



Meeting a Pressing Need

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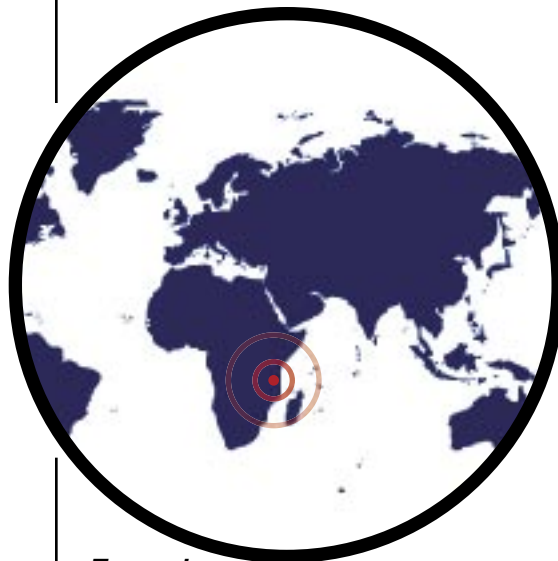
Development, Design, Dissemination
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"In terms of simple village level technologies, many people see the ram press as potentially one of the most beneficial devices available in Africa today. The benefits people can derive from the use of this technology are amazing, for example, cooking oil for home consumption, better nutrition and better health for both people and their livestock. Also it can help increase milk production, income, and employment at the rural level."

-Schuleter and Gramina, 1990

In a culture so preoccupied with body image, the latest diet fad, and obesity statistics, it is easy to forget that much of the population of Sub-Saharan Africa suffers from malnutrition resulting, in part, from a lack of fat in people's diets. Dietary fats enable the body to absorb certain vitamins; they are sources of the fatty acids necessary for membrane functions, control of blood lipids, and cell structure; and are vital sources of energy for the body (IDRC 1998, Zulberti, Schmidt & Navarro 1990). Low intake of dietary fat results in low energy reserves, produces skin disorders, and affects the development and function of the brain (Zulberti, Schmidt & Navarro 1990).

The FAO (Food and Agriculture Organization of the UN) recommends that each of us consume 9.6 liters of dietary fats each year. In late-twentieth-century Sub-Saharan Africa, however, oil consumption was often far below this level, particularly in rural areas. In some parts of Kenya, for instance, the average person consumed only 1.5 liters a year, much less than was necessary for good health (Dawson 2002). The countries with the lowest consumption of dietary fat tended also to have low GNP and a largely rural population that practiced low-input agriculture (Zulberti, Schmidt & Navarro 1990). Although most of these countries did produce some type of oilseed, local production was insufficient for local needs, and both imported and domestic commercially produced oils were expensive, and so unavailable to the rural poor.



Tanzania:

Population 36,588,225
Area: 945,087 sq. kilometers
Life Expectancy: 44 years
Average Per Capita Income: US\$600
GDP by Sector: Agriculture: 43.6%
Industry: 16.5%
Services: 40%

source: 1



"Adequate amounts of dietary fat are essential for health. In addition to their contribution to meeting energy needs, intakes of dietary fat must be sufficient to meet requirements for essential fatty acids and fat soluble vitamins. The minimum intake consistent with health varies throughout a person's life and among individuals. Adequate intake of dietary fat is particularly important prior to and during pregnancy and lactation. Increasing the availability and consumption of dietary fats is often a priority for overcoming the problems of protein-energy malnutrition."

source: 4

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Developing the Oilseed Ram Press

By the mid1980s, a number of development agencies were hoping to solve this problem by making small-scale oilseed processing equipment available to rural communities. In 1985, Carl Bielenberg was working for the development agency Appropriate Technology International (ATI). Bielenberg's task was to offer technical assistance to the Arusha Village Sunflower Project, an NGO development project intended to manufacture and disseminate a type of manually operated 'scissor jack' seed press in the Arusha region of Tanzania (Bielenberg 1990). ATI was aware that there were technical problems with the press, but had decided to assist with its dissemination and field-testing while these problems were resolved.

Bielenberg, an engineer, had spent much of the 1970s living in Cameroon where he had a manufacturing workshop making 'whatever people wanted'. This experience taught him that a successful technology for rural Africa needed to be simple, have few parts, and be designed to be durable. The scissor jack press that Bielenberg was supposed to be working with was expensive, labor intensive, and did not fit these criteria, so he set-about designing something better.

For the Tanzanian project to be sustainable, it was important that Bielenberg's press (and its spare parts) could be manufactured locally, and that it could be operated by human power alone. The existing technologies most commonly used for small-scale processing were the screw press and the batch press. Both press types work by placing a batch of oil seeds in a heavy-duty metal cage, and then exerting pressure on the material with a heavy metal plunger or piston (ITDG technical brief). The pressure causes oil to be expelled from the seeds, and the oil gradually drips out of the cage into a collection chamber below. The screw press uses a threaded screw to push the plunger and exert pressure on the seeds. This is a highly efficient extraction method, but requires very great mechanical energy – considerably more than can be produced by human power alone. The batch press uses a long handle to operate a big piston that presses large batches of seed at a time. Because the piston is big, hydraulics are required to provide the necessary force. Hydraulics are costly, and not generally appropriate to local manufacturing.



Table 1: Availability of Fats by Economic Group

Region	Grams of Fat/Capita/Day	
	1960 Data	1990 Data
Developing Regions	28	50
Africa	38	43
Far East	22	45
Near East	46	72
Latin America	51	75
Developed Regions	93	128
Former USSR	69	107
Oceania	125	138
Europe	104	143
North America	124	151

Source: 4

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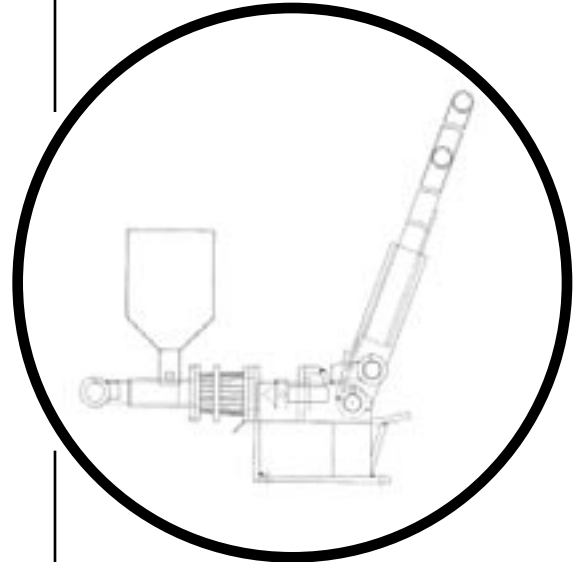
Bielenberg took the batch press as the starting point for his new 'ram press'. First he reduced the piston and cage size enough to produce a press that could be manually operated by two people. A conventional batch press with a small piston and cage could not be operated productively, however - too much time would be wasted waiting for the oil to be expelled, lifting the piston, removing the used seed, and replacing it with fresh material. What was needed was a small-piston press that could operate continuously, rather than in batches. Bielenberg solved this problem by turning the ram-press piston into a kind of valve. When a cage-full of seed has been pressed, the user pulls up the handle and the piston pulls back to its resting position, leaving an empty chamber in front of it. This chamber is automatically filled from a hopper mounted on top of the press, the user pulls down on the handle, the piston moves forward pressing the fresh seed into the cage, and the used 'seed cake' is pushed out of the end of the cage through an adjustable restriction cone, and the pressing cycle starts again.

Although the ram press was a new invention, Bielenberg was later surprised to discover that a patent for a similar press had been issued in England during the mid 19th Century (Bielenberg 1990). The English press was intended to be powered by a steam engine, with the expelled seed cake being used to partially fuel the engine. This technology quickly became obsolete in Europe, and knowledge of the ram press was lost until Bielenberg 'reinvented the press' in late 20th Century Tanzania.

Adoption

When the new press was first launched, there was much controversy among development workers as to whether or not it could be considered an 'appropriate technology' (Bielenberg 1990). The original Bielenberg Ram Press could extract 70-80% of the oil in a load of sunflower seeds, and more if the seed was first heated by laying it in the sun (Hyman 1992). About 100kg of seed could be pressed in 10 hours, yielding 20-30 liters of oil. This output was relatively low for a small-scale press, and some felt that it was not sufficiently productive to be commercial, and so was not 'appropriate' to people's needs (Bielenberg 1990).

The press was, however, sufficiently productive for rural



Drawing of the Bielenberg Ram Press

source: 5



One version of a Ram Press in action
(Mwape, Zambia 2005)

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villages to be able to produce enough oil for their own consumption. The leaders of the Arusha project, Lynn Schuleter and Dallas Gramina, believed that a reliable technology which allowed rural people to be self-sufficient in oil would have a significant positive effect on people's health, and they chose to back the project.

Despite being custom-designed for the project, the Bielenberg press was not initially very well received by ATI, local manufacturers, and some development workers in the field (Schuleter and Gramina 1990). The Arusha Village Sunflower Project had originally been intended to establish ten medium-scale sunflower seed oil-extraction enterprises over 4 years. When Schuleter and Gramina decided to switch to the Bielenberg Ram Press, this objective had to be amended to forty small-scale enterprises (which better suited the production capacities of the new press), and the manufacturers had to start working with a whole new technology (Hyman 1992). In the short-term, the change meant considerable upheaval for everyone involved, with no guarantee of success. Some missionaries who were supposed to be implementing the presses in their parishes wrote to the project leaders asking them not to work in their areas after all; they were afraid that the new press would cause the project to fail, and they didn't want their reputations to be tarnished by association (Schuleter and Gramina 1990).

Dissemination – Ramming Home the Benefits

Schuleter and Gramina realized that, to be successful, they needed a really good dissemination program for the ram press. This program would have to get oil presses into the rural villages where they were so needed, and ensure that those presses were used in a way that provided real benefit to the communities.

The first stage was to arrange a sustainable system for manufacturing the press. The Arusha project began with a single manufacturer for the Bielenberg press, but it was soon discovered that the lack of competition resulted in high prices and mediocre quality control (Hyman 1992). The press was designed for production in a workshop equipped with only a lathe and an electric welder, so project technicians trained a number of small, informal sector workshops in press manufacture. Once trained, the workshops were



Traditional method of extracting oil from peanuts.
(Mwape, Zambia 2005)



The intermediate result of the traditional method of extracting oil, pictured above.
(Mwape, Zambia 2005)

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asked to submit bids to produce 5-10 presses. If a bid seemed reasonable, the Arusha project would place an order and pay the workshop as soon as each press was completed. Whenever a press was sold, the project would commission a replacement (Hyman 1992, Schuleter and Gramina 1990).

Within the context of the Arusha project, this system had a number of advantages over using a single manufacturer. Competition between the various small-scale manufacturers lowered the price of the press, encouraged better quality control, and also resulted in a number of workshops coming up with design innovations (Hyman 1992). Having the project pay for the initial press inventory encouraged manufacturers to take a risk with an unknown product, and allowed them time to get a feel for the market. Finally, a press that could be built and repaired locally was relatively unlikely to fall out of use because of mechanical breakdowns, a lack of spare parts, or a lack of working knowledge of the machinery.

Once a number of good-quality presses were available for sale, the Arusha team began a program of intensive press demonstration and promotion. They took the press to rural villages and agricultural trade fairs, showed it in action, and let farmers and villagers try it for themselves. Sometimes a village would show no interest, or farmers were resistant to the idea of a technology they had never seen or heard of before (Zulberti, Schmidt, & Navarro 1990; Hyman 1992).

When the pioneer press owners were to seen to succeed with the technology, however, much of the resistance disappeared and previously uninterested villages became keen to have presses of their own (Hyman 1992, Schuleter and Gramina 1990). To ensure that people made the best use of the presses they bought, the Arusha project provided each owner with training and information on nutrition, operating the press, marketing the oil and seedcake, the socio-economic benefits of oil seed processing, and running an agri-processing business (IRDC 1998).

Demonstrating the press to villages shortly before the sunflower planting season proved to be particularly important (Hyman 1992). Although some sunflowers were already grown in Arusha, these tended to be hard-shelled varieties that were often low in oil content. The Bielenberg

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press is suitable only for soft-shelled seed varieties, some of which are very oil-rich and high-yielding. At village demonstrations, farmers could see the advantages of planting the recommended soft-shelled varieties, and could buy suitable seed from the project.

To make it possible for rural people to buy the press, the Arusha project offered loans for up to 75% of the market cost (Hyman 1992). Borrowers who operated their presses at a productive level were able to earn back enough to pay off their loans within a single pressing season. There were, however, early problems with the loan scheme, which stemmed largely from restrictions on who qualified. The Arusha project was implemented by the Lutheran Diocese of Arusha, and received significant funding from Lutheran World Relief (in addition to ATI and USAID). Initially, the Arusha Diocese's Project Steering Committee restricted loans to village groups and Lutherans. This considerably limited the dissemination potential of the press; although many people in the Arusha region were Lutherans, there were very few organized groups within the villages that the project staff could work with (Schuleter and Grania). Schuleter and Gramina found themselves having to work with villagers to form artificial groups to apply for a loan and operate a press. This extra task was a drain on their limited time and resources, loans were often not repaid on time, and the project staff felt that artificial groups were unlikely to make a success of oilseed processing operations.

Two years into the project, ATI and the project staff persuaded the Lutheran Steering Committee to offer loans on a non-denominational basis, and to individuals as well as groups (Hyman 1992). Once the loan-scheme was opened-up, the technology began to spread rapidly in the region.

In addition to the ram press technology and the dissemination program, Schuleter and Gramina emphasized the importance of follow-up and monitoring in the success of the Arusha project (Schuleter and Gramina 1990). The first version of the Bielenberg press sold in Arusha was large and quite difficult to use, and so generally needed to be operated by two people at a time. The project team began disseminating this press despite its drawbacks, but were careful to collect feedback from the owners and work with them to solve any problems. After a year of feedback on the first model, Martin Fisher of ATI modified the press to



Operation of a ram press.
(Mwape, Zambia 2005)

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make it easier to use (principally by lengthening the handle). Because the project staff had maintained good relationships with the original press owners, it was easy for them to introduce a new press design without having people lose faith in the product or the project. Feedback continued to be collected throughout the project, and eventually the Arusha staff switched to disseminating a less expensive, easier to use model developed by the Craftsmen and Artisans Promotion Unit (the CAPU press).

Project success

By mid-1991, 368 ram presses had been sold in Tanzania as a result of the Arusha project and a follow-on project implemented by the same team (Hyman 1992). In the year from July 1989 to June 1990, the individually owned presses produced an average of 2,440 liters of oil, whereas the group-owned presses produced a much lower average of 1,070 liters. A survey of press owners from the Arusha project conducted in 1990 indicated high consumer satisfaction with the ram press. All the presses in the region remained in working order, including the earliest machines that were of relatively poor quality. Few mechanical problems were reported, and owners were able to get spare parts and repairs locally and cheaply.

Households with presses had significantly increased their own consumption of oil, press owners were able to sell surplus oil at a profit, and a market had emerged for the 'seed cake' by-product to be used as animal feed (Hyman 1992 and 1990). Many press owners reported building new houses and livestock with the proceeds, or paying school fees for their children (Hyman 1990). During the period of the Arusha project (1986-1989), the local production of sunflower seed increased fourfold, and there was an almost complete shift to planting the soft-shelled varieties that are suitable for processing with the ram press. At this period, ram press owners in rural areas reported earning more than typical urban salaries in the local capital. In addition to domestic and commercial pressing, most owners also reported providing service pressing for other farmers in exchange for a share of the oil extracted.

Developments beyond Tanzania

After partnering in the Arusha project, ATI developed a

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program called Regional OILS to implement the ram press and other small-scale oil processing technologies in a variety of African countries. At around this time, ATI also changed its name to Enterprise Works.

As the Regional Oils program progressed, Enterprise Works' made a decision to radically alter their approach to ram press manufacturing and dissemination (IDRC 1998). Originally they had limited their role to offering technical assistance to NGOs such as the Arusha project. In the late 1990s, however, they switched to a private sector approach, founding for-profit companies to commercialize and mass-manufacture the presses.

In Zimbabwe, for instance, Enterprise Works felt that having production shared between small manufacturers was limiting the impact of the program (Dawson 2002). The small workshops were not sufficiently productive for the a well-established program, and keeping up with training, quality control, and back-up support was proving to be too expensive and time-consuming for this approach to be sustainable. As a means of addressing this problem, Enterprise Works teamed with a private engineering firm and founded a company (RAM Ltd) to mass-produce the ram presses. Thanks to the economies of scale, RAM was initially able to increase profits on press sales while dropping the prices by 10% (Dawson 2002). In 1995, Enterprise Works took this new approach a step further, and formed a distribution and marketing company for the Zimbabwean presses, called ZOPP. Initially, ZOPP sold presses through agents, shops, and partner NGOs, but later took on a more direct commercial role and started selling direct and having staff on commission. Enterprise Works believed that this program of mass production and commercialization had a greater overall impact than their earlier small-scale production strategy. However, they also saw their earlier foundation-building strategies as vital prerequisites for commercialization.

Unfortunately, political instability and violence in Zimbabwe meant that EnterpriseWorks was unable to continue working with RAM and ZOPP, and they were forced to close their Zimbabwe Oils project in 2000. It is, therefore, impossible to judge whether this private sector approach to manufacturing and distributing the presses would have been successful in the long term.



Data Recently Collected by Enterprise Works (formerly ATI) for the Tanzania Oilseeds & Staple Foods Project:

Project Lifetime

December 1985 - September 2005

Economic Participants

37,365 (2001)

Enterprises Assisted

874 (2001)

Total Monetary Benefits

\$921,975 (2001)

Cumulative TMB

\$12,520,284

Project Budget

\$2,887,000

Primary Funders

USAID

CIDA (through CARE/Imara)

National Income Generation Project

Tanzania-Swiss Trust Fund

Food Industry Crusade Against Hunger

source: 6

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The Kenyan non-profit ApproTEC also had considerable success disseminating ram press technology. ApproTEC was co-founded by Martin Fisher, who had made the first modifications to the Bielenberg ram press when he worked for ATI in Tanzania. Later, whilst working for Action-Aid Kenya, Fisher made further alterations to the press, and developed a filter to make the process of purifying the expelled oil much simpler and quicker than before (Fisher 1990).

ApproTEC was founded on the belief that self-motivated entrepreneurs running dynamic small-scale businesses are the most effective agents for developing emergent economies (Fisher 1998). The organization developed and promoted technologies that were affordable and appropriate in their context, and had good potential for creating profitable new enterprises and jobs. In the early 1990s, oilseed and oil prices in Kenya were high, but there was no suitable oilseed-processing equipment available for purchase by small-scale entrepreneurs. Consequently, ApproTEC developed their own version of the ram press and an improved filter, and trained four Kenyan engineering firms to manufacture them (Fisher 1998). This press was called the 'Mafuta Mali', Swahili for 'oil wealth'. Using the Mafuta Mali, two workers could produce over 20 liters of oil and 60kg of seed cake per day. Profit margins for oil press businesses were as high as 100%.

Like the later Enterprise Works Regional OILS projects, ApproTEC promoted this technology to entrepreneurs using private sector marketing strategies rather than conventional NGO distribution channels (Fisher 1998). This distribution method worked well for ApproTEC, and by the end of 2003 they had sold over 1,000 presses in Kenya (ApproTEC 2004). They estimated that over 1,500 new jobs had been created in oil-pressing businesses, and a further 8,000 new jobs had emerged in related activities.



"The ApproTEC Oilseed Press Business Package includes: a press, a bucket filter, a detailed manual, spare parts and a tool kit. The whole package sells for \$350 in Kenya and comes with a one year guarantee. It has been selected as the manual oilseed press of choice by numerous other international development organisations."

source: 8



Approtec's Oilseed Press' Impacts in Kenya through 2003:

- 3 manufacturers making oilseed presses
- Over 1,000 presses sold
- Over 700 oilseed pressing businesses created or expanded
- Over 1,500 new jobs in oil pressing businesses
- Over 8,000 new jobs in related activities
- Increased sunflower cultivation in Kenya
- Improved nutrition for people and livestock

source: 8

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Discussion Questions

ATI/EnterpriseWorks began with a manufacturing and distribution model for the press that focused on local production and community-based promotion and dissemination. Later, they switched to centralized mass-production and a commercial approach to marketing and distribution. Debate the merits of the two models, both in terms of their economics and their broader community impact.

The goals of the Arusha Sunflower Seed Project and ApproTEC were very different. The Arusha project wanted to make rural Tanzanians self-sufficient in edible oils, primarily in order to improve their nutrition. ApproTEC wanted to provide Kenyan entrepreneurs, most of them urban, with a technology that would allow them to create profitable and sustainable new businesses. Compare these two approaches to international development. Are they both an 'appropriate' use of the oil press technology?



The Approtec Oilseed Press in Use in Kenya

source: 7

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