Appropriate germplasm facilitates new interest in neglected crops – the case of *Lablab purpureus* in the Limpopo Province, South Africa

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Introduction

In many crops, only limited variability is commercially used. This is particularly the case in underutilized crops. On the other hand, lines/cultivars used commercially depend on seed availability, some even rely on seed imports. In most research and development activities, the overall properties of a specific crop are seen represented by the one or two lines widely used and known. These, however, may be inappropriate for a particular agro-ecological niche and/or production system. In such a case of failure, usually the crop and not the cultivar is excluded from further research and development, while the use of appropriate germplasm would keep the crop involved. This will be illustrated by the case of *Lablab purpureus* in South Africa.

An underutilized crop in Africa – *Lablab purpureus*

In most regions of Africa, *Lablab* is an underutilized crop. Also in South Africa, it has received no research attention. It used to be widely cultivated by smallholder farmers, particularly as a vegetable and pulse in homegardens some 40 years back, but now largely disappeared. The crop is a multipurpose leguminous species and can be used as forage for livestock, cover crop and human food, either as a leafy vegetable or grain legume by the rural communities of the province. The leaves may be boiled and prepared like spinach or – like the seeds – in soups or stews. Currently, only one variety is available commercially in South Africa, cv. Rongai, which is being used by large scale farmers as a forage plant. This cultivar, released in 1967 in Australia (Oram, 1990) and spread widely throughout the tropical world, can produce herbage yields of 6–7 t/ha under South African conditions. However, as a long-season type it flowers only after 5-6 months. This late flowering is a major constraint in such drought and/or frost-prone areas in semi-arid environments. It is most likely that in many years no seed will be produced, neither for consumption nor for sowing in the following season, which would make the farmers dependent on external seed supply. In addition, cv. Rongai is too competitive with maize in the prevailing mixed cropping production system on low fertility soils and, thus, tends to significantly reduce maize yields (Ayisi et al., unpublished data).

In a morpho-agronomic (MA) characterization of a large germplasm collection of *Lablab*, Pengelly & Maass (2001) demonstrated much larger variability available in the germplasm held *ex situ* in Australia and at ILRI (International Livestock Research Institute) in Ethiopia. In a subsequent classification, accessions were assigned to MA-types. For example, accessions of MA-type RB-8 were characterized as the earliest-flowering materials, prostrate, low-growing, small-seeded with short pods and in overall appearance close to wild types. Accessions of MA-type RB-3 were also early-flowering and small-seeded. Further characterization and evaluation of the collection is ongoing, e.g. by assessing the quality of seeds with regard to nutritive and antinutritional factors (Usongo & Maass, unpublished data).
This research aimed to reinstate Lablab in smallholder production by using new lines in maize systems in the Limpopo Province of South Africa. The research mostly took place within the project “Tropical forage and ley-legume technology for sustainable grazing and cropping systems in southern Africa” sponsored by ACIAR.

Approach used
In South Africa, field experiments were carried out at the University of the North experimental farm at Syferkuil and at a smallholder farmer field at Dalmada near Polokwane in the Limpopo Province during the 2002/03 growing season. Soil fertility at Syferkuil is relatively higher than on the farmer's field at Dalmada. The experiments were established as randomized complete block designs with 3 replication at each location. Selected, early-flowering plant materials that seemed to be most suitable for this particular agro-ecological niche, were evaluated in small plots. Thirty-three accessions mainly from MA-types RB-8 and RB-3, plus 3 local types (cv. Rongai selected for 3 different seed colours) were evaluated on farm and on station with farmers visiting (preliminary results). Protein and tannin contents in dry seeds of MA-type RB-8 accessions produced in Samford, Australia, were analyzed at University of Göttingen applying standard methods. As trials have not been finalized, no statistical analyses have been applied so far. Only preliminary data are presented here.

Results and prospects
Preliminary data collected so far indicate great diversity in flowering, maturity, biomass accumulation and growth types. Most of the accessions were early flowering and some of them also high-yielding in 2002 (Fig. 1). Twenty accessions matured between 90 and 109 days. Most of these early-flowering and early-maturing accessions belong to MA-type RB-8. The three local materials included in the evaluation remained vegetative after 130 days. So within the new accessions evaluated, there seem to be materials suitable for the typical rainfed conditions in the Limpopo Province.

![Fig. 1](image)

**Fig. 1.** (a) Flowering time [d] and (b) biomass production [kg/ha] of 30 *L. purpureus* accessions in the Limpopo Province, South Africa in 2002 according to MA-type as compared to local checks (DAP = days after planting).

Generally, the early-flowering types accumulated lower total biomass compared to the late-season types, however, some of them showed remarkable seed set. The local materials were among those types growing more vigorously. Not only the differences in biomass accumulation but also in harvest index will be helpful in providing farmers with options to use Lablab in different circumstances, such as a forage crop, grain legume, cover crop, rotational crop or as a component crop in an...
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intercropping system. Smallholder farmers got interested in the early-maturing plants as they might not only provide them with a new option for managing soil fertility but also could offer an additional choice of vegetable for human consumption. They particularly showed interest in the leaves (as relish), and green pods and seeds.

Dry seeds contained high levels of proteins in a reasonable range, as well as remarkable differences in tannin contents that seemed to be more related to red tones in the seed coat colour than in darkness (Table 1). The variation available in germplasm accessions consequently offers scope for selecting for quality. Though, additional research needs to establish environmental influences on the stability of both quantity and quality of products before accessions may be recommended for wider distribution. Farmers’ opinions on the food value of leaves, green pods and seeds will be gathered and considered within this selection process. Finally, the new types’ agronomic requirements need to be developed with regard to sole or mixed cropping in maize systems.

Table 1. Protein and tannin contents in dry seeds of *L. purpureus*, MA-type RB-8 according to seed colour (Usongo & Maass, unpubl. data).

<table>
<thead>
<tr>
<th>Seed colour</th>
<th>Accessions (no.)</th>
<th>Protein (%) mean</th>
<th>Protein (%) range</th>
<th>Tannin (%) mean</th>
<th>Tannin (%) range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tan</td>
<td>8</td>
<td>28.3</td>
<td>26.0-30.7</td>
<td>4.1</td>
<td>1.9-7.3</td>
</tr>
<tr>
<td>Dark brown</td>
<td>1</td>
<td>21.5</td>
<td>–</td>
<td>2.0</td>
<td>–</td>
</tr>
<tr>
<td>Black</td>
<td>3</td>
<td>31.1</td>
<td>30.3-31.8</td>
<td>1.1</td>
<td>0.3-2.0</td>
</tr>
</tbody>
</table>

As a consequence of these results, it is highly recommended that particular attention be given to foster country-specific or region-specific informal seed systems, such as seed fairs (e.g. Nathaniels & Mwijage, 2000), in order to avoid the dependence of smallholders from commercial sources or even international imports that may not be suitable for their conditions. Efforts should also be undertaken to link the informal and formal sectors for feeding in promising materials for smallholder agriculture.

In conclusion, it is shown that – with increasing research efforts – a better understanding arises of the variability available in a crop. The identification of representative morpho-agronomic types assisted notably in choosing appropriate materials for a particular agro-ecological niche. Farmer participation in the trials help further to identify types and lines for future development under these particular agro-ecological and typical production conditions. The wider deployment of the crop most likely will lead to improved conservation of a more comprehensive range of its diversity.

References


