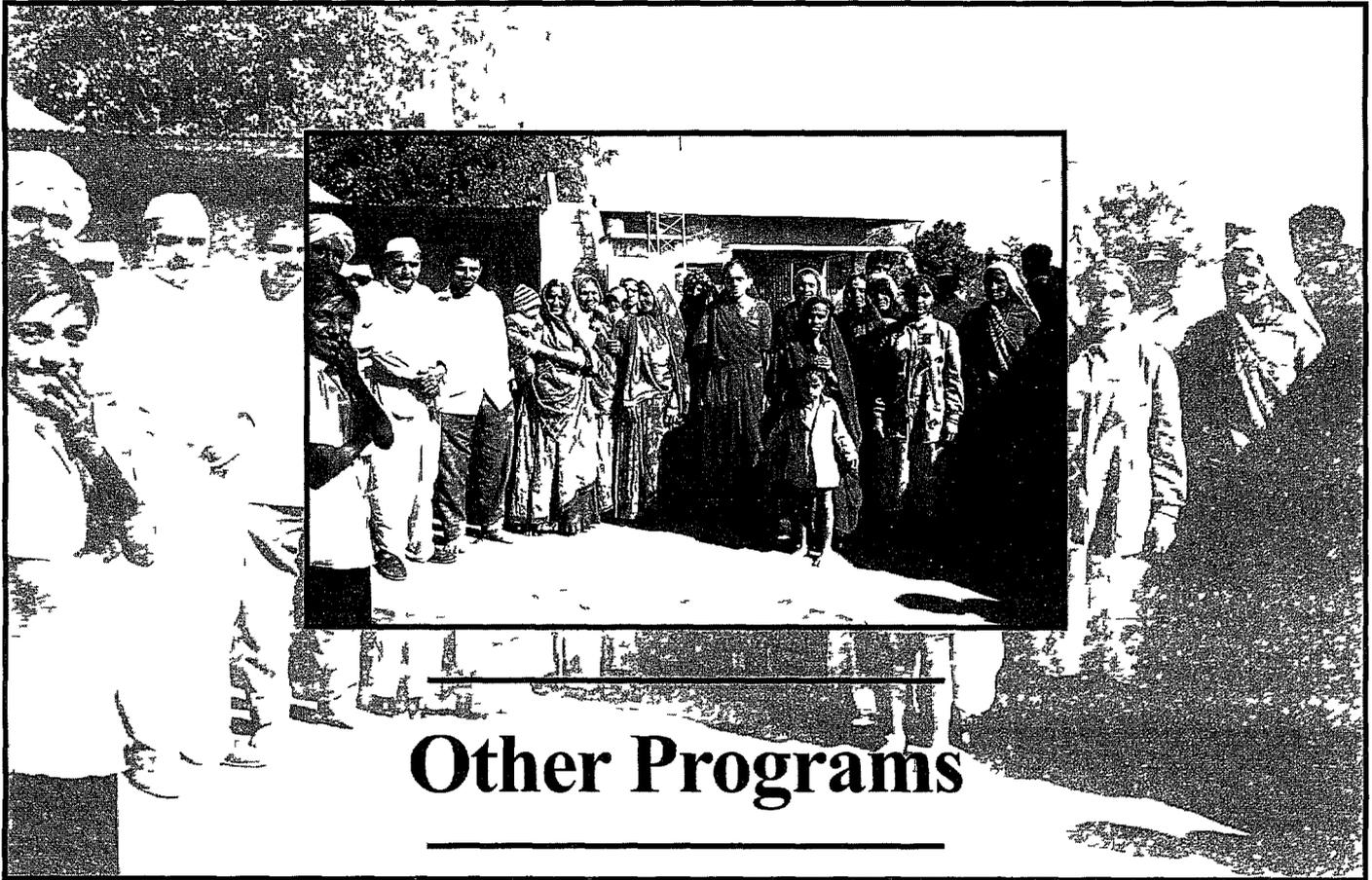
Importance of Continuous Improvement When the ram press was first invented in late 1985, few envisioned the proliferation of multiple models and the extensive process of technical change that would follow. Much of this research and development was done by EnterpriseWorks Worldwide, but some was a result of the work of other NGOs and private sector manufacturers.

Scale of Manufacturing In Tanzania, EnterpriseWorks found that relying on a single small-scale manufacturer could keep press prices too high and limit sales through production bottlenecks. As a result, subsequent work in Tanzania and, until recently, all of EnterpriseWorks' oilseed project activities in Zimbabwe and other countries emphasized manufacturing by multiple microenterprises. However, this approach resulted in high project costs for providing training, technical assistance, and most importantly, quality control services for the manufacturers. Ultimately, many of the microenterprises that had produced the ram press stopped making it. To increase the production of presses, reduce manufacturing costs per unit, and decrease quality control problems, EnterpriseWorks is experimenting with mass manufacturing by one firm that would supply the domestic and export markets for the press.

While EnterpriseWorks remains interested in assisting manufacturing microenterprises, the bulk of the economic benefits of the ram press go to press users and oilseed farmers. The income and employment gains for microenterprises manufacturing the press are relatively small compared to those of the oilseed processing enterprises. The best way to maximize total economic benefits is to produce the press as cheaply as possible, make it widely available, and try to eliminate quality control problems.

Selected Sources for Further Information

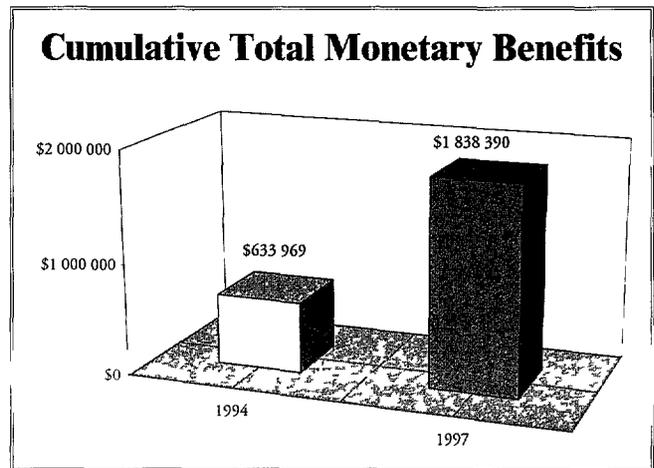
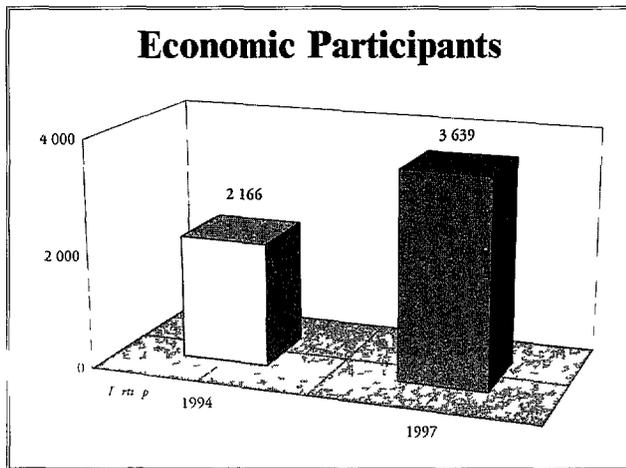
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- Hyman, Eric. 1998. NGO Roles in Developing and Commercializing Technologies for the Rural Non-Farm Economy. Prepared for the IFPRI Workshop on "Strategies for Stimulating Growth of the Rural Non-Farm Economy in Developing Countries," May 17-21, 1998. Washington, DC: EnterpriseWorks Worldwide.



Other Programs

Other Programs

Cumulative total monetary benefits and the number of economic participants from 1993 through 1997



Guatemala Ceramics Project

May 1992 - December 1997

Project Overview

This project established a Ceramics Support Center (CSC) to provide technical services, sell machine services and improved inputs, develop appropriate designs of gas and wood-fired kilns, offer ceramicists fixed and working capital loans, and help them tap more lucrative markets. Ceramics production in Guatemala had been a declining industry because of substitution of cheaper items made from plastic, the high cost of wood fuel for kilns, the labor-intensiveness of manual preprocessing of clay and tending traditional kilns, a lack of capital to expand, quality control problems, and rudimentary product designs that did not match the tastes of the export market. Ceramicists also faced occupational hazards from use of lead glazes and exposure to kiln heat.

Project Partners

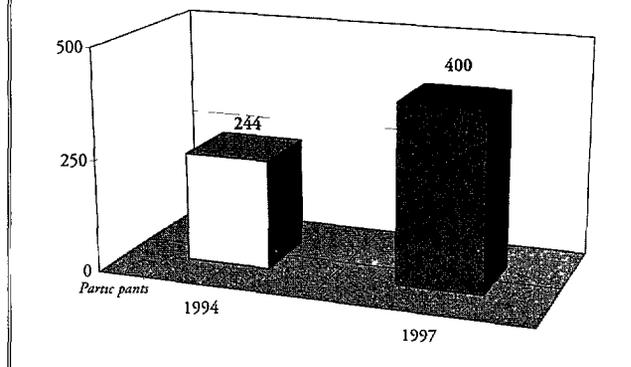
- Fundacion para el Desarrollo Integral de Programas Socioeconomicos (FUNDAP - Foundation for the Integrated Development of Socioeconomic Programs)

Funders

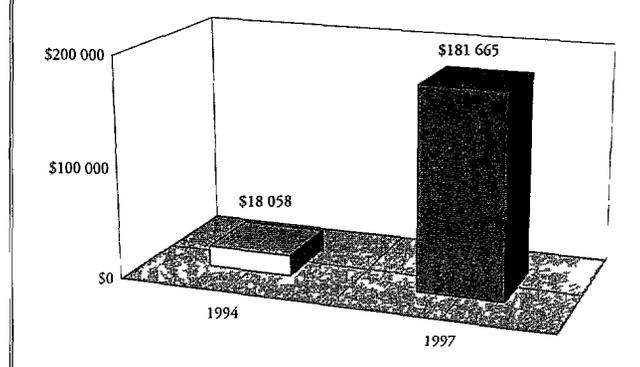
- Fundacion para la Asistencia al Desarrollo (CODESPA - Foundation for Development Assistance) [Spain]
- Fondo Nacional para el Fomento de las Artesanias (FONART - Mexican Republic National Fund for Handicrafts)
- Proyecto de Apoyo a las Artesanias (PROART - National Project for the Development of Handicrafts)
- Fondo de Inversion Social (FIS - Foundation for Social Investment)

Budget \$582,875, Expended 100%

Economic Participants



Cumulative Total Monetary Benefits



Project in Progress

Objectives and Targets

- Help 400 ceramics enterprises (800 owners and workers) in the Department of Totonacapan to increase their incomes by increasing the quantity and quality of their pottery and reducing production costs
 - Encourage ceramicists to switch to low-lead and lead free glazes for pottery to reduce producer and consumer exposure to this toxic metal, and improve working conditions for ceramics producers by reducing exposure to kiln heat
 - Decrease fuelwood consumption in pottery making to help conserve forest resources
-

Accomplishments

Ceramics Support Center (CSC) In 1997, the cooperative of ceramicists continued providing services to its members through the CSC. None of the previous members dropped out and some new members joined. The cooperative's Board of Directors demonstrated increasing responsibility. The ceramics producers were able to use equipment at the CSC on a service fee basis, the equipment includes a ball mill, small jar mills, and a hammermill. Clay milling was the most popular service provided by the CSC. In 1997, the CSC received no funds for covering salaries or other operating costs. In 1997, 50 ceramics enterprises paid for use of the gas-fired kilns at the CSC, 30 used the CSC's drying facilities. 35 paid for CSC milling services, and 3 purchased improved glazes. The CSC received \$350 from fees for using the gas kilns and \$1,141 for other machine services (milling of clay, glazes, and lead). It also grossed \$3,473 from sale of raw materials.

Technology Development The project designed a gas-fired kiln for urban ceramics enterprises in three sizes. The gas kiln was intended to reduce fuel costs and deforestation, save labor time in fuel preparation and tending the kiln, allow year-round production, reduce product losses in firing, and enable use of low-lead, high-temperature glazes for better product quality and decreased health risks. It took much longer than expected to identify a low-cost formula for the kiln refractory linings using locally available materials. A kiln for calcination of glazes and frits was also produced for the CSC. A clay dryer was developed for the CSC, but design problems had not been fully worked out.

Construction of a New Ceramics Support Center FIS provided \$70,000 for construction of a building for the CSC which was scheduled to be completed in 1997.

Capacity Building Eight local associations of ceramics producers have been formed to promote the sustainability of project impacts.

Marketing Assistance FUNDAP's for-profit marketing unit, INNOVA, purchased products from the best of the assisted ceramicists for resale to export and tourist markets. Members of the coffee cooperative can go through the CSC to access the marketing services of INNOVA, but cannot do this directly on their own. In 1997, 10 loans were made with a value of \$2,274. A total of \$8,663 in loan repayments was due and the cooperative received \$4,436 in repayments (including \$829 in interest). The balance in the loan fund at the end of the year was \$1,693.

Training Expanded to Ceramicists Outside the Project Area With \$9,000 in support from FONART and PROART, the project offered a training workshop in 1997 to enable more ceramicists in Totonacapan as well as others outside the project's service area to adopt technologies and other inputs promoted by the project. The improved glazes from FONART were well received because they can be fired at relatively low temperatures (less than 1000°C) that can be attained in traditional open kilns. The project was moving toward becoming a national resource.

Challenges

Logistical Challenges Initially, provision of improved inputs and services to ceramicists was hampered by unreliable electricity, supplies, the need to move the CSC from its initial rented site, and the poor condition of some of the used equipment donated by CODESPA

Cost of Kilns While a gas-fired kiln can be a profitable investment over time, most producers considered the initial capital cost to be high even with loan financing. Although the gas-fired kilns can be profitable for larger, urban ceramics enterprises, the smaller rural enterprises (especially those operated by women) cannot take advantage of this technology. The project did not succeed in developing an economically viable, fuel-efficient, wood-fired kiln for rural producers who make large ceramic pieces such as containers for water storage.

Cost of Imported Materials The cooperative's lack of adequate funding for importing raw materials from Mexico has been a limiting factor preventing widespread adoption. Nevertheless, at \$0.75-\$1.00 per lb, the price of better imported glazes is competitive with lead glazes.

Low Demand The domestic demand for low-quality ceramics has been declining due to substitution of less costly plastics. While the project provided some design assistance to the ceramics enterprises, further design improvements for ceramics products are still needed to reach more lucrative export and tourist markets.

Credit Repayment Problems In 1997, the cooperative continued to offer credit, but the value of the loan portfolio was reduced because of repayment problems with the large loans for gas kilns. Kiln owners cited operating inefficiencies due to the problems with the refractory linings for the kiln as the reason why they could not repay their loans on time.

Absence of a Technical Expert The project budget was too small to allow for hiring long-term technical experts. While a capable consultant from Mexico was brought in on some extended consultancies, technical progress stopped when he was not in Guatemala.

EnterpriseWorks' Role in Leveraging Funding from Other Donors Although EnterpriseWorks' financial contribution to this project was small, its technical assistance role proved crucial in helping the project partner get a larger amount of funding from another donor.

Market Niche for Decorative Ceramics is Small While the project provided important benefits to the participating producers, decorative ceramics production involves a relatively small number of producers in Guatemala. Also, the cost-effectiveness of the project was relatively low because of the small market for Guatemala ceramics. EnterpriseWorks now chooses commodity areas based on a number of criteria and the potential magnitude of outreach and impact.

Selected Sources for Further Information

- Hyman, Eric and Luz Marina Delgado. 1995. Midterm Evaluation of the Guatemala Ceramics Producers Project. Washington, DC: EnterpriseWorks Worldwide.

India, Philippines, and Sri Lanka Rhizobium Inoculant Project

March 1994 - February 1997

Project Overview

This project was designed to enable small-scale farmers of legumes (such as soybeans, groundnuts, and mungbeans) in Sri Lanka, India, and the Philippines to increase their incomes through use of rhizobium inoculant. Rhizobia are types of bacteria that live on root nodules of leguminous plants and convert atmospheric nitrogen into a form that plants can use. Since nitrogen is one of the most important nutrients for plant growth, rhizobium inoculant can increase crop yields and/or reduce production costs by allowing a reduction in chemical fertilizer use. Before planting, the legume seeds are moistened and coated with a powder that contains the live bacteria in a substrate such as peat moss.

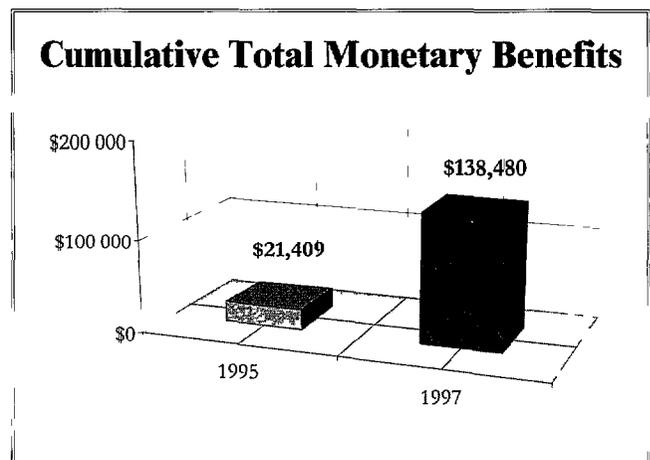
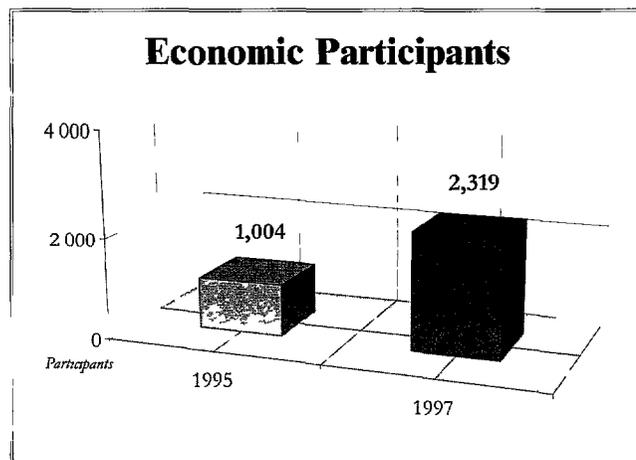
Project Partners

- ATI/Philippines
- Plenty Foods Private Limited [Sri Lanka]
- University of the Philippines at Los Banos (ULBP) Biotech Unit [Philippines]
- Hindustan Biofertilizer Private Limited [India]
- Biological Nitrogen Fixation for International Development (NifTAL) [USA]
- Asia Network for Small-scale Agricultural Bioresources (ANSAB) [Nepal]
- Philippine Department of Agriculture (DA)
- Philippine Council for Agriculture, Forestry and Natural Resources (PCARRD)

Funder

- International Development Research Center (IDRC)

Budget \$256,603, Expended 100%



Objectives and Targets

- Ensure the reliable supply of high-quality reasonably priced rhizobium inoculant through private and public sector cooperation
- Develop a business plan for at least one enterprise in each country to produce and market inoculant
- Promote the Lab-to-Land process of cross-country collaboration, and
- Conduct field trials of rhizobium use with at least 1,400 farmers

Accomplishments

Sri Lanka

Plenty Canada, (an NGO when the project began at that time) was the principal project partner in Sri Lanka. It imported rhizobium inoculant from Thailand and sold it to farmers for field trials with soybeans in four districts during both the rainy and dry seasons of 1995-96. Plenty's extension agents trained 465 farmers in rhizobium use. The Institute of Fundamental Studies in Kandy tested the quality of the rhizobium before sale.

Although initially committed to establishing a new rhizobium production facility in Sri Lanka, Plenty Canada was not financially or administratively prepared to do this as scheduled. Instead, it continued importing rhizobium for distribution through extension agents and collaborating retail outlets. In 1996, the NGO was reorganized as a private company, Plenty Foods Pvt Ltd. After launching commercialization activities, it expanded the distribution network by adding Ceylon Agro-Industries and 16 other retailers. With the improved distribution network, the project was able to increase the number of households using rhizobium by over 200 percent in 1996 and the land area covered by over 300 percent.

India

Hindustan Biofertilizer (HBF), a private business in Orissa, set up a small-scale rhizobium production facility that supplied inoculant from its own laboratory and other manufacturers to 520 farmers for field trials in 1995-96. In 1996, HBF began setting up a more sophisticated Micro-Production Unit designed by NIFTAL. In 1996, HBF purchased some equipment from U.S. suppliers and its owner received further production training in Bangkok.

The Tata Energy Research Institute (TERI) in New Delhi and a public sector laboratory in Orissa provided quality control services for HBF. The company contracted with TERI to conduct random sample testing on a long-term basis. In 1996, HBF field staff and two wholesalers distributed rhizobium inoculant and 44 retail shops sold it to farmers.



A farmer inspecting his legume crop inoculated with rhizobium

The Philippines

Biotech, a university research unit, and the Philippine Department of Agriculture (DA) produced and marketed rhizobium in conjunction with the project. The DA owned decentralized rhizobium production facilities and sold inoculant through its extension staff and a farmer's cooperative. The rhizobium packets were bundled with legume planting seeds — a sales strategy that had previously proven effective in Thailand. A total of 145 farmers participated in inoculant field trials with mungbeans.

The partner organizations had planned to expand production to serve mungbean farmers outside the field test area, but were limited by insufficient supplies of inoculant. ATI/Philippines worked with the DA to identify private sector agro-input retail stores and cooperatives to serve as distributors. The inoculant produced by Biotech was of much better quality than the Department of Agriculture's product. To address this problem, Biotech trained the DA staff and provided continuing quality control services to the DA production facility by randomly testing samples of the inoculant.

Challenges

Unfamiliar Product It is difficult to market rhizobium inoculant on a commercial basis where farmers are not familiar with its use because the costs of demonstration plantings and farmer training are likely to exceed short-term manufacturer or dealer profits from its sales. Agricultural input retailers also expressed concern that the inoculant would reduce their sales of chemical fertilizers, a product with a higher profit margin.

Quality Control Prior experience with poor-quality rhizobium inoculant presented an additional challenge for the project in some locations. In India, efforts to link the inoculant manufacturer with an external quality control laboratory proved difficult due to costs and the distance between the two organizations. In Sri Lanka, testing is still needed for rhizobium carriers that can be made from domestically available materials.

Promotion of the Technology The agricultural extension service in Orissa, India did not have a strong interest in promoting rhizobium due to previous experience with the government's promotion of the technology. The Government of Sri Lanka had a major program for soybean farmers that included promotion of rhizobium, but did not offer similar services for mungbean and groundnut growers.

Low Demand The demand for rhizobium inoculant in the Philippines was low because there was relatively little cultivation of soybeans and other legumes. Soybean production in Sri Lanka declined in 1995 and 1996.

Economies of Scale Since rhizobium production was done on a laboratory scale in India and the Philippines, the equipment and facilities need to be upgraded to reach an industrial scale of production. In India, public sector rhizobium producers had a large excess capacity that was a barrier to entry of private producers, while the Indian market is large enough to support specialized inoculant producers that do not make other products. Product diversification would be necessary to achieve commercial viability in other countries.

Lessons Learned

Promoting Private and Public Sector Partnerships Closer coordination between public sector agricultural extension agencies, private rhizobium producers, and retailers is needed in countries where the inoculant has not yet been commercialized. Without this, private firms may be reluctant to produce and market a relatively unknown product without an established demand. In previous public sector efforts to promote rhizobium in Thailand, closer coordination between public sector agricultural extension agencies, private rhizobium producers, and retailers was needed. In countries where the inoculant has not yet been commercialized, the promotion and train-

ing efforts of agricultural extension agents were needed to ensure that sufficient supplies of high-quality inoculant were available. Although the private and public sector partnership was helpful, managing this collaboration was the project's greatest challenge. Planning and coordination in all three countries took far more time and energy than expected.

Demonstration and Training Since training a few farmers at a time is not cost effective, new approaches that can reach larger numbers at a time are needed. Rhizobium promotion will only be effective in increasing inoculant use if supply and quality control problems have already been overcome. Commercialization of a technology can be hindered if the public sector continues to have a major role in production and distribution, especially if it is sold at a subsidized price. However, commercialization can be accelerated if the public sector role is limited to promotion and training.

Quality Control Public sector producers of rhizobium have frequently had trouble maintaining quality standards and this can discredit the technology for a long time. Quality control was often a problem in previous public sector efforts to promote rhizobium, especially in Orissa, India. As a result, EnterpriseWorks' subsequent project in this state faced a challenge in re-establishing the integrity of the product. Proper storage is also important since the inoculant has a limited shelf life (6 months to 1 year) and is susceptible to heat damage.

Product Demand The field trials increased farmer demand for rhizobium inoculant in the test areas in all three countries, but the extent of the increase is not clear. The yield increases were less encouraging for mungbeans than soybeans because mungbeans were typically planted after the rice harvest when native rhizobium were already present in the soil in sufficient numbers and dry weather and pests reduced yields. Continued support for rhizobium production and distribution is needed until demand increases enough to generate private sector interest.

Need for Longer Term Activities Transferring a new technology to smallholder farmers requires continuing efforts on a significant scale. The 3-year time frame of the project was too short and the relatively small financial resources were spread too thinly over 3 countries.

Selected Sources for Further Information

- Singleton, Paul. 1997. Lab to Land: Application and Commercialization of Rhizobium Inoculant for Small-Scale Farmers in India, Sri Lanka, and the Philippines. Washington, DC: EnterpriseWorks Worldwide.

Thailand Micro-Enterprise Finance Project

June 1993 - March 1996

Project Overview

This project was designed to provide financing (loans, equity capital, and loan guarantees) and other business development services to low-income entrepreneurs, primarily women in Northern Thailand. It was also aimed at strengthening the partner organization's enterprise development program so that it would be financially viable and sensitive to the needs of women clients. The projects planned to establish links with formal financial institutions that would serve its graduating clients.

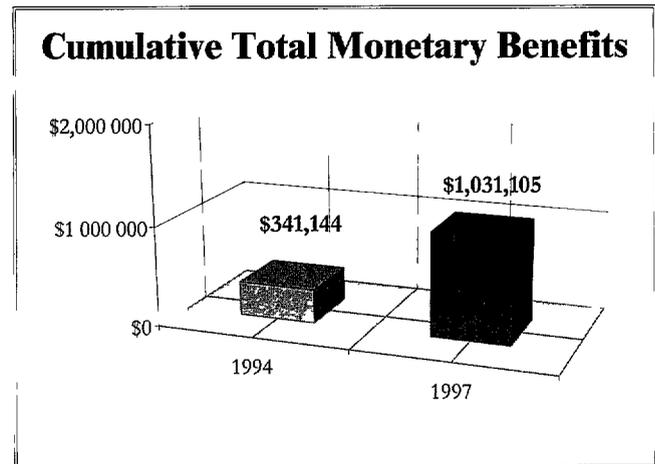
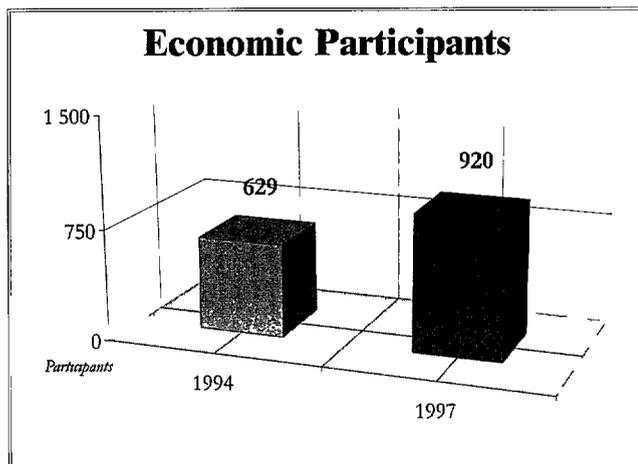
Project Partner

- The Rural Small-Scale Industry Development Company (RSSI) of the Population and Community Development Association (PDA) [Thailand]

Funder

- United Nations Development Fund for Women (UNIFEM)

Budget \$324,085, Expended 100%



Objectives and Targets

- Finance at least 380 investments providing a total of \$186,000 to 160 clients
- Provide 50% of the loans to enterprises owned by women
- Achieve a loan delinquency rate below 5 percent,
- Sell at least 1% of RSSI's outstanding shares to clients,
- Link 15 clients to formal financial institutions

Accomplishments

Loans In its first meeting, the project's Policy Advisory Group (PAG) limited the financial services to just loans, dropping loan guarantees and venture capital investments due to concerns about staff and client capacity and insufficient time for training and testing these other financing methods. The project also provided nonfinancial business development services. The project provided loans to 379 enterprises with a total value of more than \$750,000.

Over the course of the project, RSSI became more efficient at screening clients. In the first year, the ratio of loan approvals to enterprise visits was 1 to 3.06, it improved to 1 to 2.69 in year 2. The average loan size was \$1,979 and no collateral was required. The interest rate was 18% per year and the loan term was typically 6 months. At the time, most formal financial institutions in Thailand charged an interest rate of 10.5% to 12%, although some charged nearly 17% but all of them required collateral. Activities financed included food shops, handicrafts, clothing, silk weaving, furniture making, and agriculture. A total of 17 clients (including 11 women) were linked to formal financial institutions.

Focus on Women Clients Unlike formal financial institutions, this project sought out women clients and helped them with business planning and loan applications. Since women entrepreneurs often have little or no collateral, they were generally not served by banks. Since there were some repeat loans, 450 clients (293 women and 177 men) benefited.

Project Sustainability EnterpriseWorks' financial contribution to this project ended in March of 1996, although the project's revolving loan funds allowed it to continue as previous loans were repaid.

Challenges

Delayed Implementation Project start-up was delayed almost 2 years because of USAID restrictions on new development assistance funding in Thailand after a democratically elected government had been overthrown. These restrictions also applied to funds from EnterpriseWorks Cooperative Agreement with USAID.

Increase in Rates During the first year, there were no loan defaults because the enterprise promotion specialists knew the initial clients well. However, as the project staff expanded their outreach, they encountered clients that they were not familiar with and who had less reliable references. The loan delinquency rate was higher than expected and transaction costs amounted to almost 20% of the approved loans. Some loan repayments were late due to the seasonality of the financed enterprises. In one area, flooding caused repayment problems because clients could not produce or sell their products and had to pay for repairs to damaged property. Some defaults were due to overly optimistic cash flow projections in the business plans. About a quarter of the defaults appeared to be willful and had to be written off, especially in cases where clients could no longer be located. RSSI's loan review committee was working to strengthen the loan appraisal procedures.

Lessons Learned

Choice of Microenterprise Financing Methods The project demonstrated that rural entrepreneurs are interested in taking out loans with unsubsidized interest rates. Because the focus was changed to direct loans, the project was unable to demonstrate that a loan guarantee fund or equity investments could have helped clients who had little collateral but proven business skills and enough profit to access commercial bank credit. Since other financial institutions charged a lower interest rate, RSSI could have charged graduated enterprises a fee for assistance in leveraging finance from other sources. RSSI could have earned dividends and capital gains from equity invest-

ments in successful enterprises that could conceivably have exceeded revenues from loan repayments, but this mode of financing was not tested. Many low-income entrepreneurs served by this project needed \$500 to \$2,000 in financing and felt that a longer term loan (6 to 12 months) might have served their needs better.

Many of the clients did not want the 'business' partner relationship that an equity investment venture mechanism would have imposed. Venture capital may not be a very appropriate financing mechanism for microenterprises in developing countries. The shared ownership and need for greater transparency in accounting for profits and losses when venture capital financing is provided would have necessitated a level of business involvement by the project that microenterprises are unwilling to accept.

Over-Ambitious Goals Provision of financing for small-scale enterprises (rather than microenterprises) was a new activity for RSSI. The project tried to accomplish too many things over a short period of time and the initial capital fund was too small to allow RSSI to become self-sustaining. The Policy Advisory Group directed RSSI to experiment with new services for women, raise additional funds, and contain costs and it proved difficult to do all of these things simultaneously. High expectations for replicability and scaling up of operations after the pilot phase were not met.

Staff Training and Organization of Credit Groups The high loan default rate indicated some deficiencies in assessing loan risks and enforcing repayment. Greater staff training and incentives might have been able to reduce this problem. The transaction costs were also high due to the range of other business development services besides credit that RSSI provided. The project's final evaluation recommended that RSSI organize savings and credit groups to reduce delinquency rates on its own loan portfolio through peer pressure and help the enterprises speed up their own capital accumulation so they could be served by formal financial institutions.

Other Pre-Impact Projects

Benin Technology Transfer Project

October 1997 - October 2001

Project Partner

- ATI/Benin

Funder

- USAID/Benin

Budget \$1,626,486, Expended 8%

This project in Benin has two main components — to establish manufacturing and sales of treadle pumps, equipment, and hand-augered, PVC-lined tubewells and to introduce the large Bielenberg ram press for small-scale processing of edible oil. The project's goal is to sell 200 treadle pumps in year one and 300 additional pumps in year two. In 1997 the project trained 3 treadle pump manufacturers and 70 pumps were sold late in the year.

Prototypes of three oil presses were built and tested on various oilseeds — the manual and motorized Caltech expellers EnterpriseWorks had promoted in the 1980s in Cameroon and the large Bielenberg ram press developed in Tanzania (see Tanzania Oils Project). The Caltech presses were used for the extraction of palm oil and the Bielenberg press for sesame, sunflower seed, peanuts and coconuts.

Niger Market Gardening Project

March 1997 - March 2001

Project Partners

- Agence Nigerienne de la Promotion de l'Irrigation Privee (ANPIP - Niger Agency to Promote Private Irrigation) [Niger]
- ATI/Niger

Funder

- The World Bank

Budget \$960,692, Expended 18%

This project was designed to test inexpensive improved technologies for water capturing, lifting, and distribution. The project's targets over its 4-year life are:

- Import 40 pumps for testing,
- Train 20 artisans in pump manufacturing,
- Sell 1,000 pumps,
- Conduct 1,600 demonstrations,
- Sell 1,000 tubewells,
- Test various technologies for capturing, lifting, and distributing water,
- Assist a total of at least 3,250 people

Activities will also include training, technical assistance, and provision of equipment for manufacturers as well as extension services and promotion of the technology through the media. In 1997, five enterprises were manufacturing treadle pumps, and the project sold 26 treadle pumps and 7 tubewells.