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An emerging success story of pigeonpea expansion in smallholder agriculture in Mozambique: A summary of key findings[1]

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Summary

1. Pigeonpea production in Mozambique is large, is very important for smallholder farmers, has made important contributions to poverty reduction, and has outstanding prospects for growth (points 1-4);
2. Pigeonpea's expansion was largely unanticipated by public sector. It therefore occurred in an atmosphere of "benign neglect", and was based on a *de facto* extensification strategy (points 5-6);
3. Success has led to attention from policy makers and local agribusiness. But any strategy for continued growth must be based on a sound knowledge of (a) the details of the Indian market, (b) the agronomic realities of pigeonpea as a crop, and (c) the local context in which expansion has taken place (points 7-10);
4. The way forward for pigeonpea in Mozambique requires a balanced, mixed approach emphasizing steady productivity growth, shorter duration varieties, and investments to reduce marketing costs (point 11)

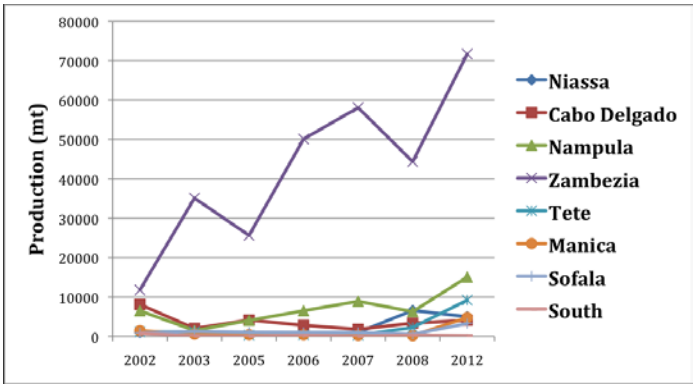
In this flash, we document the rapid emergence of pigeonpea as a smallholder export crop in Mozambique and discuss implications of its expansion. The analysis is based on seven years of nationally and provincially representative rural survey (TIA) data from 2002 to 2012 and an assessment of pulse production and consumption in India. Pigeonpea production in Mozambique showed the greatest growth of any of the 12 field crops covered in the TIA survey. The report highlights the potential for smallholder income growth and proposes interventions to move the commodity value chain forward based on financially feasible public and private investments. The major findings and implications are summarized below.

1. Globally, Mozambique was the 5th largest producer of pigeonpea and the 3rd leading exporter of the crop in 2014. Pigeonpea is an Indian crop. India is by far the largest consumer and producer; however, global production is diversifying geographically as the growing deficit between production and consumption leads to rising import demand in India. It is unlikely that Mozambique will be able to overtake Tanzania and become the largest African exporter of pigeonpea in the near-term. But Mozambique should be able to retain its ranking as the 5th largest producer and 3rd leading exporter if the government continues to invest in road and market infrastructure to reduce marketing costs, and avoids policies that undermine farmer profitability.

[1] The full report is published as Walker, T, Silim, S., Cunguara, B, Donovan, C, Parthasarathy, P.R., Amane, M., Siambi, M. (2015) Pigeonpea in Mozambique: An Emerging Success Story of Crop Expansion in Smallholder Agriculture. WP 78E. Ministry of Agriculture and Food Security, Directorate of Economics, Maputo.

2. Production growth of 8% per annum has made pigeonpea potentially more important to small- and medium-sized Mozambican farmers than any other crop except maize and cassava, the major staple food crops. By 2012, more than one million rural households were producing pigeonpea on about 250,000 hectares, rivaling groundnut and rice in economic importance (Walker et al. 2015). In spite of low but stable yields of 300-400 kgs per hectare, prospects are bright that Mozambique can continue to rely on an extensification strategy – area expansion with modest growth in yields - to meet rising import demand from India into the foreseeable future. Given strong export prices, pigeonpea is a good bet to be the third-ranking field crop in economic importance in Mozambique by 2025. At that time, its importance will still be dwarfed by maize and cassava, but it is likely to rank first in export earnings and third in value of production.

Figure 1 Pigeon pea production in Mozambique by Province, 2002 - 2012



Source: TIA data analysis as found in Walker et al 2015

3. Because it is produced almost entirely by small-scale farmers (see point 6 below), a large share of increased income from pigeonpea sales goes to the rural poor. Direct benefits per household are small, yet it was estimated that by 2012 the expansion of the crop had helped 10,000 rural households move above the poverty line (Walker et al. 2015). By 2025, if the current trends continue, a 1 percentage point decline in national rural poverty could be attributed solely to the expansion of pigeonpea; this is an enormous effect for one crop, especially one that had been so minor prior to its expansion.

4. Even conservative scenarios on Indian import demand suggest room for continued very rapid growth in Mozambican exports. Rising import demand from India was the engine of growth for pigeonpea production in Mozambique. In 2014, India imported 300 consignments from Mozambique equivalent to 60,000 metric tons valued at about 40 million USD. Import demand in India for pulses in general and pigeonpea in particular is expected to continue rising. India's current deficit of pigeonpea is about 500,000 metric tons. While projections by the Mozambican private sector of a deficit of about 3 million metric tons by 2025 seem overly optimistic, more realistic assessments still suggest room for continued rapid growth in Mozambican exports. Specifically, factoring in past trends in demand, area, and technological change in India (such as partial adoption of hybrid pigeonpea by 2025) suggests a gap between production and consumption of about 1.2 million metric tons. Even a very conservative scenario entailing a deficit between 750,000 and 1,000,000 metric tons by 2025 would be sufficient for Mozambican exports to double by 2025, as long as Mozambique maintains its market share. *Mozambican pigeonpea production is not constrained by export demand to 2025.*

5. The growth in pigeonpea production and export was largely unanticipated, and it occurred in an atmosphere of "benign neglect". Pigeonpea production is poorly reflected in FAO's production data for Mozambique. This gives the erroneous impression that the crop is unimportant. In the 1990s and into the first decade of the 2000s, pigeonpea in Mozambique was given little priority in R&D projects and in the production of breeders/foundation seed of improved varieties. ICRISAT's regional pigeonpea improvement program has been funded by a range of donors including USAID and the Kellogg Foundation, but the crop has been better supported by the public-sector and the donor communities in Kenya, Malawi, and Tanzania than in Mozambique. In the early 2000s, there was little optimism that pigeonpea could increase its share in the export market.

The record of extension of pigeonpea improved technologies has been somewhat more positive. In particular, the diffusion of modern longer duration varieties was actively supported by USAID in Zambezia via World Vision in the early 2000s.

6. This lack of policy attention resulted in a *de facto* "strategy" of extensification, not intensification; *but this extensive strategy is well suited to the crop's characteristics and to the country's relative land abundance.* Rapid increases in the number of households cultivating pigeonpea and in the total area cultivated have been the dominant forces driving higher pigeonpea production in Mozambique. Rising productivity has been a minor factor. Other than weeding, the crop requires very little household labor. Even with negligible inputs, it has one of the most stable-yields of any crop in Mozambique's

smallholder sector. Moreover, pigeonpea is difficult to intensify or to mechanize. Elsewhere in the world, it is mostly cultivated as an intercrop or in association with other crops. Medium-duration pigeonpea, which is the dominant type, is rarely sole-cropped. Large tracts of sole-cropped pigeonpea entail high risks of infestation, especially from the American cotton bollworm that feeds on the flowers and the grain. Spraying insecticide more than once or twice to control this pest is not cost effective in the smallholder sector.

As a result of these characteristics and of Mozambique's agrarian structure, the mean growing area of households planting pigeonpea is only 0.25 to 0.33 hectares; few households sow more than 1.0 hectare (Walker et al. 2015). Pigeonpea is regarded as a secondary crop by the vast majority of households that grow it. The very small-size distribution of pigeonpea area is due to the difficulties encountered in intensification described above and to the absence of animal traction in Zambézia, the primary province of production.

7. Pigeonpea is now receiving much attention from government and agribusiness. The challenge is to ensure that any new strategy is based on a sound knowledge of (a) the details of the Indian market, (b) the agronomic realities of pigeonpea as a crop, and (c) the local context in which expansion has taken place. Reversing a history of "benign neglect" requires well-targeted investments in agricultural research, the seed sector, and extension to increase productivity; and in secondary and tertiary roads and local rural markets, depots, and assembly points, to reduce marketing costs. Together, higher productivity and lower marketing costs would increase returns to farmers, strengthen the country's competitiveness in the export market, and potentially grow its share in that market. An effective strategy also requires a strong understanding of the details of the Indian market, and what, if any, prospects it offers for exports of value-added product rather than raw pigeonpea.

8. Today, about 95% of total pigeonpea imports from all countries into India in 2014 were in the form of raw, whole pigeonpea; only 5% were split (processed). All of the principal exporters including Myanmar, Tanzania, Malawi, and Mozambique exported small amounts of split pigeonpea to India in 2014. Myanmar, the leading exporter and highest yielding pigeonpea-growing country, learned 30 years ago that it was better to export whole peas than split peas to India even though Myanmar had invested in dhal milling capacity.

9. The predominance of raw exports to India is driven by two factors. The first factor is that the availability of African production coincides with the seasonal incidence of high prices in the Indian market. Most African pigeonpea exports to India occur from September to January, prior to the harvest of India's rainy-season crop. Exports from September to December fetched a price at least US$150 per metric ton higher than the seasonal low price in February in 2014; prices at their peak in October were US$200 higher than the prices in February. Although lemon tur, a pigeonpea from Burma, is preferred to African pigeonpea in India, the timing of production in East and Southern Africa is an enormous advantage for African exporters.

Several authors point out the advantage in smoothing African production to avoid a rush to assemble harvested output at the end of the year. Planting shorter duration five-month varieties is one way to do this, and would also diminish the incidence of drought stress near the end of the production cycle. Earlier harvesting in April-June – which would occur with this shorter duration variety - may mean additional storage costs in order still to sell during the period of high Indian prices, but those costs should be offset by production gains from reduced drought stress in most years.

The second factor driving the predominance of raw product, rather than processed product, in exports to India is the relatively low price premium on split (processed) pigeonpea compared to the unprocessed product. In fact, the seasonal price premia on whole pigeonpea are larger than the difference in imported value between split pigeonpea and whole pigeonpea. Holding other things constant, split pigeonpea received a price premium of only 20%, equivalent to an imported value of US$720 per metric ton processed compared to US$600 per metric ton whole (Walker et al 2015). Compare this $120 premium to the $150 - $200 premium on whole pigeonpea exported September – December compared to February. The 20% processing premium is insufficient to make local pigeonpea processing competitive with dehulling and splitting in India.

Part of the reason for the lack of competitiveness of local processing is that the concentration of production in a short period of time requires overinvestment in dhal-mill capacity in order to process large quantities of pigeonpea in time to capture India's high prices from September to December. This overinvestment drives higher unit processing costs, undermining competitiveness.

This does not mean that dhal mills cannot be profitable in the exporting countries. Local Dhal processing makes sense for higher-priced markets in Europe and the Middle East, but those destinations are very small in size compared to the Indian market.

10. It should also be noted that the Indian pigeonpea market is a "quantity market", not a "quality market". Price distributions of pigeonpea are very narrow, showing relatively little price variation in imports to India from different destinations. Almost all consignments are graded 'FAQ' for Fair to Average Quality. Very few entries are discounted for poor quality. Under these conditions, quantity is paramount as quality becomes only a secondary consideration: exporters need only pass minimum thresholds on essential criteria such as seed size, dryness, and perhaps color. Crop improvement scientists may have over-emphasized quality in selecting elite materials and may have missed some opportunities for generating heavier yielding improved materials. Presently, it is such a seller's market that anything that could be truthfully labelled as pigeonpea seems to have a very good chance of being classified as FAQ. The absence of differentiation and rigorous quality standards is advantageous for Mozambican smallholders, who lack incentives for compliance because of their small volumes of production combined with a rudimentary market infrastructure in many locations.

11. The way forward for pigeonpea in Mozambique requires a balanced approach emphasizing steady productivity growth, shorter duration varieties, and investments to reduce marketing costs. Plausible scenarios for continued rapid growth, analyzed in more detail in the main report, include (1) an emphasis on pure extensification by increasing the number of growing households to raise production from its current 120,000 metric tons to about 170,000 metric tons, (2) gradually giving way to specialization by increasing growing area per producer from 0.25 to 0.50 ha to reach 220,000 metric tons in total production, and (3) relying on intensification to increase productivity from the current 300-400 kg/ha to 600-700 kg/ha, to attain an output of 270,000 metric tons by 2025. In practice, extensification, specialization, and intensification will all play a role in augmenting production, but extensification will be the main driver in the near-term future as it has been in the recent past.

Within this near-term extensification strategy, it will be important to generate and release improved varieties to achieve some gains in productivity. Given the late start to varietal development in the region, varietal adoption of improved ICRISAT-related materials is respectable at 20-40% in the major pigeonpea producers of East and Southern Africa. The most widely adapted and adopted improved variety is ICEAP 00040 that became available to farmers in the early 2000s. It features bold white-colored grain in a disease-resistant, long-duration background. The economic importance of the crop now warrants more selection of improved materials in the Upper Zambézia sub-region of Mozambique. Emphasis is urgently needed in foundation seed production so that ICEAP 00040 and the newer medium-duration varieties can be made available to more producers in Zambézia and in other mid-altitude districts of the provinces in Central and North Mozambique.

Pigeonpea has a low seed rate of only about 11 kgs per hectare and a high multiplication ratio. Its disadvantage for seed production is a natural outcrossing rate of 20-40%. As a result, maintaining genetic purity is difficult, and most varieties become mixtures over time. The medium-duration varieties with earlier flowering should be easier to maintain than their longer-duration counterparts. Aside from their presumed yield advantage, this is another reason why the so-called 'medium-duration revolution' represents a timely opportunity for Mozambican pigeonpea producers and exporters.

Some in Mozambique are proposing an export tax on raw exports to motivate Mozambican processing. This policy will be examined in a forthcoming Flash, but the research contained here and in Walker et al. 2015 indicates that processed pigeon peas for export may not be competitive with processing in India and may not be able to obtain the seasonal price advantages sufficient to recompense processing. If there is risk in competitiveness then farmers, traders, and even the processors may lose. It is important that Mozambique learn from its difficult history with export taxes on tobacco (Benfica et. al, 2004) and cashew (Mole and Weber, 1999), before embarking on a policy approach that risks derailing a great success story.

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