

SORGHUM'S KNIGHT IN SHINING ARMOUR

A small Canadian device for removing the hulls from dryland grains was redesigned in Botswana where it has spawned a milling industry and reduced women's drudgery. The technology, which last year won an international technology prize for the African organization that perfected it, is now being adapted and tested in Zimbabwe, India, and elsewhere.

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Grains aren't really food until they have been processed into palatable form. In the case of sorghum and millet — two important cereal crops for millions of people living in the world's semi-arid regions — the outside layer or hull of the kernels is usually removed before the grain is eaten. This gives the grain, or the flour made from it, a more acceptable texture when cooked.

The labour involved in this daily "dehulling" chore is monotonous drudgery for the women and children who do it. The grain is first soaked in water, then pounded by hand using a mortar and pestle. In Botswana, it takes about four hours a day to dehull enough sorghum for a family of five.

In 1981, sorghum and millet accounted for 28 percent of Africa's cereal production. Despite their important position in the continent's food system, they still represent only a small fraction of the cereals bought and distributed by official grain marketing agencies.

In some countries, sorghum and millet are still viewed as 'poor people's food'. Grown and eaten mainly by rural farmers, they are of little commercial interest to big urban-based milling enterprises.

In recent years, consumer tastes in Africa have begun to shift. Even though sorghum and millet stand up well to drought and can therefore enhance a country's food security, Africans are showing a growing preference for rice, wheat, and prepackaged maize meal — no-fuss status foods, often imported.

In the early 1970s, IDRC began funding a series of research projects on the mechanical dehulling of sorghum and millet. The idea was to, find a way around the 'post-production bottleneck' that was gobbling up so much of rural women's time and relegating millet and sorghum to the status of second-class foods. It was evident that efforts to breed better varieties of these crops would be wasted unless processing techniques were updated.

The starting point of IDRC's initiatives was a barley thresher modified for dehulling by the Prairie Regional Laboratory (PRL) of the National Research Council of Canada. The PRL (later renamed the Plant Biotechnology Institute) also designed a mini-dehuller as a lab tool for testing the dehullability of small samples of grain produced by breeding programs. These



RIIC dehuller: motor-driven abrasive discs replace muscle-powered mortar and pestle.

two prototypes became the jump-off points for experimental projects in various African countries, India, and parts of Latin America. These efforts have spawned several variants of a basic dehuller design, some of which are on the threshold of widespread use in semi-arid areas of Africa and Asia.

Botswana's new milling industry

Some initial experimentation in Nigeria demonstrated the PRL dehuller could be used on local sorghum, millet, and cowpeas. And in the Gambia, the Catholic Relief Services introduced a modified mini-dehuller that handles small batches of grain up to 5 kilograms.

It is in Botswana, though, that the dehuller has undergone the most sophisticated development, not simply as a discrete piece of hardware but as a complete food processing system, including machine design, manufacture, testing, training, consumer surveys, information dissemination, and public policy. Some aspects of this evolution were planned from the start; others, though natural offshoots, were unexpected.

Last year, the organization in Botswana that developed the system, Rural Industries Promotions, won the first International Prize in Development Technology. The competition for

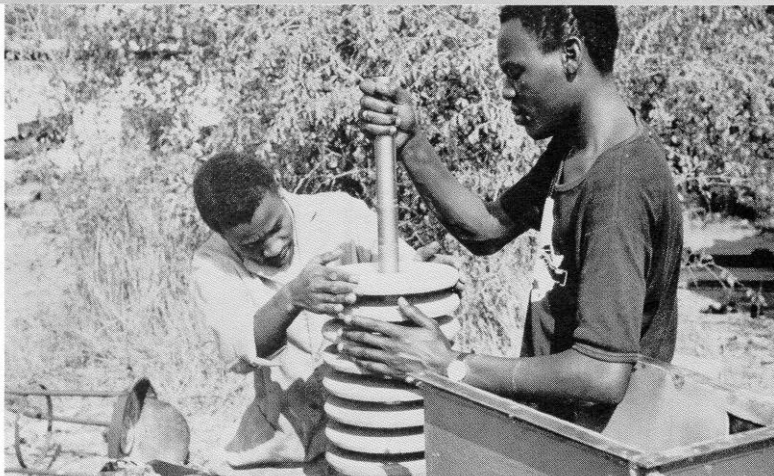
the award was organized by the International Centre for Peoples' Development in Genoa, Italy.

The Botswana experience is a complicated success story, complete with the internal conflicts to be expected when a major component of a country's food delivery system is radically altered. Above all, it is a story of intricate collaboration, over many years, between various government departments and agencies, technical innovators, mill owners, consumers, IDRC, and several other organizations.

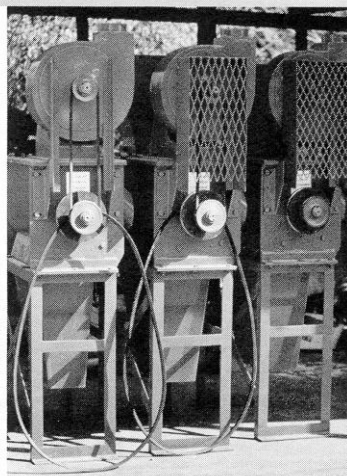
In the mid-1970s, the Botswana Agricultural Marketing Board replicated an earlier Nigerian operation by setting up an experimental sorghum flour mill that included two of the Canadian dehullers. Although the mill was a continuous-flow operation unable to process individual customers' small batches of grain, its experience confirmed that rural and urban consumers liked flour made from dehulled sorghum and were prepared to pay for it.

In 1977, the Rural Industries Innovation Centre (RIIC) entered the picture. RIIC, which is an arm of Rural Industries Promotions, a private, nonprofit development company in Botswana, was already well aware of the 'dehulling-by-drudgery' phenomenon and therefore went to work adapting the PRL dehuller to rural needs. It added a trap door so

Photo: Rowan Shirkie



Left: The heart of the dehusser is a set of closely spaced discs that rotate quickly, rubbing off the unpalatable coating on each grain of sorghum. Right: In Kanye, Botswana, brand new dehullers made by a local firm await inspection at RIIC.



that grain could be removed from the machine at any time. Thus, customers with small batches could have 'their' grain dehulled on the spot and kept separate from other people's.

True to its name, RIIC is a rural operation, based in the large village of Kanye on the edge of the Kalahari Desert in Southeastern Botswana. In the Centre's workshops and offices, engineers and technicians prepare diagrams, build models, manufacture parts, and experiment with new materials. A variety of technologies are under development here: animal-drawn water pumps, windpumps, solar desalinators, farm carts and trailers, biogas plants. And, of course, dehullers. At the same time, young Batswana are being trained in breadmaking, carpentry, tanning, metalworking, milling, and other trades.

As a backdrop to this daily bustle is the continuous hum of the dehusser and hammer mill run by RIIC as a commercial venture to defray operational costs. Local women bring in 10 kilograms of their sorghum at a time to be dehulled and ground into flour for a small fee. The mill can also handle large shipments of sorghum.

With IDRC and other funding, the PRL dehusser went through a relatively quick metamorphosis at RIIC. In addition to modifying the machine to handle either small batches or a continuous flow of grain, the engineers strengthened, lightened, and simplified it. For example, a small platform for holding a container under the grain outlet proved to be unnecessary and was therefore eliminated. This not only cut production costs and manufacturing time, but made it easier to crate the dehullers for transport.

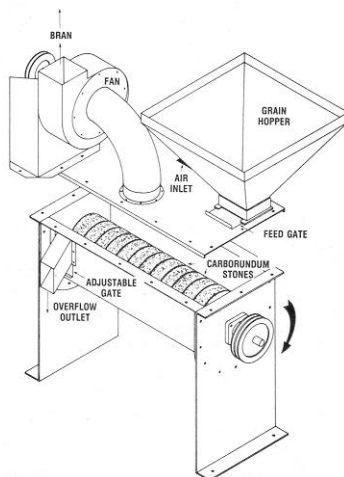
The machine's appearance was also spruced up, a problem of leaking bran corrected, and the bearing housing improved. An operator's manual was also produced in English and Setswana and RIIC was able to provide the necessary performance information to help entrepreneurs get credit to set up sorghum mills.

In the past few years, two major developments have been the transfer of the manufacturing technology to the private sector and the appearance of an export market. Two local companies now build dehullers under the guidance of RIIC which continues to be responsible for marketing and servicing. RIIC also exports dehullers to about 10 other African

countries including, ironically, South Africa which is normally the supplier in its trade with poorer neighbours.

By 1986, 25 small-scale mills (each comprising an engine, one or more dehullers, and a hammer mill) were in operation throughout Botswana, providing about 200 jobs. A small-scale sorghum milling industry is thus now in place, covering the populous eastern region. It even has its own national association to share information and to look after its interests, especially in regard to government pricing and grain supply policies.

Although the industry is well established, factors such as government policies, the 1981-85 drought, and competition from wealthy mill owners who are well supplied with grain have changed its complexion, clouding the prospects for small rural service mills. The dehusser-mill package was originally conceived by RIIC fundamentally as a rural service operation, that is, catering to farmers with small batches of homegrown grain. A number of mills, however, now operate as commercial factories, handling bulk loads of several tonnes, and the three



largest operations now control about two-thirds of the sorghum flour market.

Although the future seems uncertain for the largely idle rural service mills, government plans to grow more sorghum in the north may create the opportunity to harness the country's excess milling capacity.

On the brighter side, sorghum has been given a more secure home market in Botswana and many rural women no longer have to spend tedious hours dehulling by hand. According to Rural Industries Promotions' 1986 Report, a substantial proportion of that time-saving "is put into new productive activities". Perhaps as important has been the creation of a pool of indigenous knowledge and technical expertise.

The success of the dehusser in Botswana has not gone unnoticed in the rest of Africa. RIIC has helped to train researchers from Kenya, Malawi, Senegal, Tanzania, Uganda, and Zimbabwe in the initial stages of their dehusser-adaptation work.

In Zimbabwe, the local branch of an African nongovernment organization known as ENDA has launched a four-year nation-wide project to develop and disseminate dehusser technology in that country. It is being conducted in cooperation with the Ministry of Agriculture. Preparatory work was supported by IDRC.

The project goals are to ensure that local metalworking companies are able to build the dehullers, to have 40 milling systems installed throughout the country, and to set up a credit system so that operators can buy equipment. The four-year project will receive more than \$3.5 million from the Canadian International Development Agency.

The Botswana experience, as well as lessons learned by another Zimbabwean nongovernment organization from an earlier mill installation, pointed out the importance of matching the dehusser's size to local population patterns and demand. In Zimbabwe, where the rural population is more dispersed than in Botswana, ENDA investigations made it clear that a relatively small dehusser would be needed. ENDA therefore lengthened the barrel of the PRL mini-dehusser and added a trap door to handle small batches. The result is a locally made machine smaller than the RIIC model but larger than the one used in the Gambia. It is currently being tested in five locations and IDRC is optimistic about the future of the technology in Zimbabwe's food system. ■

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