With adequate training, it is expected that very little seed will be rejected on the grounds of contamination if farmers follow the correct procedures.

Currently, such contract schemes are operational in communal lands in Chivi (seed of sorghum variety Macia) and Tsholotsho (pearl millet PMV 3). The seed companies involved are Pannar Seeds and Seed Co. Donor agencies (notably GTZ) and NGOs like the Organization of Rural Associations for Progress (ORAP), COMMUTEC, and the Intermediate Technology Development Group (ITDG) play a pivotal role in forming farmer groups to produce seed. The government extension service (AGRITEX) provides essential supervisory assistance and the benefits of their long-standing experience in working with farmers.

The primary source of seed is the Matopos Research Station, where both ICRISAT and the National Sorghum and Millets Research Program are based. Both institutions produce limited quantities of Foundation seed of released varieties (Table 1). This seed is sold to seed growers at cost, to keep the Foundation seed production scheme at Matopos running on a self-sustaining basis.

Table 1. Foundation seed production at Matopos Research Station

Variety	1997/98 season (kg)	1998/99 season (kg)
SV 1	-	295
SV 2	1200	883
SV 3	1020	354
SV 4	1400	2499
PMV 1	-	348
PMV 2	700	440
PMV 3	1200	113

This system of producing seed on-farm seems to be working very well and is self-sustaining. We aim to further encourage the development of such community-based schemes, until seed production is sufficient for national needs.

Constraints

A number of varieties have been developed by the national program, and are being tested at research stations. But very little testing is done on-farm, mainly because transport constraints prevent regular visits to on-farm sites. This is a serious constraint—scientists are unable to become fully familiar with the environments in which their varieties will be grown, and performance data from on-station trials are not always a good indicator of performance under "real" conditions. Assistance with transport to conduct on-farm testing will strengthen the national program's efforts and accelerate the process of getting improved varieties to farmers.

The way forward

With the available resources, the national program will continue to train smallholder farmers to grow seed on their own fields. This seems to be the best way to improve seed availability of improved varieties. The larger the number of trained farmers, the greater the availability of seed, and the better the adoption of any subsequent variety releases.

Commercialization of Sorghum Milling in Botswana

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During the past decade, commercial sorghum processing in Botswana has grown rapidly. In 1989, the country had 36 small-scale sorghum mills, most operating on a service basis, i.e. milling grain by the bucket or bag on behalf of individual consumers. By 1999, the number of small- and medium-scale sorghum mills had increased four-fold. The majority of these mills are now buying grain for processing and sale through local retail shops and supermarkets. The quantity of sorghum being commercially milled has increased from an estimated 17 000 t to 60 000 t over this same period. In consequence, the status of sorghum has changed from being a food security crop largely consumed in rural areas, to a commercial crop competing in the urban food market.

A SMIP study (Commercialization of Sorghum in Botswana: Trends and Prospects, in press) reviews the factors underlying the growth of the sorghum milling industry in Botswana, and the prospects for further market expansion. Four major factors underlie the growth. First, there is a widespread preference among domestic consumers for sorghum meal. The recent growth of the sorghum milling industry has allowed sorghum to compete with maize meal as a commercial food product. The simple availability of sorghum meal on the retail market, at a price little different from maize meal, has led to a decline in the growth of maize consumption and possibly a decline in absolute maize consumption levels.

Second, a grain dehulling and milling technology was readily available, and a local parastatal made strong efforts to encourage the use of this technology. This technology provided good quality meal despite variability in the quality of sorghum grain.

Third, the Government of Botswana provided the industry financial support, encouraging investment in new technology and expansion. Government grants sharply limited the risks faced by new entrepreneurs, allowed millers to learn their craft, and encouraged spillover effects on the manufacture of dehulling and milling equipment. Finally, the growth of the sorghum milling industry depended on the consistent availability of grain of acceptable quality, to keep mills functioning throughout the year. This grain is almost entirely imported from South Africa. Sorghum production in Botswana cannot compete with these imports, mainly because of low productivity. Sorghum yields in Botswana average less than 250 kg ha^{-1}. The returns to labor invested in sorghum production by the smallholder sector are generally lower than the rural wage rate. Production levels are highly variable and grain prices in the local market are high. It is therefore unlikely that domestic sorghum production will ever contribute more than a small share of industry requirements.

Many aspects of the Botswana case are unique, including the relative strength of consumer demand for sorghum meal, and the magnitude of government financial support for development of the industry. However, the stimulus created by linking technology, finance, and raw material supply is broadly replicable across the SADC region.

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Improved Pearl Millet Varieties Released in Mozambique

Three improved pearl millet varieties, SDMV 91018 (Kuphanjala 2), SDMV 90031 (Kuphanjala 1), and SDMV 89005 (Changara, Chokwe) were released in Mozambique by the National Variety Committee in March 2000. The varieties are recommended for all pearl millet growing ecologies of Mozambique, and are particularly well adapted to conditions in Zambezia, Nampula, and Tete Provinces. During trials, they outperformed local varieties by 30-50%.

SDMV 91018 was developed by SMIP at Matopos Research Station and at its Muzarabani off-season location in Zimbabwe, from 7 Nigerian progenies: P31125-2, P31231-5, P31149-5, P31141-3, P31120-11, P31161-3, and P31231-2. These constituent progenies were crossed in a diallele fashion during the 1987/88 season. During the 1989/90 season, equal proportions of the resultant crosses were space-planted at Muzarabani in isolation for random mating. Fifty single plants of similar height and time to maturity with good tillering ability were selected. Equal seed quantities from the populations were mixed and planted in isolation at Matopos during the 1990/91 season. The resulting variety, SDMV 91018, was promoted to regional collaborative trials and was First tested in Mozambique during the 1991/92 season.

SDMV 90031 was developed by SMIP at Matopos. It is a product of an intervarietal recombination (of all possible combinations including reciprocals) of progenies from 5 varieties: SDMV 89003, SDMV 89004, SDMV 89005, ICMV 88908, and SDPM 2264. Three of the constituent parents have been released in three SADC countries. SDMV 89004 was released in Zimbabwe as PMV 2, SDMV 89005 in Malawi as Tupatupa, and ICMV 88908 in Namibia as Okashana 1. Initial crosses to develop SDMV 90031 were made during the 1989/90 season. Equal proportions of each resultant cross were mixed to constitute a bulk. The bulk was space-planted in isolation during the 1990 off-season and selected for high tillering ability, and uniformity in time to maturity and height. Altogether 120 selected progenies were bulked to constitute SDMV 90031. This variety was first tested in regional collaborative trials, which included Mozambique, during the 1991/92 season.

SDMV 89005 was developed by SMIP at Matopos from ICMS 8359. The latter is one of six germplasm accessions identified by SMIP following multilocational