Final report

The pigeon pea value chain in Mozambique

Examining the 2017 price fall and its implications

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Abbreviations

BM	Bank of Mozambique
CA	Conservation Agriculture
FAO	Food and Agriculture Organization
GoM	Government of Mozambique
IAI	Integrated Agricultural Survey - *Inquérito Agrícola Integrado*
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IGC	International Growth Centre
IIAM	Agriculture Research Institute of Mozambique – *Institututo de Investigação Agrária*
INE	National Statistics Institute – *Instituto Nacional de Estatística*
LER	Land Equivalence Ratio
MASA	Ministry of Agriculture and Food Security
MoU	Memorandum of Understanding
MEF	Ministry of Economy and Finance
MIC	Ministry of Industry and Trade
MINEDH	Ministry of Education and Human Development
MSP	Minimum Support Price
MZN	Mozambican Metical
SIMA	*Sistema de Informação dos Preços Agrícolas*
UAE	United Arab Emirates
USA	United States of America
USD	US Dollar

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1. Introduction

Mozambique has a total area of 799,380 km^2, half of which, around 36 million hectares, represents arable land. The country has abundant natural resources and its agro-climatic conditions are favourable to the production of a large range of agricultural products, both for domestic consumption and for export, which is facilitated by the country's strategic location, with its long Indian Ocean coastline.

Agriculture is the main economic activity of about 70% of the population and the sector is dominated by small subsistence farmers. The increased export of agricultural products could, in addition to its impact on the income of rural families, provide a solid basis for the diversification of the economy, acting as a major source of foreign exchange and as a catalyst for inclusive and sustainable economic growth.

The last decade witnessed a remarkable growth in pigeon pea production, rapidly turning it into one of the country's main cash crops and agricultural exports. On the back of growing Indian demand, several African countries, notably Mozambique and Tanzania, quickly emerged as significant pigeon pea exporters. During this period, various NGOs and international development agencies partnered with the private sector to promote pigeon pea production among Mozambican farmers, convinced that the market would remain strong. As a result of these efforts, production expanded rapidly, reaching almost 200,000 tons in 2016. Most of the production takes place in the provinces of Zambézia and Nampula, the most densely populated parts of the country. From the 2016 crop, Mozambique exported more than 170,000 tons of pigeon peas, corresponding to USD 125 million, which makes it the third largest agricultural export, after tobacco and sugar.

Pigeon pea is processed into dhal, the main source of protein for the majority of Indians. For various years, Indian production could not keep up with growing domestic demand, leading to a deficit of more than 500,000 tons per year. This made India the world's largest producer, consumer and importer of pigeon peas by far, accounting for about 90% of global imports; there is no other significant market.

The Indian Prime Minister visited Mozambique in July 2016 and signed a Memorandum of Understanding, through which he formalised India's commitment to import 125,000 tons of pulses in 2017-18, gradually increasing to 200,000 tons by 2020-21. Subsequently, the Government of Mozambique (GoM) intensified the promotion of pigeon pea production as a means of meeting the targets. These efforts, together with the high pigeon pea price of 2016, helped to further boost the area cultivated and the number of pigeon pea farmers, reaching more than one million, which led to an estimated production of 250,000 tons in 2017, the largest ever recorded in Mozambique.

However, in addition to encouraging production in Mozambique, India also stimulated domestic pigeon pea production, which, combined with good monsoon rains and high farm-gate prices in 2016, led to an all-time production record of almost 5 million tons in 2017, enough to satisfy domestic demand and still be left with 1 million tons. As a result, the pigeon pea price in India collapsed, provoking farmer protests. In response, the Indian government took measures to protect its farmers, introducing a 200,000 ton pigeon pea import quota for the financial year 2017-18.

Following these developments in India, the farmgate price in Mozambique fell by 90%, from an average of MZN 45/kg in 2016 to MZN 5/kg in 2017. Simultaneously, the price of other important crops dropped as well. The price of maize, for instance, declined from more than MZN 20/kg in 2016 to around MZN 5/kg. This means that many farmers were left without any financial revenues, and subsequently without the resources to invest in the next agricultural season, which could lead to a reduction in overall cultivated area. In addition, the reduced purchasing power of the farmers created significant multiplier effects in the local economy. The depth of the crisis varies by district, with the worst impact felt in those districts where few farmers had other cash crops, besides pigeon pea, which is the case in most of Middle and Upper Zambézia. In this region, virtually all traders and shop-owners interviewed in November 2017 reported that their business volume had declined by more than 50% compared with the same period in the previous year.

India´s dominance of the global pigeon pea market, in particular its 90% share of global imports, must be carefully considered when reflecting on the future of pigeon peas in rural

Mozambique, because it means that Mozambican farmers depend almost exclusively on a single market. In all likelihood, India will continue its efforts to increase domestic production and reduce its dependence on imported pulses, particularly of pigeon peas. In this context, a scenario in which many Mozambican farmers continue to rely on pigeon pea as their principal cash crop should be avoided. Diversification into other crops, including other pulses, is imperative.

Pigeon pea will certainly not disappear from rural Mozambique, however, because it has several highly favourable characteristics from a farmer´s perspective. It is a drought-resilient crop, does not require much in terms of inputs and has a high nitrogen-fixing capacity, making it ideal for intercropping with maize or for crop rotation.

This study will analyse the Mozambican pigeon pea value chain, investigating its recent growth, as well as the international market of pigeon peas and other pulses. The research team visited the main producing regions of Mozambique, particularly the provinces of Zambézia, Nampula and Tete, as well as neighbouring Malawi. During these visits the team interacted with a wide range of relevant stakeholders from the public sector, the private sector (both farmers and traders), NGOs and academics.

This report, the main output of the research, is organised into six chapters. Following this introduction, Chapter 2 will discuss the crop´s major characteristics and analyse its economic, agronomic and nutritional advantages, showing that pigeon pea cultivation has a positive effect on soil fertility and that it is ideal for human consumption. Chapter 3 analyses the functioning and evolution of the pigeon pea production chain in Mozambique, with particular attention being paid to its cultivation and to the strategic role of the commercialisation network, which is complex and composed of thousands of stakeholders. Chapters 4 and 5 are dedicated to the analysis of the international market, with specific reference to the Indian market. While the focus is on pigeon peas, the market potential for other pulses is also examined. Finally, Chapter 6 details concrete suggestions for short-, medium- and long-term policy measures, with the general aim of placing the subsector on a more sustainable path and preventing the type of negative shock experienced by Mozambican farmers in 2017. Table 12 (p.53-54), in the same chapter, provides a detailed

overview of all policy recommendations, based on the analyses of this report, including suggested timelines and responsible entities.

2. Pigeon Pea Characteristics

Pigeon pea [*Cajanus cajan* (L.) Millspaugh] was domesticated in India thousands of years ago and its production has multiple advantages, from an agronomic, socioeconomic and nutritional perspective. Over the last decades, pigeon pea cultivation has been widely promoted in Southern and Eastern Africa, often in the context of efforts to introduce "conservation agriculture (CA)" (Barbito et al. 2015)[1]. The extent of CA adoption by African farmers has been the subject of debate. In a thorough review of the available literature, Andersson and d'Souza (2014) indicate that one particular dimension of CA – intercropping grains with legumes, especially pigeon peas - has been widely adopted in Kenya (Shiferaw et al. 2008), Tanzania (Mponda et al. 2013), Malawi (Simtowe et al. 2010), Zimbabwe (Waddington et al. 2007) and Mozambique (Rusinamhodzi et al. 2012, Devji 2011, Walker et al. 2015).

In terms of agronomy, the pigeon pea plant has a positive effect on soil fertility, with the potential of fixing up to 235 kg of atmospheric nitrogen per hectare (Odeny 2007). Its roots also support the release of phosphorus to the soil, making it available for the growth of other plants. Although many other legumes also have the ability to fix nitrogen, few are as effective as the pigeon pea plant in this respect. Furthermore, unlike other legumes, pigeon pea does not require inoculation to optimize its nitrogen fixing potential (Odeny 2007).

Its strong nitrogen fixing capacity makes pigeon pea ideal for intercropping with maize, one of Africa's most important food crops. In West Africa, Sogbedji et al. (2006) find that maize productivity increases by 32% when intercropped with pigeon pea. Likewise, in Tanzania, Myaka et al. (2006) argue that the productivity of maize that is intercropped with pigeon pea is equal to that of monoculture maize that benefited from fertiliser application.

[1] AC integrates three main concepts: (i) minimum soil disturbance (direct seeding), (ii) mulching, and (iii) intercropping grains with legumes.

Moreover, many consecutive years of maize monoculture without fertiliser application, which is common in Mozambique, results in soil degradation, while intercropping with pigeon pea maintains soil fertility (Myaka et al. 2006).

For the specific case of Mozambique, Rusinamhodzi et al. (2012) evaluate the Land Equivalent Ratio (LER), an indicator used to determine the efficiency of intercropping. An LER above 1 means that intercropping is more efficient than production of the different crops in a monoculture system.[2] The authors evaluate the LER on farmer fields in Central Mozambique, using several different ways of intercropping maize with pigeon pea, and consistently find values above 1, in some cases reaching close to 2.[3]

Several studies on agriculture in Mozambique indicate that one of the main constraints to increased production is the availability of labour (Leonardo et al. 2007, Lukanu et al. 2007). Thus, in socio-economic terms, the particular suitability of pigeon pea for intercropping is a major advantage because it is a cash crop that does not compete with the main food crop (maize) in terms of the allocation of land and labour resources. Another advantage of pigeon pea is that it is a low-demanding crop, as it does not depend on fertiliser application. Pigeon pea is also known to be relatively drought-tolerant, even compared with other legumes, such as cowpea (Odeny 2007). According to Waddington et al. (2007), the yield variability of pigeon pea is lower than that of maize or other legumes. Similary, ICRISAT (website) stresses that the resilience of the pigeon pea plant allows for its cultivation in a wide variety of environments and cultivation systems, including in areas with less than 650 mm of annual precipitation.

Finally, in nutritional terms, traditional pigeon pea varieties have a high protein content of 18-26%, and agronomists have developed improved varieties with even higher protein levels (Odeny 2007). Pigeon pea is also rich in minerals such as calcium, phosphate, magnesium and sulphur, as well as vitamins, containing five times more Vitamin A and three times more Vitamin C than ordinary peas (Odeny 2007). The pigeon pea grain is

[2] For example, for intercropping of maize with pigeon pea, an LER of 1.2 would indicate that 1 hectare of pigeon pea and maize under intercropping produces the equivalent of 1.2 ha of pigeon pea and maize in separate areas.

[3] The most common form of intercropping in Mozambique is to plant maize and legumes in separate rows. For this technique, the authors measured LERs ranging from 1.1 to 1.4. However, in neighbouring Malawi it is common to intercrop within rows. For this technique, the authors measured LERs between 1.7 and 2. It would be important for the MASA Extension Services to evaluate these results and, in case they are confirmed, to promote this intercropping technique among farmers.

processed and transformed into dhal, a major staple food in India, and the green pods are also consumed fresh as vegetables. In addition to human consumption, pigeon pea foliage is also used to feed cattle[4], and its dry stems can be used as fuel (Odeny 2007). Finally, pigeon pea can also be used as an alternative protein source in chicken feed. Igene et al. (2012) find that the substitution of up to 50% of the soybean cake in chicken feed with pigeon pea has no negative effect on the chicken's growth, despite having an adverse impact on haematological indicators, such as the level of haemoglobin and leukocytes. Amaefule et al. (2011) suggest a diet that integrates 40% of pigeon pea, supplemented with amino acids.

3. Pigeon Pea in Mozambique

Mozambique is one of the world's largest producers and exporters of pigeon pea. Traditionally, it has been grown in small quantities, by smallholder farmers, mostly for home consumption. However, the last decade saw the introduction of a new dynamic. Increasingly, hundreds of thousands of farmers started to engage in the production of pigeon pea as their first or second-most important cash crop. This change was mainly caused by rising demand from India and by the interventions of NGOs and traders to promote the crop, through seed distribution and agricultural extension. For instance, World Vision was active in Zambézia and SNV in Tete.

Collecting reliable data on pigeon pea production and sales is not straightforward, as the crop has not received specific attention in the statistics of the Government of Mozambique or FAO, which means there are no official annual production data. Given the increased importance of the crop in recent years, some districts have taken the iniative to start collecting and monitoring pigeon pea specific data. This is a very important step to facilitate the development of future initiatives to guide the sub-sector, but the initiative will need to be adopted at the central level and transformed into a more structured and comprehensive process.

[4] A study by Von Schaaffhausen (1966) shows that, in Brazil, bulls that were fed by grazing on mixed pastures that included pigeon pea gained 35 kg during 90 days, while those in control pastures gained 6 kg less.

3.1 Domestic Production and Number of Farmers

In the absence of reliable annual production statistics in official government documents, Walker et al. (2015) traced the evolution of pigeon pea production in Mozambique based on data from the various agricultural surveys, in particular the *Trabalho de Inquérito Agrícola* (TIA) and the *Inquérito Agrícola Integrado* (IAI), estimating that production more than tripled between 2002 and 2012. As Table 1 shows, the total number of producing households increased from approximately 700,000 in 2002 to 1,080,000 in 2012, when close to 250,000 hectares were cultivated, producing almost 115,000 tons of pigeon peas.

Table 1. Growth of the number of pigeon pea producers and cultivated area.

Year	Number of Producers	Average Area (ha)	Total Area (ha)	Yield (kg/ha)	Estimated Production (ton)
2002	695,286	0.10	68,814	462	31,792
2005	723,228	0.22	157,804	269	42,449
2006	727,142	0.23	170,252	324	55,162
2007	738,142	0.27	198,868	313	62,245
2008	748,593	0.25	190,368	336	63,963
2012	1,079,636	0.23	248,929	456	113,511
2015	760,665	0.24	182,817	379	69,287

Source: Authors, based on Walker et al. (2015), and De Vletter (forthcoming).

The authors show that until 2012, the expansion of pigeon pea production was driven primarily by Zambézia province, where production increased more than sevenfoldbetween 2002 and 2012. In particular, the districts of Milange, Mocuba and Morrumbala accounted for more than 40 % of total domestic production in 2012. With the exception of Cabo Delgado, production also more than doubled in all other provinces in Northern and Central Mozambique.

Perhaps surprisingly, data from the IAI 2015 suggest that the number of pigeon pea farmers fell back to 760,000 in 2014-15. This seems to contradict the narrative of a constant increase of production, driven by increased numbers of pigeon pea farmers.

Despite the drop, however, the survey results indicate that pigeon pea was still the most important cash crop in Zambézia and the second most important one in Nampula, the country's two most populous provinces (Table 2).

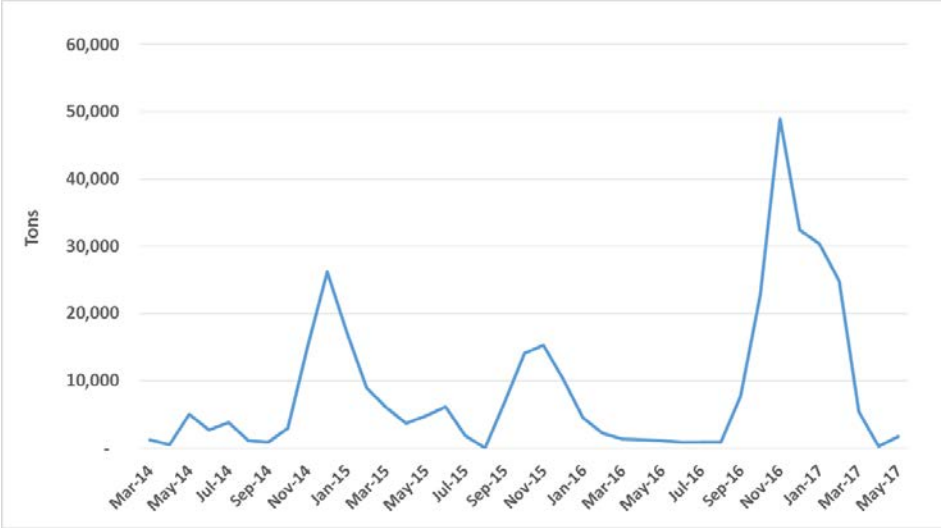
Table 2. Main Cash Crops by Province, 2015

Province	Most Important Income Crop	2nd Most Important Income Crop
Niassa	Tobacco	Cotton
Cabo Delgado	Cotton	Sesame
Nampula	Cotton	**Pigeon pea**
Zambézia	**Pigeon pea**	Cotton
Tete	Tobacco	Common Bean
Manica	Maize	Sesame
Sofala	Sesame	Cotton

Source: Let´s Work (forthcoming).

Since most of the production in recent years was destined for export to India, Indian import data can help estimate production trends in Mozambique, given the absence of official and reliable domestic data. India reports detailed import statistics by product, month and country of origin, which allows us to construct Figure 1. Although import data for the calendar year 2015 appear to be high, upon close inspection it can be observed that substantial volumes were imported in the first half of 2015, which still relates to production from the 2014 harvest. The imports from September 2015 to August 2016, which would correspond to production from the 2015 season, show a significant decrease compared to previous years.

Figure 1. Monthly Import of Mozambican Pigeon Pea by India, 2014-17.



Source: Autores, based on ITC Trade Map.

Based on the Indian import data, Table 3 provides an overview of the agricultural seasons of 2014, 2015 and 2016 in Mozambique. It is interesting to note that the reduction in Indian imports of Mozambican pigeon peas from the 2015 season coincides with the reduction in the number of pigeon pea farmers and production volume as observed in the agricultural survey data (Table 1), which supports our confidence in the reliability of the Indian import data. Using the trade data to understand the sector's subsequent dynamics in Mozambique, we observe extraordinary growth from 2015 to 2016, when exports almost tripled to more than 170,000 tons. This is largely explained by the fact that the farm-gate price increased significantly from around MZN 14/kg in 2014 to around MZN 37/kg in 2015.[5]

There is no evidence to suggest that there was a jump in productivity, so the sharp increase in production and export originated mainly from the expansion of the cultivated area. Due to the lack of data, it is difficult to say whether the determining factor was the increase in the number of farmers, or in the average area per farmer. All key informants that were consulted agree that, during this period, pigeon pea production spread to new parts throughout Central and Northern Mozambique, leading us to believe that the increase in the number of farmers certainly played an important role. Even when assuming that the

[5] It should be noted that farm-gate prices vary according to the region and the period in which the transaction takes place. An additional factor that can help explain the rapid growth from 2015 to 2016 is a seed distribution project that took place in 30 districts in 2015.

two factors contributed equally, we reach an estimate of 1.2 million farmers engaged in pigeon pea production in 2016.

Table 3. Indian imports of Mozambican pigeon pea per agricultural season[6] [7]

Agricultural Season	2014	2015	2016
Volume (´000 tons)	93.6	59.5	174.7
Value (USD Million)	68.7	71.4	124.0

Source: ITC Trade Map

Considering that the farm-gate price rose even further in 2016, reaching MZN 44/kg [8], it is to be expected that the number of farmers also increased further in the 2017 season, which leads us to estimate that the number of pigeon pea farmers in 2017 was above 1.2 million. Considering that the average household consists of five members, this means that over 6 million Mozambicans, or 20% of the population, were expecting to gain revenue from pigeon pea sales in 2017. In all likelihood, they will not get these revenues, or much less than expected, due to the uncertainties regarding access to the Indian market and the severe drop in the farmgate price. It should be noted that the degree of dependence on income from pigeon pea varies significantly between districts and provinces. For example, in the districts of Middle and Upper Zambezia, many farmers had planted only maize, cassava and pigeon peas in 2017. In most districts of Nampula province, on the other hand, most farmers also grew other cash crops, besides pigeon pea.

In summary, the strong growth in pigeon pea production over the last decade resulted from a combination of factors: (i) Indian market demand for Pigeon pea (dhal), driven by population growth and improved incomes; (ii) the role of NGOs (eg World Vision, SNV, TecnoServe, etc.) and private sector operators in promoting the crop; and finally (iii) the highly attractive pigeon pea price in recent years, reaching MZN 40-50/kg in 2016.

[6] The price per ton increased significantly from 2014 to 2015, due to the drought in India. Prices started to fall again from the last quarter of 2016, on the back of good monsoon rains and estimates of an abundant harvest

[7] For each season, the export volume and value indicated in the table refer to exports that took place between September of that year and August of the next year.

[8] The depreciation of the national currency also helped to raise the price in MZN.

3.2 Production Cost

In examining the cost of pigeon pea production, we should start with the initial input - the seed. For 1 (one) hectare of pigeon pea, a farmer needs about 10 kg of seeds. The cost of improved seed is, on average, MZN 120/kg. However, this cost is irrelevant to the extent that the vast majority of farmers do not buy improved seeds, and prefer to save a part of the previous harvest to use as seeds in the following season.[9]

For slightly larger pigeon pea farmers, most of the production cost is concentrated on hired labour for field preparation and weeding. According to Leonardo et al. (2015), we cannot treat "smallholder farmers" as if they were a homogeneous group. It is important to distinguish between labour-contracting producers, those who both hire and sell labour, those who share labour, and those who only sell labour. Usually, in addition to the amount agreed in cash, the contracted labourer also receives in-kind payments (often lunches and alcoholic beverages). Throughout Central and Northern Mozambique, this form of contracting labour is known as *ganho-ganho*[10].

For those hiring in labour, the "price" of the *ganho-ganho* is estimated at MZN 50/day + lunch/drinks, corresponding to approximately MZN 85/day/person. Assuming that one needs to to hire 15 people for 3 days to prepare a field of 1 hectare, this operation will cost approximately MZN 4,000 per hectare. Table 4 shows the estimated cost of these and other operations throughout the season, reaching a total of MZN 11,650 per hectare. It should be noted that weeding represents the largest share of the cost (44%), even without considering a third weeding operation, which is recommended. Leonardo et al. (2015) conclude that access to labour for weeding operations seems to be the main constraint to increasing agricultural productivity in Mozambique, since productivity is significantly lower when weeding is not done at the appropriate times.

[9] The pigeon pea plant is not very demanding in terms of inputs, since it is a resilient crop, relatively drought-tolerant, and does not require the application of manure or fertilizers. In fact, the pigeon pea plant enriches the soil. Thus, the main factor for increased productivity is the availability of certified seed, which has been a challenge in Mozambique. Farmers complain about the recurrent lack of seeds at agricultural input stores. As a result, only 10% of the farmers use certified pigeon pea seed (Walker et al., 2015). There has been a great deal of effort, on the part of various stakeholders, to promote the use of improved seeds, but the coverage remains very limited. According to Walker et al. (2015), pigeon pea has received less attention from the formal seed system than other pulses and related crops, such as sesame or sunflower.

[10] Ganho-ganho means “win-win” in English.

Table 4. Labour Cost for Agricultural Operations, 2016[11]

Operation	Number of people	Number of days	Approximate Cost per hectare (in MZN)
Field Preparation	15	3	4000
Seeding	15	1	1300
1st Weeding Operation	10	3	2600
2nd Weeding Operation	10	3	2600
Harvesting	10	1	900
Threshing	3	1	250
TOTAL			**11,650**

Source: Authors

Considering the cost of production in Table 4 and the average prices of pigeon pea, Table 5 shows that pigeon pea cultivation was highly profitable in 2016. It should be noted that, using an intercropping regime, the cost per hectare includes the cost of maize production which implies that, in addition to the MZN 10,850 profit from pigeon pea in that year, the farmer also obtains the maize harvest, which can be consumed or sold. However, the drastic fall of the pigeon pea price in 2017, caused by the record harvest in India, will have a devastating effect on revenue, with the farmers incurring large losses. The extremely low price will have a strong impact in the Central and Northern regions, increasing rural poverty and potentially leading to a collapse of trading networks and a crisis in the rural economy of those districts that are most dependent on pigeon pea. Further, the emerging farmers who normally contract *ganho ganho* labour may not be able to do so in the next season, due to a lack of resources.

Table 5. Estimates of Income from Pigeon Pea Cultivation in 2016 and 2017

	2016	2017
Cost per Hectare	11,650	11,650
Productivity (kg/ha)[12]	500	500
Pigeon pea price	45	5
Income (MZN)	22,500	2,500
Profit (MZN/ha)	**10,850**	**- 9,150**

[11] These costs are only relevant for the case of "emerging farmers", who hire labour.

[12] It is assumed that "emerging farmers" who contract *ganho ganho* labour attain a yield that is above the national average of 385 kg/ha. In interviews conducted during the field visit, it was found that this type of farmer has a yield of approximately 500 kg/ha.

Source: Author

3.3 The Complexity of the Marketing System

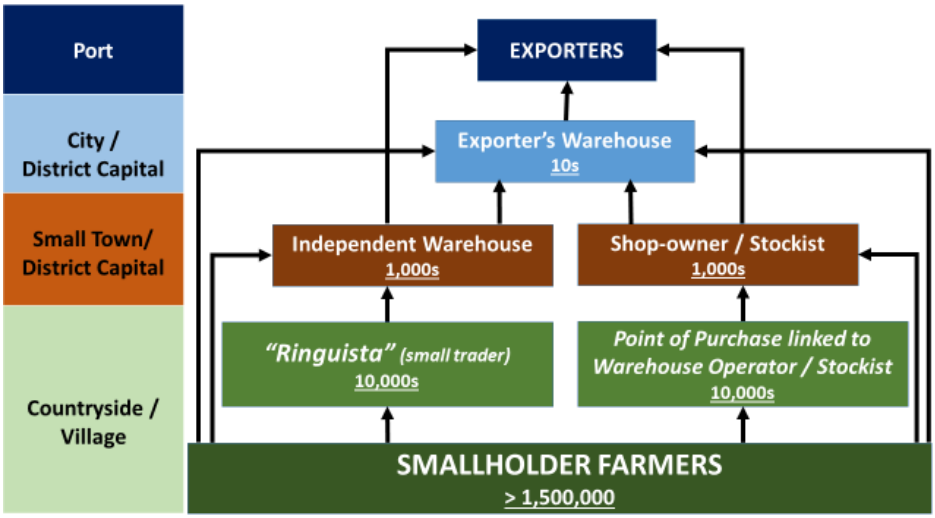
In the post-harvest period, farmers face severe difficulties in drying and storing production, which can cause significant losses. Therefore, farmers are forced to quickly sell their produce or to delay harvesting beyond the recommended period. The trading and marketing network is complex, involving exporters, intermediaries contracted by exporters, independent intermediaries, micro-intermediaries (called *nakarawa* or *ringuistas*, depending on the province), and warehouse operators. This system is highly efficient and reaches the most remote production areas.

As shown in Figure 2, there are several channels through which the pigeon peas find their way from the farmer to the port of export. On the one hand, export companies buy raw material directly from the farmer. However, the same companies also use intermediaries, often providing them with lines of credit to purchase produce from the farmers.[13] These intermediaries are usually shopowners in rural towns and villages, and often happen to be foreigners, particularly Bengalis. In the post-harvest period, many of these shopowners get involved in agricultural marketing, setting up buying posts in remote villages where they purchase the pigeon pea directly from the farmers. Receiving value chain finance from the exporters, the intermediaries are obliged to deliver the product under the terms and conditions stipulated in the agreement, regardless of subsequent price dynamics in the market.

Finally, independent warehouse operators based in the towns either buy directly from farmers who come to their warehouse with bags of produce, or they work in partnersip with micro-buyers, known as "*Nakarawa*" in Nampula and "*Ringuistas*" in Zambézia, who go to the villages and farms by bicycle to buy directly from the farmer. Generally, warehouse operators earn approximately MZN 1/kg.

[13] ETG is the main buyer, processor and exporter of pigeon pea in Mozambique. Its pigeon pea purchases are estimated to account for about 70% of the domestic market. In addition to its involvement in the marketing and export of pigeon pea, the company also processes pigeon pea (dhal) under its 'Naturz' brand. In recent years the company has invested in new processing facilities, one in Nacala and another in Beira, each with a capacity of 80 tons/day, equivalent to approximately 24,000 tons per year.

Figure 2. Pigeon Pea Marketing System



Source: Authors

Exporters determine the price paid at the port on the basis of the international market price. Starting from there, the price paid along the marketing chain varies depending on the distance from the port and the number and type of intermediaries involved. Transparency on the prices paid at various points along the chain is crucial to ensure the optimal functioning of the entire marketing system, because it can prevent certain intermediaries from exploiting the lack of price information on the part of other value chain actors, to artificially boost their margins. Therefore, pigeon pea price information should be included in the Ministry's Agricultural Market Information System (SIMA).

Interviews conducted in the field reveal that the exporters are the only actors along the value chain who possess market intelligence, in the sense of monitoring the evolution of Indian market conditions. The other intermediaries and warehouse operators are generally aware of the fact that the produce is ultimately exported to India, but they do not have information on international market trends. Most farmers have no idea of the final destination of their pigeon peas, and their only guide to determining how much to invest in a particular agricultural season is the selling price of the previous season. In this context, increased access to market intelligence and market information in a timely manner could play a key role in improved decision-making on production and sales, which could help to

avoid the type of catastrophe that occurred in 2017, in which the farmer generally ends up taking the largest hit.

4. International Market

India dominates global pigeon pea production. Between 2012 and 2014 global production was just over 4.5 million tons per year, with India accounting for nearly two-thirds of this, with close to 3 million tons (Table 6). However, India's dominance has reduced somewhat over the past two decades, having accounted for 86% of global production in the period 1992-94. Since then, Myanmar and a number of East African countries, including Mozambique, have significantly expanded their production.[14] Unfortunately, Mozambique is the only country whose pigeon pea production is not included on FAOSTAT, a situation that needs to be rectified as soon as possible. Often, international organizations, companies and consultants resort to FAOSTAT for carrying out quick analyses of the international market. Due to the absence of data for Mozambique, the country does not feature in these analyses, which has a negative effect on the recognition of Mozambique as an important market player.

On the demand side, annual Indian consumption was at least 3.5 million tons during 2012-14, corresponding to 77% of global production. The remaining 23% is mostly consumed in other producing countries, such as Myanmar, Malawi, Kenya and Haiti. In other words, apart from Indian imports, international pigeon pea trading is extremely limited.

Thus, in order to understand the dynamics of the Mozambican market, in particular the reasons behind the dramatic price fall in 2017, it is necessary to take a closer look at the Indian market. This analysis is also essential for informing public policy regarding the future of pigeon peas in Mozambique.

[14] In Myanmar, Tanzania and Mozambique, more than half of the production over the period 2012-14 was destined for export, mainly to India. In other countries, most of the production is consumed domestically.

Table 6. World Pigeon Pea Production, 1992-94 and 2012-14, tons

Country	Average annual Production, 2012-14 (ton)	% of World Production, 2012-14	% of World Production, 1992-94
India	2,987,567	65.5 %	86.1 %
Myanmar	567,633	12.4 %	4.1 %
Malawi	286,786	6.3 %	2.1 %
Tanzania	233,815	5.1 %	2.3 %
Kenya	202,594	4.4 %	2.6 %
Mozambique	120,000	2.6 %	N/A
Haiti	87,013	1.9 %	0.1 %
Dominican Republic	26,489	0.6 %	1.4 %
Uganda	13,360	0.3 %	0.9 %
Ohers	37,719	0.8 %	1.9 %
Total	**4,562,976**	**100 %**	**100 %**

Source: FAOSTAT, and Walker et al. (2015) for Mozambique

4.1 The Indian Market for Pulses and Pigeon Pea

Pigeon pea serves as a raw material for the production of dhal, a staple food for most of the Indian population. However, it should be noted that pigeon pea (known as *tur* in India) is only one among several pulses that can be used for the production of dhal. Other important pulses are: chickpeas (*chana*), mung bean/green gram (*moong*), and lentils (Table 7). Although these are all different crops, they are close substitutes, which makes it important to start our analysis by looking at the market for pulses as a group.

Table 7. Types of Pulses Used for the Production of Dhal

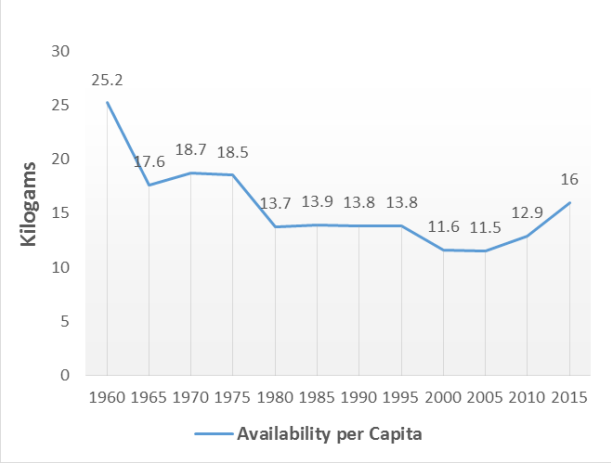
Name in Poruguese	Name in English	Scientific Name	Type of Dhal produced
Feijão Bóer	Pigeon Pea	*Cajanus Cajan*	Tur / Arhar
Feijão Holoco	Mung Bean / Green Gram	*Vigna Radiata*	Moong
Grão-de-Bico	Chickpea	*Cicer Arietinum*	Chana
Lentilha	Lentil	*Lens Culinaris*	Masur
Lentilha Preta	Black Gram	*Vigna Mungo*	Urad

Source: Authors

4.1.1 Production of Pulses in India

According to data from the Indian Ministry of Agriculture, the per capita availability of pulses decreased dramatically between 1960 and 2005, but has partially recovered since then (Figure 3).

Figure 3. Per Capita Availability of Pulses in India.



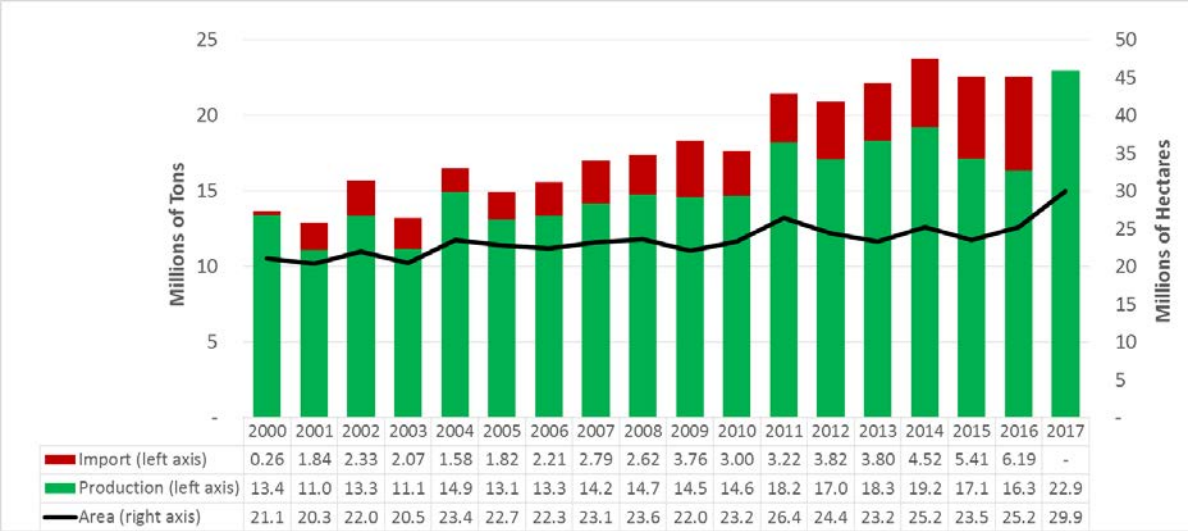
Source: Government of India (2017), p.282

Figure 4 shows the evolution of total pulses availability in India over the period 2000-2017. The sum of domestic production and imports increased from 15 million tons in 2005 to an average of 22 million tons between 2013 and 2016. This increase was due both to increased production, going from 13 million tons in 2005 to approximately 18 million tons per year between 2011 and 2014, as well as to increased imports. Imports reached unprecedented levels in 2015 and 2016, of 5.4 and 6.2 million tons respectively, mainly due to the drought that affected large parts of India in 2014 and 2015. It was in this context that the Indian prime minister visited Mozambique and other African countries to promote local production and export of pulses to India. However, against all forecasts, Indian production in 2017 was extraordinarily high, and more than enough to fully satisfy domestic demand.

Table 8 shows the production trend of the various types of pulses. Chickpea is the most produced pulse in India, accounting for between 40 and 50% of total production. The production of all of these crops saw significant growth from 2016 to 2017, thus contributing to the record production of pulses in 2017. In fact, except for chickpea, which had its highest ever production in 2014, all other pulses broke their all-time production

record in 2017. In the case of pigeon pea, production grew from 2.56 million tons in 2016 to 4.78 million tons in 2017, an increase of 87%, which is much higher than for the other pulses.

Figure 4. Area, Production and Import of Pulses in India



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Import (left axis)	0.26	1.84	2.33	2.07	1.58	1.82	2.21	2.79	2.62	3.76	3.00	3.22	3.82	3.80	4.52	5.41	6.19	-
Production (left axis)	13.4	11.0	13.3	11.1	14.9	13.1	13.3	14.2	14.7	14.5	14.6	18.2	17.0	18.3	19.2	17.1	16.3	22.9
Area (right axis)	21.1	20.3	22.0	20.5	23.4	22.7	22.3	23.1	23.6	22.0	23.2	26.4	24.4	23.2	25.2	23.5	25.2	29.9

Source: Government of India (2017), Ministry of Agriculture & Farmer Welfare

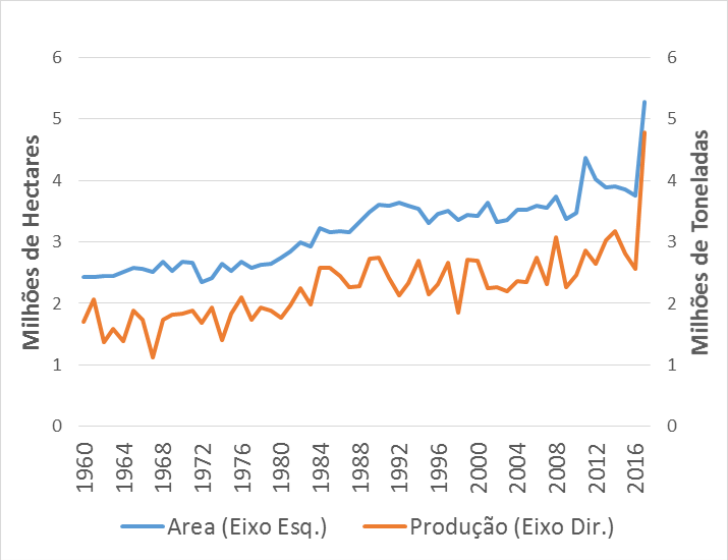
Table 8. Production of different pulses in India, Million Tons, 2006-17.

Year	Chickpea		Pigeon Pea		Mung Bean		Black Gram		Other	
	Million Tons	%	Million Tons	%	Million Tons	%	Million Tons	%	Milhion Tons	%
2006	5.60	*42 %*	2.74	*20 %*	0.95	*7 %*	1.25	*9 %*	2.84	*21 %*
2007	6.33	*45 %*	2.31	*16 %*	1.12	*8 %*	1.44	*10 %*	3.00	*21 %*
2008	5.75	*39 %*	3.08	*21 %*	1.52	*10 %*	1.46	*10 %*	2.95	*20 %*
2009	7.06	*48 %*	2.27	*16 %*	1.03	*7 %*	1.17	*8 %*	3.04	*21 %*
2010	7.48	*51 %*	2.46	*17 %*	0.69	*5 %*	1.24	*8 %*	2.79	*19 %*
2011	8.22	*45 %*	2.86	*16 %*	1.80	*10 %*	1.76	*10 %*	3.60	*20 %*
2012	7.70	*45 %*	2.65	*16 %*	1.63	*10 %*	1.77	*10 %*	3.34	*20 %*
2013	8.83	*48 %*	3.02	*16 %*	1.19	*6 %*	1.90	*10 %*	3.40	*19 %*
2014	9.53	*50 %*	3.17	*16 %*	1.61	*8 %*	1.70	*9 %*	3.24	*17 %*
2015	7.33	*43 %*	2.81	*16 %*	1.51	*9 %*	1.96	*11 %*	3.54	*21 %*
2016	7.06	*43 %*	2.56	*16 %*	1.59	*10 %*	1.95	*12 %*	3.19	*20 %*
2017	9.33	*41 %*	4.78	*21 %*	2.16	*9 %*	2.80	*12 %*	3.88	*17 %*

Source: Government of India (2017), Ministry of Agriculture & Farmer Welfare

Looking at a longer period starting in 1960, Figure 5 confirms that both the cultivated area and pigeon pea production reached historically unprecedented levels in 2017. The key question is whether this a structural trend. Has India's self-sufficiency become permanent, or were circumstantial factors at play that temporarily boosted production?

Figure 5. Pigeon Pea Production and Area in India, 1960 – 2017.



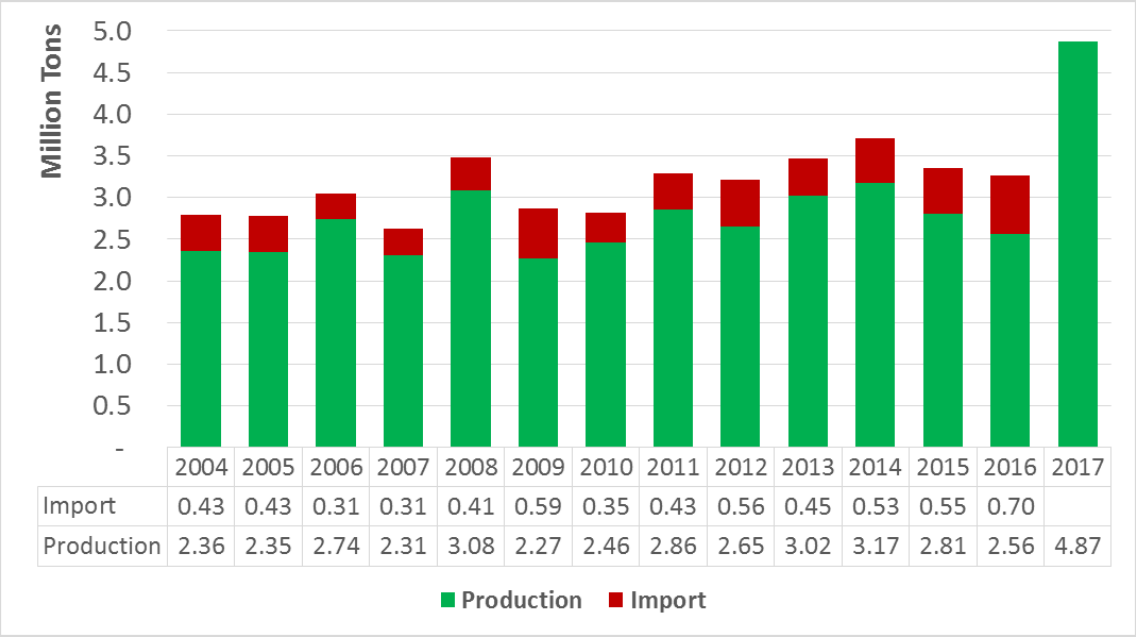
Source: Government of India (2017)

Figure 6 shows that, following a phase of solid expansion of pigeon pea production between 2009 (2.27 million tons) and 2014 (3.17 million tons), accompanied by substantial import levels (approximately 500,000 tons per year), a sharp decline took place in 2015 and 2016. This resulted in a record import level of 700,000 tons in 2016, the year in which India signed the Memorandum of Understanding with Mozambique aimed at stimulating pigeon pea production and export to India.

The figure clearly illustrates the extent of the 2017 production record, which is 40% higher than the average annual consumption during the previous five years. By the same token, assuming that, in the coming years, production and consumption will be roughly equal to 2016 levels, and that 1.5 million tons from the 2017 harvest would be stored, India would not need to import any pigeon pea in the next two years. It was in this context that the

Indian Government decided to protect its farmers by imposing import barriers[15], despite having stimulated African production in recent years with the aim of exporting to the Indian market and strengthening the country's food security.

Figure 6. Indian Production and Import of Pigeon Pea, 2004-17.



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Import	0.43	0.43	0.31	0.31	0.41	0.59	0.35	0.43	0.56	0.45	0.53	0.55	0.70	
Production	2.36	2.35	2.74	2.31	3.08	2.27	2.46	2.86	2.65	3.02	3.17	2.81	2.56	4.87

Source: Government of India (2017), Ministry of Agriculture & Farmer Welfare & ITC

[15] **Notification No. 19 of 5 August 2017,** issued by the Foreign Trade Directorate at the Ministry of Trade and Industry of the Government of India and signed by the Director General for Foreign Trade, establishes a 200,000 ton pigeon pea import quota per fiscal year. The notification states that this import restriction does not apply to import commitments made by the Government of India under any bilateral / regional agreements and MOUs, implying that Mozambique continues to have access to the Indian market up to the volumes stipulated in the Memorandum of Understanding.

Trade Notification No. 13 of 11 August 2017, issued by the Directorate of Foreign Trade at the Ministry of Trade and Industry of the Government of India and signed by the Deputy Director of External Trade, informs that the import quota of 200,000 tons of pigeon pea for the fiscal year 2017/18 has already been exhausted, and that there is no longer room for the import of this product.

It should be noted that, as early as March 2017, the Government of India introduced an import tariff on pigeon pea of 10%. This measure was introduced through Customs Notification No. 10/2017 of 28 March 2017 issued by the Tax Revenue Department of the Ministry of Finance of the Government of India. However, this measure did not have a significant impact since all major suppliers of pigeon pea, including Myanmar, Mozambique, Tanzania, Malawi and Sudan, are signatories to the Duty Free Tariff Preference Scheme for LDCs, signed in 2008. In the original agreement of 2008, pigeon pea only had a 10% preference margin (p.37, Nº23), which would mean that, with an MFN tariff of 10%, pigeon pea from LDCs would face a 9% tariff. However, in the 2014 update, there was an expansion of the included products, and pigeon pea from LDCs became fully exempt from customs duties, no longer appearing on either the exclusion list or the margin of preference list. It is worth noting that Kenya is not part of the LDC category, and therefore does not enjoy these benefits, so that pigeon pea imports from Kenya would be charged the 10% tariff.

Drastic Change of Market Conditions

The Indian bumper harvest, the introduction of an import quota and the consequent fall in prices has completely changed the international market scenario in the space of a single year, with adverse implications for the African countries producing pigeon pea. In their analysis of the Indian market, Walker et al. (2015) came to the conclusion that India would not be able to raise pigeon pea production to the point of fully responding to the growing domestic demand. Citing estimates by Dahl (2014), the gap between pigeon pea consumption and production was predicted to increase from 500,000 tons in 2012 to 1,450,000 tons in 2017, and to more than 3 million tons in 2025. The authors note that the area of pigeon pea cultivation increased significantly between 2010 and 2013, but nonetheless conclude that "*it is unlikely that rapid area expansion is a sustainable force for expanding pigeon pea production in India, even with substantially higher support prices for pulses*" (p.25). Overall, they estimate that "*rising and sustainable import demand from India for pulses is, for all intents and purposes, a certainty unless India experiences a sharp downturn in economic growth and/or a steep depreciation of the Rupee"* (p.21).

However, in stark contrast to these optimistic predictions about the Indian market, the reality is that demand for pigeon pea imports disappeared almost completely in 2017. Moreover, looking at India's official estimates of next year's production of about 4 million tons, there are no indications that market conditions for Mozambican pigeon peas will be much better in 2018. To form expectations of market developments in the coming years, it is crucial to try to understand what was behind the record production of 2017, and to assess whether it was an exceptional event, or whether it is part of a more structural process.

A determining factor was the sharp increase of the pigeon pea price in the Indian market in 2015 and 2016, as a result of reduced production in these drought years. As shown in Figure 12, the price increased from approximately INR 50/kg in early 2015 to over INR 100/kg at the end of the year, remained high during the first half of 2016, above INR 80/kg, and started to fall with the first forecasts of the impending 2017 bumper harvest.

This price increase led to significant growth of the cultivated area in the 2016-17 season, reaching 5.13 million hectares, which is 34% higher than the 2014-16 average. The bumper harvest was a result of the powerful combination of this increase in cultivated area and the good rainfall in 2016, which boosted yields. Average yield reached 932 kg/ha, a record level, and 25% higher than the average yield between 2014 and 2016, when rains were poor.

Another key factor is the Indian government's agricultural policy, particularly in relation to the Minimum Support Price (MSP). India has a tradition of guaranteeing minimum prices for agricultural products, although some states have faced difficulties in effectively implementing the MSP for pulses. In recent years, the pigeon pea MSP has increased substantially, from INR 43.5/kg for the 2014-15 season to INR 50.5/kg in 2016-17.

An important report (Subramanian 2016) on pulses was published in September 2016 by Dr Arvind Subramanian, Chief Economic Adviser to the Government of India. This report advises the Indian Government to increase the pigeon pea MSP to INR 60/kg. In the same document, Subramanian also analysed imports, arguing that it would be dangerous for India to remain dependent on pulse imports because there is a strong correlation between production in India and the other pulse-producing countries, since they are all susceptible to El Nino effects. Consequently, in a year of low production in India, the availability of pulses on the international market would probably follow the same pattern. For this and other reasons, Subramanian suggests that food security in terms of pulses should be achieved by increasing productivity and domestic supply (p.10). He also advises that in the long term a moderate import tariff of 5 - 10% would be a good option to signal to farmers the Government's intention of and interest in stimulating local production (p.30).

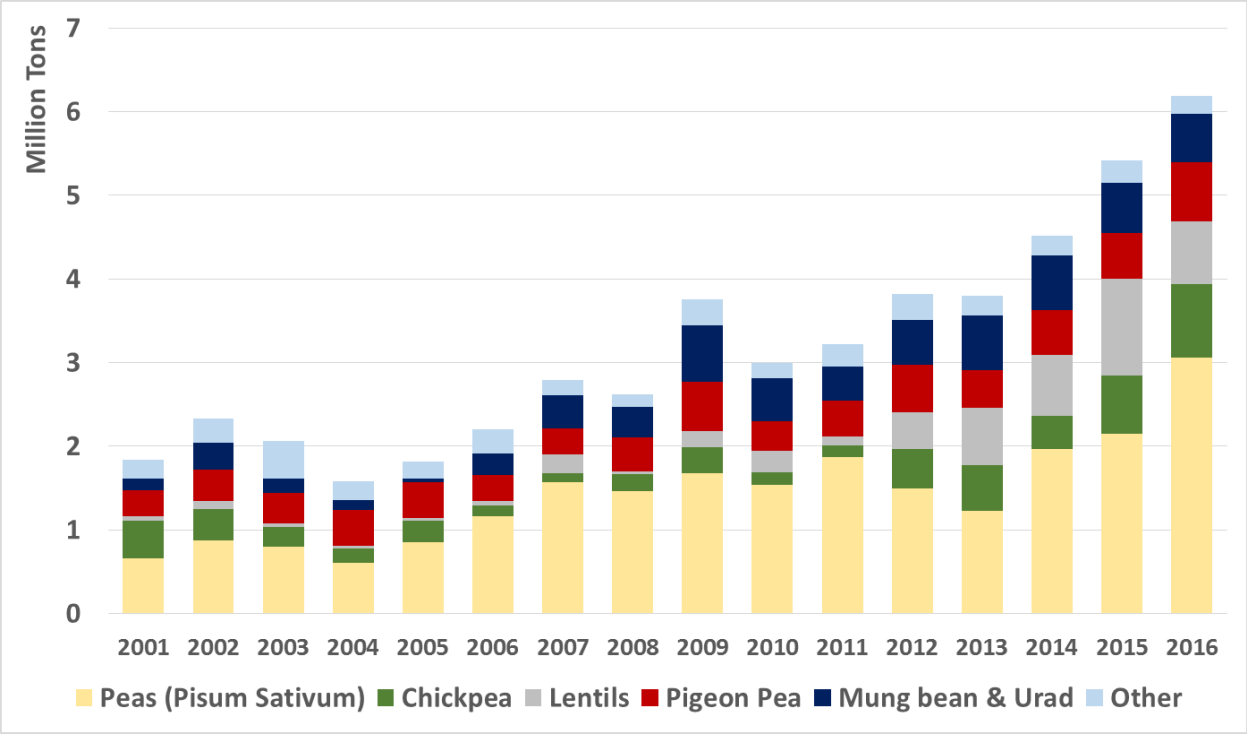
Thus, one cannot simply dismiss the record production of 2017 as an exceptional one-off event, which is unlikely to happen again for many years. The possibility of Indian agricultural policy following up on Subramanian's recommendations should be contemplated, which could lead to structurally higher levels of production. In this scenario,

African production would appear to serve as "costless" insurance so as to ensure sufficient availability in years of extremely low production in India. It is important to note that the price of dhal to the urban consumer is a variable of extreme political importance in India, and the government will always aim to keep it stable and affordable.

4.1.2 Indian Import of Pulses

Despite the change that occurred in 2017, it is important to take a closer look at the growing Indian import of pulses until 2016. Figure 7 shows that pulses imports tripled between 2006 and 2016. Yellow split pea (*pisum sativum*) accounts consistently for half of pulses imports and is generally imported from countries with temperate climates, mainly Canada, Russia, USA and France. It should be noted that the price of yellow split peas is lower than the price of other pulses, but also that it is not so much a substitute for chickpeas, pigeon pea, mung bean / green gram, lentils (*masur*) and black gram (*urad* bean), because these are all used for the production of dhal, while the yellow split pea is normally consumed fresh.

Figure 7. Indian Import of Pulses, by crop, 2001-16

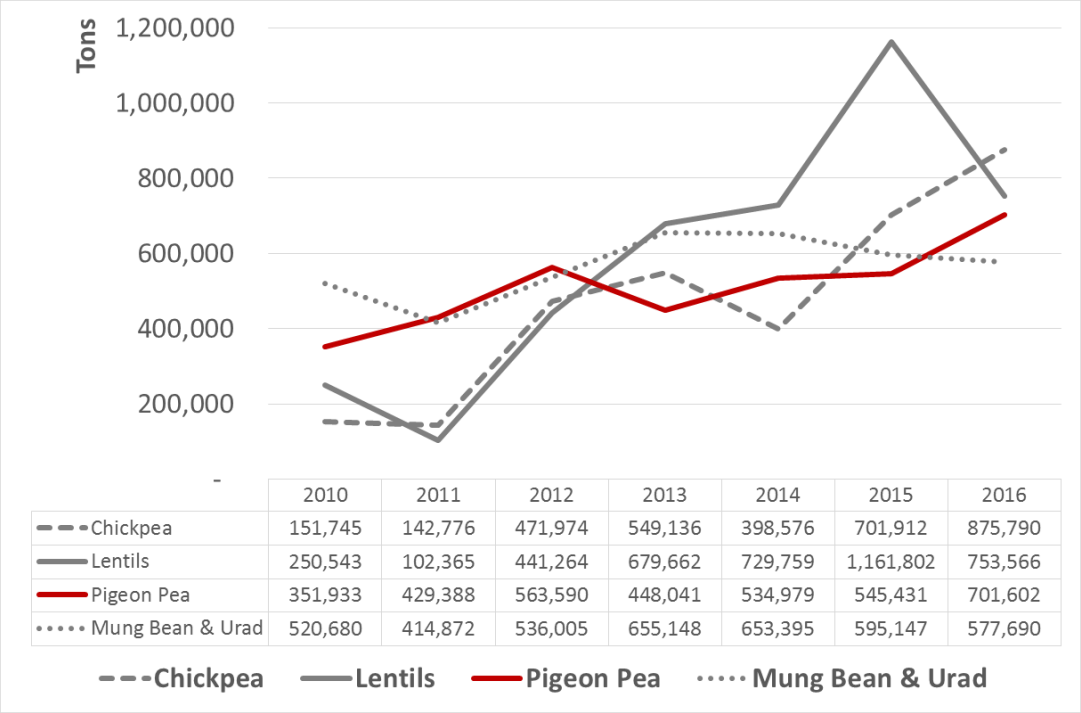


Source: Government of India, Ministry of Agriculture & Farmer Welfare & ITC, Trade Map

Figure 8 shows India's import of pulses that are generally grown in sub-tropical climates, such as Mozambique, in more detail. The annual import of pigeon pea doubled between 2010 and 2016, from 350,000 tons to 700,000 tons. However, the import of lentils tripled over the same period, while chickpea imports increased five times. The import levels of mung bean and black lentils (urad) have been more stable, at approximately 600,000 tons per year.

It is worth noting that lentils can be produced in different types of climate, and Canada, the USA and Australia are the largest exporters to India. In turn, the largest exporters of chickpeas include Australia, Russia, Tanzania and Ethiopia. Finally, the main suppliers of Indian imports of mung and urad beans are Myanmar, Australia, Tanzania, Kenya and Uzbekistan. The figure clearly shows that, since 2010, growth of Indian lentil and chickpea imports has been faster than the growth of pigeon pea imports.

Figure 8. Import of (Sub-) Tropical Pulses by India, 2010-16.



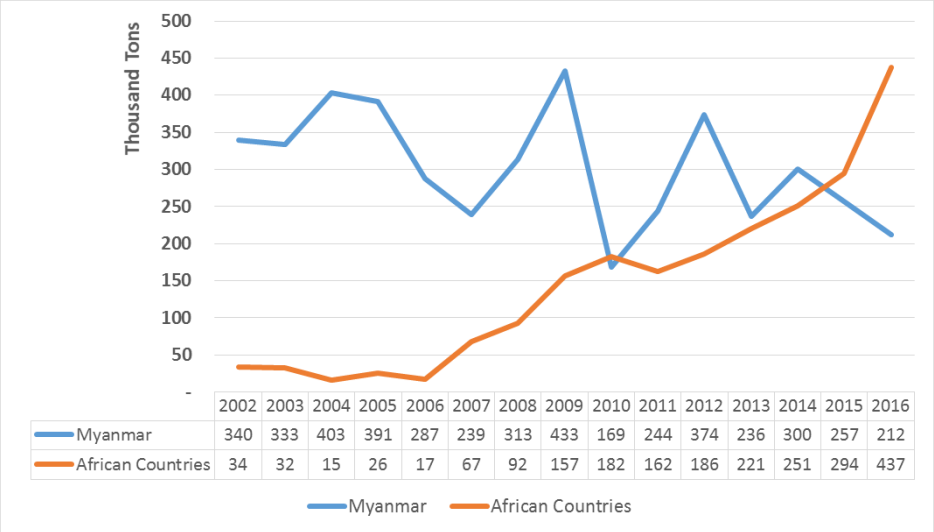
	2010	2011	2012	2013	2014	2015	2016
Chickpea	151,745	142,776	471,974	549,136	398,576	701,912	875,790
Lentils	250,543	102,365	441,264	679,662	729,759	1,161,802	753,566
Pigeon Pea	351,933	429,388	563,590	448,041	534,979	545,431	701,602
Mung Bean & Urad	520,680	414,872	536,005	655,148	653,395	595,147	577,690

Source: Government of India, Ministry of Agriculture & Farmer Welfare & ITC, Trade Map

4.1.3 Export of Pigeon Pea to India

Pigeon pea exports to India have traditionally been dominated by Myanmar, but its share has declined over the last decade (Figure 9). During this period, East African pigeon pea exports increased dramatically, from USD 20 million in 2006 to USD 455 million in 2016. It should be noted that, in the last two years, the African countries, taken together, overtook Myanmar as the main source of Indian pigeon pea imports.

Figure 9. Export of Pigeon Pea to India: Myanmar and Africa



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Myanmar	340	333	403	391	287	239	313	433	169	244	374	236	300	257	212
African Countries	34	32	15	26	17	67	92	157	182	162	186	221	251	294	437

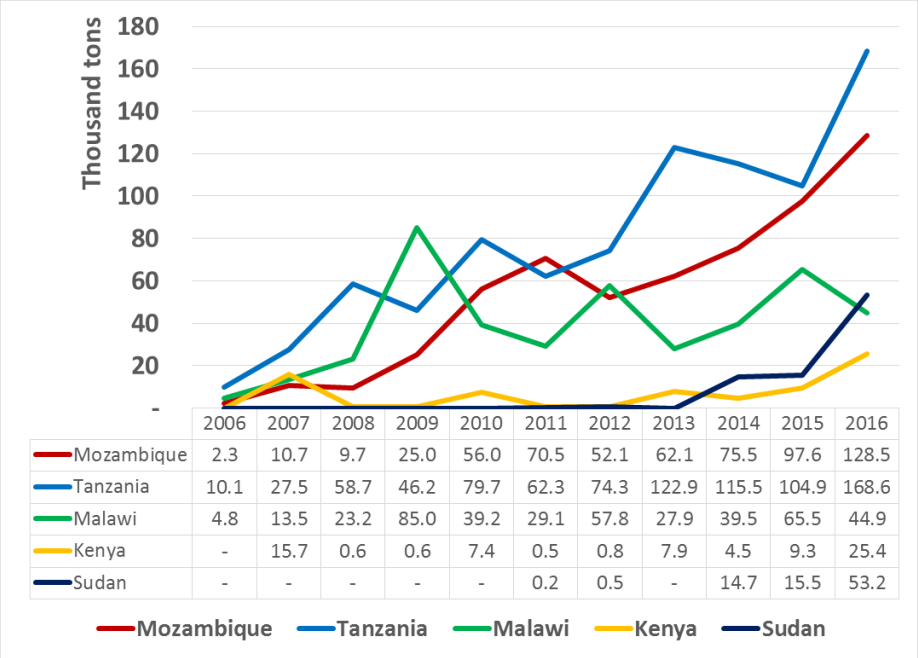
Source: Authors, based on ITC Trade Map

Figure 10 shows the dynamics of African pigeon pea exports during 2006-16. Tanzania and Mozambique stand out as the main drivers of the increase in African exports, accounting for two thirds of the continent's exports to India.

Malawi's exports increased significantly between 2006 and 2008, but stagnated in the following period, although this is not necessarily related with production levels. In both Malawi and Kenya, local consumption of pigeon pea has a much stronger tradition than in other countries. Simtowe et al. (2010) report, for example, that more than half of Malawi's production is destined for local consumption. A notable case is the very rapid growth of

Sudan's exports since 2014. Until then, Sudan had hardly featured at all among exporters to India, but by 2016 its exports reached 53,000 tons, thus surpassing Kenya's export of approximately 25,000 tons.

Figure 10. African Pigeon Pea Exports to India



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Mozambique	2.3	10.7	9.7	25.0	56.0	70.5	52.1	62.1	75.5	97.6	128.5
Tanzania	10.1	27.5	58.7	46.2	79.7	62.3	74.3	122.9	115.5	104.9	168.6
Malawi	4.8	13.5	23.2	85.0	39.2	29.1	57.8	27.9	39.5	65.5	44.9
Kenya	-	15.7	0.6	0.6	7.4	0.5	0.8	7.9	4.5	9.3	25.4
Sudan	-	-	-	-	-	0.2	0.5	-	14.7	15.5	53.2

Source: Authors, based on ITC Trade Map

4.2 World Market Price and Processing Prospects in Mozambique

In the literature we found three propositions in relation to world market prices that deserve to be discussed further:

1. The processing premium of pigeon pea into dhal is only USD 120/ton, or 20%. Considering that the conversion rate of the whole pigeon pea to the processed dhal is 0.7, it is argued that it does not make sense for Mozambique to process raw pigeon pea into tur dhal (Walker et al. 2015).

- **Analysis**. It is true that with a conversion rate of 0.7, the dhal premium (in USD / ton) should be at least 43% to offset the weight loss (30/70). In the international trade statistics (HS) system, there are no separate categories for pigeon pea and tur dhal, with both entering under the line HS 071360. However, looking at prices on the Indian market reveals that the premium for tur dhal is always at least 50%. In October 2017, the price of pigeon pea was approximately INR 37/kg, while the price of tur dhal was approximately INR 61/kg,[16] a premium of 65%. India does not have a differentiated tariff on the import of dhal, so the premium on the processed product should, in principle, also be transmitted to the international market.

  In this regard, we do not agree with Walker et al. (2015) that, on this basis, processing into dhal would not be advantageous for Mozambique. On the contrary, processing would result in higher value-added in the country and job creation on a competitive basis. In addition, it helps to diversify the market, as India is practically the only importer of raw pigeon pea, while there are other markets, albeit small, for tur dhal, such as the USA, Canada, the European Union and the Middle East.

2. The international market is characterised by price seasonality, with the price reaching its highest level beween September and December, before the pigeon pea harvest in India (which takes place in December and January). Such seasonality would imply that African countries have a short window after their own harvest in August/September to take advantage of the seasonal premium, which reaches USD 150-200 per tonne, according to Walker et al. (2015). Based on this assertion, the authors reinforce their argument that processing in Mozambique is infeasible, as there is not enough of a time window before prices start falling. Therefore, the sector should encourage the export of raw pigeon peas immediately following the harvest.

[16] Level A Commodities, Weekly Report (Tur), 25th October 2017. This difference implies a premium of INR 24 / kg, equivalent to approximately USD 370 / ton.

- **Analysis.** We find no evidence of price seasonality. Figure 11 shows that there is a seasonality in terms import volumes, with peaks in the period from October and December, right after the African harvest. However, between 2014 and 2017 we do not observe seasonality in the price. Walker et al. (2015) state that they observed data from February 2014 to December 2014 to assess the seasonality in import prices, which is not a sufficienttime window for such an analysis. Figure 11 shows that the price in November 2014 was certainly higher than in February 2014, but it is also clear that this increase formed part of a general upward trend in the market price, and is not necessarily related to seasonality dynamics.

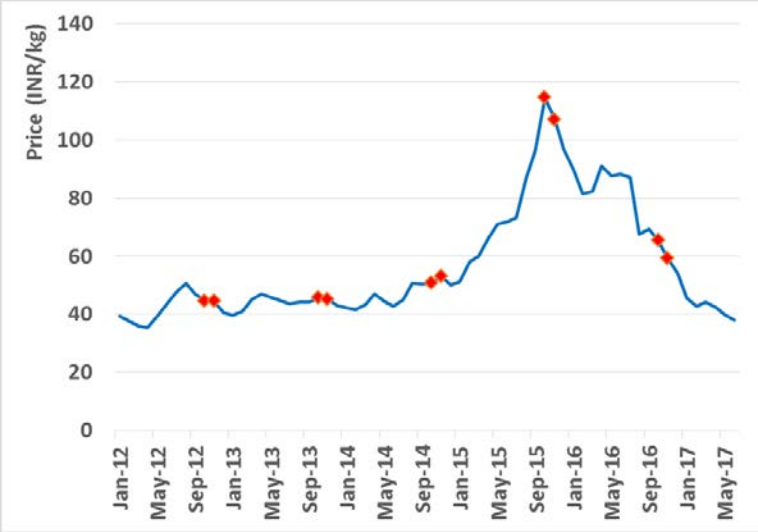
Figure 11. Indian Imports Volume and Price per Month, 2014-17.

Source: Authors, based on data from Zauba and ITC Trade Map

Furthermore, if import prices were characterised by seasonality, one would expect this to be reflected in pigeon pea prices on the domestic market as well. Figure 12 shows the evolution of the wholesale price of pigeon pea in Indore (a

city in one of the largest production zones) between January 2012 and August 2017, confirming that there is no significant price seasonality. The red dots refer to the months of October and November. Although there is a slight price reduction in the month of January for the years 2013, 2014 and 2015, these are not significant movements. It is also clear that the multi-year price trend dominates any possible seasonal trends. This observation had already been made by Lo Monaco (2006), who says that there used to be some price seasonality, but that the effect had faded.

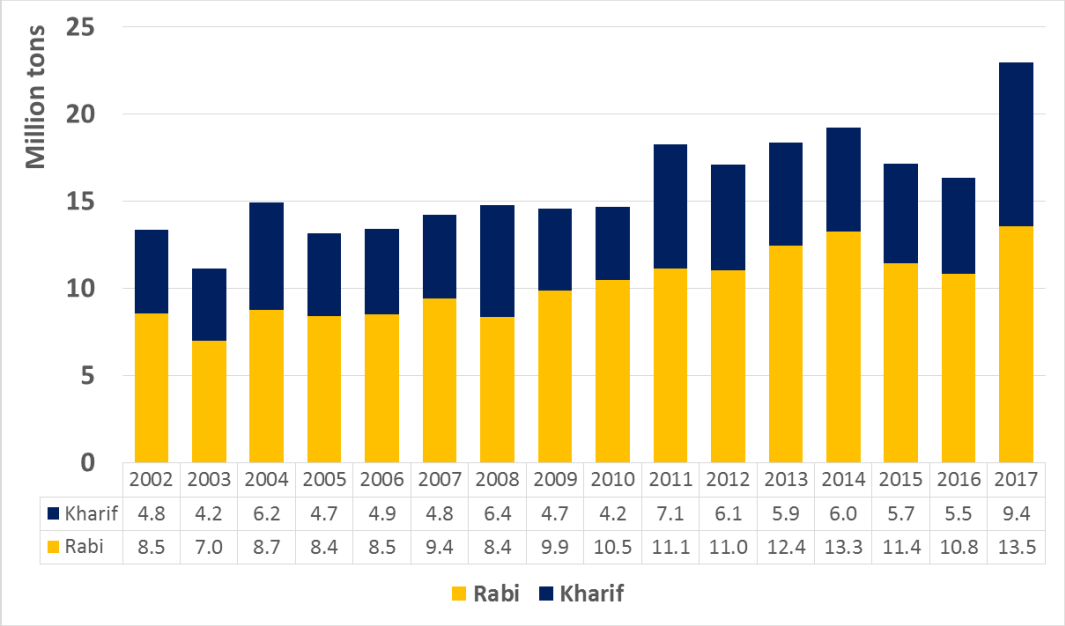
Figure 12. Pigeon Pea Price in Indore (INR / kg)



Source: Authors, based on data from Agriwatch

In fact, considering that India has two agricultural seasons per year, the *Kharif* with its harvest in January, and the *Rabi* in May, one would not expect a strong seasonality linked to the pigeon pea *Kharif* harvest. While the *kharif* is the main agricultural season, taking advantage of the monsoon rains of August / September, most pulses, principally chickpeas, are produced in the *rabi* season (Figure 13). While some pulses are produced in both seasons, pigeon pea is only cultivated in the *kharif* season. To the extent that the major pulses are substitutes to some extent, their price is less volatile due to the existence of two harvests.

Figure 13. Production of Pulses in India, by year



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Kharif	4.8	4.2	6.2	4.7	4.9	4.8	6.4	4.7	4.2	7.1	6.1	5.9	6.0	5.7	5.5	9.4
Rabi	8.5	7.0	8.7	8.4	8.5	9.4	8.4	9.9	10.5	11.1	11.0	12.4	13.3	11.4	10.8	13.5

Source: Authors, based on data from the Government of India (2017)

3. African pigeon pea exports suffer a slight discount, due to quality issues, when compared to Myanmar's, ranging from 5% for Kenya and Tanzania, to 10% for Mozambique and 15% for Malawi.

    - **Analysis**: In order to test this assertion, we must control for two factors: (i) export of pigeon pea that has been processed into dhal, which would increase the price per kilogram; and (ii) export in different months, which may affect the price. The difficulty is that the trade data reported in COMTRADE do not distinguish between raw and processed pigeon pea. Zauba data[17], however, make this distinction and are available for the period from January 2014 to November 2016. Looking only at the export of raw pigeon pea, and controlling

[17] See www.zauba.com

for imports taking place in different months, we find the results reported in Table 9.

Table 9. Price of Pigeon pea exported to India by country of origin

Country	% of Average Price of Indian Imports of Raw Pigeon Pea, Controlled for Month of Import
Malawi	95.2
Mozambique	95.2
Myanmar	103.2
Kenya	95.7
Sudan	101.9
Tanzania	96.8
Uganda	94.1
Other	97.7

Source: Authors, based on data from Zauba

Thus, we agree with Walker et al. (2015) that there is a slight discount on African exports, of similar magnitude for the various countries, with the notable exception of Sudan. Interestingly, Sudan has been getting better prices than other African countries, which could be linked to ICRISAT efforts to promote short-duration, bold-seeded brown varieties in the Gezira Irrigation scheme (Walker et al., 2015, p.27), one of the largest in the world.

4.3 Dependence on the Indian Market

Table 10 compares, for the largest pigeon pea exporters, the degree of dependence on the Indian market during the period 2012-16. Mozambique and Tanzania are most dependent on India, accounting for 98.1% and 95.9% of their exports, compared with 86.7% and 84.9% for Malawi and Myanmar, respectively. In the case of Myanmar, we observe some exports to China, Malaysia and the United Arab Emirates (UAE).

For a long time, Malawi and Kenya were the only African countries with a significant processing industry. Until the recent construction of factories in Beira and Nacala, Malawi had the largest pigeon pea processing industry outside India (Jones et al., 2002). It appears that a history of tur dhal production has helped Malawi and Kenya to find markets other than India, especially in countries with a substantial Indian community such as the UAE, Malaysia, Singapore, United Kingdom and Canada (Shiferaw et al., 2008).[18] Lo Monaco (2006) reports that, for the case of Malawi, the tur dhal export market has been more stable than the market for unprocessed pigeon pea. India also imports some quantities of processed pigeon pea, according to data from Zauba. In fact, Table 10 shows Mozambique as the main exporter of tur dhal to India, at 5,000 tons per year between 2014 and 2016, representing approximately 5% of total Mozambican pigeon pea exports of pigeon pea to India during this period.

Table 10. Dependence on the Indian Market, 2012-16.

			2012	2013	2014	2015	2016	Média
1.	Pigeon Pea Export (´000s tons)	Mozambique	52.3	62.4	78.2	99.3	131.1	**84.7**
		Tanzania	75.3	128.7	125.2	109.0	172.8	**122.2**
		Malawi	60.6	34.5	54.4	72.3	50.0	**54.3**
		Myanmar	429.3	289.8	344.7	308.3	253.5	**325.1**
2.	Pigeon Pea Export (million USD)	Mozambique	30.0	36.3	52.2	97.6	104.4	**64.1**
		Tanzania	47.9	76.3	91.3	118.3	119.8	**90.7**
		Malawi	35.4	22.1	38.7	72.9	47.3	**43.3**
		Myanmar	281.6	204.5	251.6	306.7	313.6	**271.6**
3.	Pigeon Pea Export to India (´000s tons)	Mozambique	52.1	62.0	75.5	97.6	128.5	**83.1**
		Tanzania	74.3	122.9	115.5	104.9	168.6	**117.2**
		Malawi	57.8	27.9	39.5	65.5	44.9	**47.1**
		Myanmar	374.2	236.3	300.1	257.2	212,2	**276.0**
4.	India (%)	Mozambique	99.7 %	99.4 %	96.6 %	98.3 %	98.1 %	**98.1 %**
		Tanzania	98.6 %	95.4 %	92.3 %	96.3 %	97.6 %	**95.9 %**
		Malawi	95.3 %	80.9 %	72.7 %	90.7 %	90.0 %	**86.7 %**
		Myanmar	87.2 %	81.5 %	87.1 %	83.4 %	83.7 %	**84.9 %**
5.	Processed pigeon Pea Export to India (´000s tons)	Mozambique			2.1	8.0	5.0	**5.0**
		Tanzania			0.7	1.6	0.2	**0.8**
		Malawi			4.2	6.8	1.0	**4.0**
		Myanmar			2.8	1.4	0.6	**1.6**

Source: Authors, based on data from COMTRADE

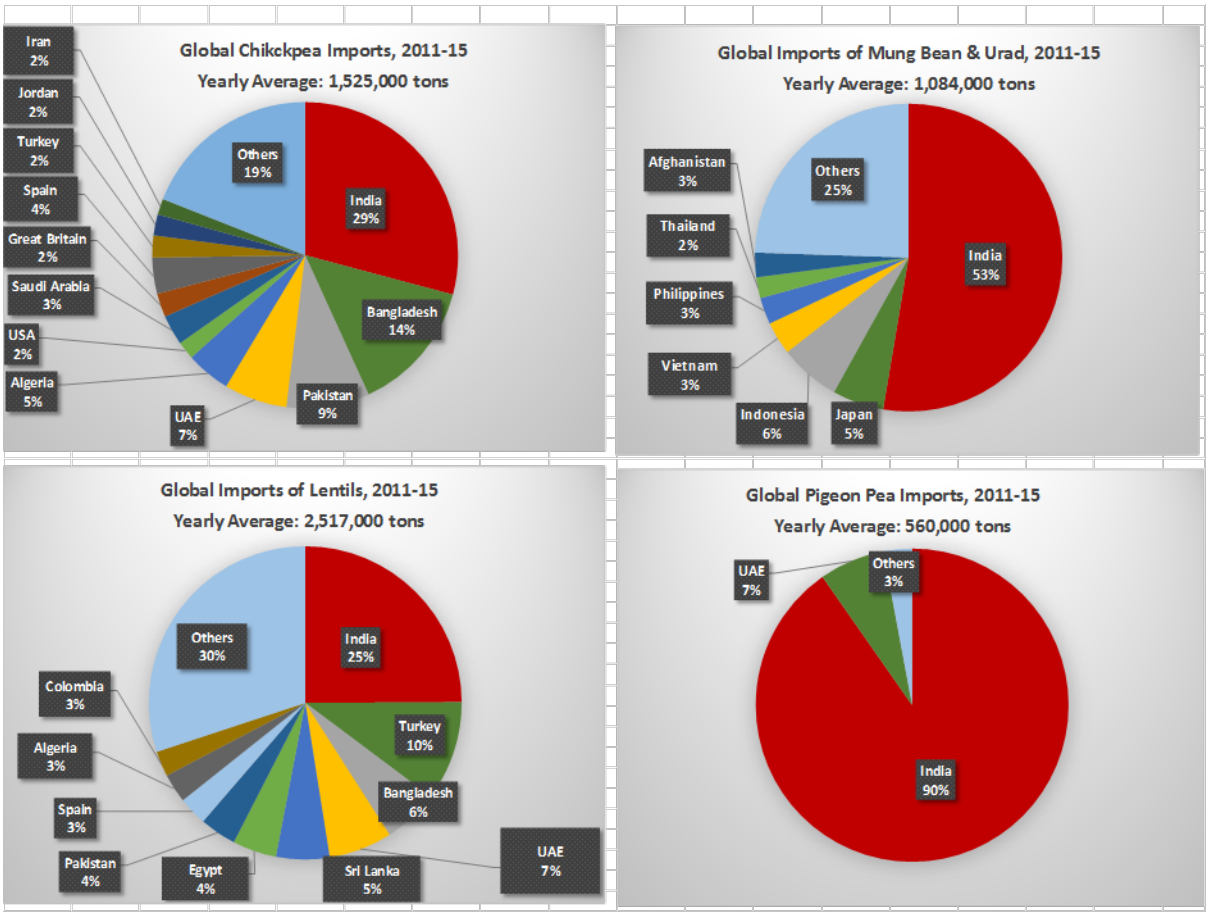
[18] This analysis is complicated by the fact that many countries do not report dhal imports under the pigeon pea code (line 071360), even if it is *tur* dahl, using the line for "other pulses" instead (071390).

5. The Possibility of Diversification to Other Pulses

The previous analysis suggests that there may be some possibility of diversifying to other pigeon pea markets. It is clear, however, that this possibility is very limited, due to the strong Indian dominance of global pigeon pea consumption and imports. Figure 14 shows that the international pigeon pea market is extremely concentrated, with India accounting for 90% of global imports between 2011 and 2015. Although India is also the largest importer of other pulses used for dhal production, its degree of domination of global imports of these pulses is much more limited. The country accounts for "only" 29% of global chickpea imports, which has significant markets in other South Asian countries and in the Middle East. In regard to Mung beans and *urad* beans, India accounts for 53% of global imports, more than half, but other significant markets do exist in East and Southeast Asia. It is important to note that the total size of the international pigeon pea market, with an annually traded volume of 550,000 tons on average, is much lower than that of mung & *urad* beans (> 1 million tons), chickpeas (> 1.5 million tons) and lentils (> 2.5 million tons).

From a long-term perspective, all types of pulses have significant scope for international market diversification, due to a trend of growing pulses consumption in Western countries. In these markets, consumers are becoming increasingly aware of the effects of their consumption patterns on personal health, but also on climate change, poverty and inequality (CBI 2016). The growing number of vegetarians can be seen as part of this trend. Mintel, a well-renowned market research firm, has found, for example, that 12% of people in the United Kingdom consider themselves to be vegetarian, and that this share is as high as 20% in the age group 16 to 24. In addition to vegetarians, there is also an increasing number of flexitarians, who consume meat only once or twice a week. For these consumers, pulses constitute a highly attractive alternative source of protein.

Figure 14. International Market of Chickpea, Mung & Urad beans, Lentils and Pigeon Pea, 2011-15 average, in tons



Source: Authors, based on COMTRADE data

In Mozambique, the share of pigeon pea exports in the total volume of pulses exports has been growing in recent years, from 72% in 2012 to 88% in 2016. In this regard, lessons could be learnt from neighbouring Tanzania, where, despite a similar or even stronger boom in pigeon exports, the share of pigeon pea in total pulses exports has remained stable at around 55%.

During the period of rapidly growing pigeon pea exports, Tanzania was also able to simultaneously increase the export of other pulses, such as mung beans and chickpea, as shown in Table 11. Mung bean exports increased from 22,000 tons in 2012 to 69,000 tons

in 2016, worth USD 62 million. The export of chickpeas, meanwhile, increased from 39,000 tons to 65,000 tons (USD 64 million) in 2016. Similarly, Kenyan mung bean exports grew from 6,000 tons in 2012 to 46,000 tons in 2016. According to the same table, Mozambique, on the other hand, exported only 16,000 tons of mung bean in 2016, while the production and export of chickpea has been virtually non-existent. Given that some mung bean production is already taking place in Mozambique, its expansion seems a viable option. Another advantage is that Mozambicans like to consume mung beans, much more so than pigeon pea.

Table 11. Pulses Exports, 2012-16, in tons and USD.

		2012	2013	2014	2015	2016	Average
Pulses Export (HS 0713) (000s tons)	Mozambique	72.8	80.7	96.5	110.6	148.4	**101.8**
	Tanzania	155.2	222.6	219.2	208.3	313.0	**223.6**
	Malawi	70.7	46.8	62.6	75.7	54.7	**62.1**
	Kenya	15.1	74.4	53.4	52.5	84.7	**56.0**
PIGEON PEA							
Pigeon Pea Export (´000s tons)	Mozambique	52.3	62.4	78.2	99.3	131.1	**84.7**
	Tanzania	75.3	128.7	125.2	109.0	172.8	**122.2**
	Malawi	60.6	34.5	54.4	72.3	50.0	**54.3**
	Kenya	0.8	10.3	4.8	10.1	25.6	**10.3**
Pigeon Pea Export, % of legumina export	Mozambique	71.8 %	77.4 %	81.0 %	89.7 %	88.3 %	**83.2 %**
	Tanzania	48.5 %	57.8 %	57.1 %	52.3 %	55.2 %	**54.6 %**
	Malawi	85.7 %	73.7 %	86.9 %	95.5 %	91.3 %	**87.4 %**
	Kenya	5.4 %	13.8 %	8.9 %	19.2 %	30.2 %	**18.4 %**
MUNG BEAN							
Mung Bean Export (´000s tons)	Mozambique	9.8	10.6	12.8	7.9	15.7	**11.4**
	Tanzania	21.6	48.3	40.1	27.1	69.1	**41.2**
	Malawi	1.6	3.1	2.3	1.1	0.9	**1.8**
	Kenya	6.0	23.3	14.6	33.0	46.2	**24.6**
Mung Bean Export (USD Million)	Mozambique	7.1	9.4	11.5	8.6	13.2	**9.9**
	Tanzania	14.6	34.7	40.4	29.9	61.6	**36.2**
	Malawi	1.4	2.8	2.7	1.1	0.9	**1.8**
	Kenya	4.9	19.9	15.2	36.2	43.9	**24.0**
CHICKPEA							
Chickpea Export (´000s tons)	Mozambique	0.2	-	-	-	-	0
	Tanzania	39.2	29.0	34.6	59.0	64.6	45.3
	Malawi	1.0	0.4	0.4	0.1	0.3	0.5
	Kenya	0.7	0.2	0	0.1	0.7	0.4
Chickpea Export (USD Million)	Mozambique	0.2	-	-	-	-	0
	Tanzania	32.0	16.2	17.0	40.1	63.7	33.8
	Malawi	0.9	0.4	0.4	0.1	0.3	0.4

	Kenya	0.7	0.2	-	0.1	0.6	0.3

Source: Authors,based on COMTRADE data

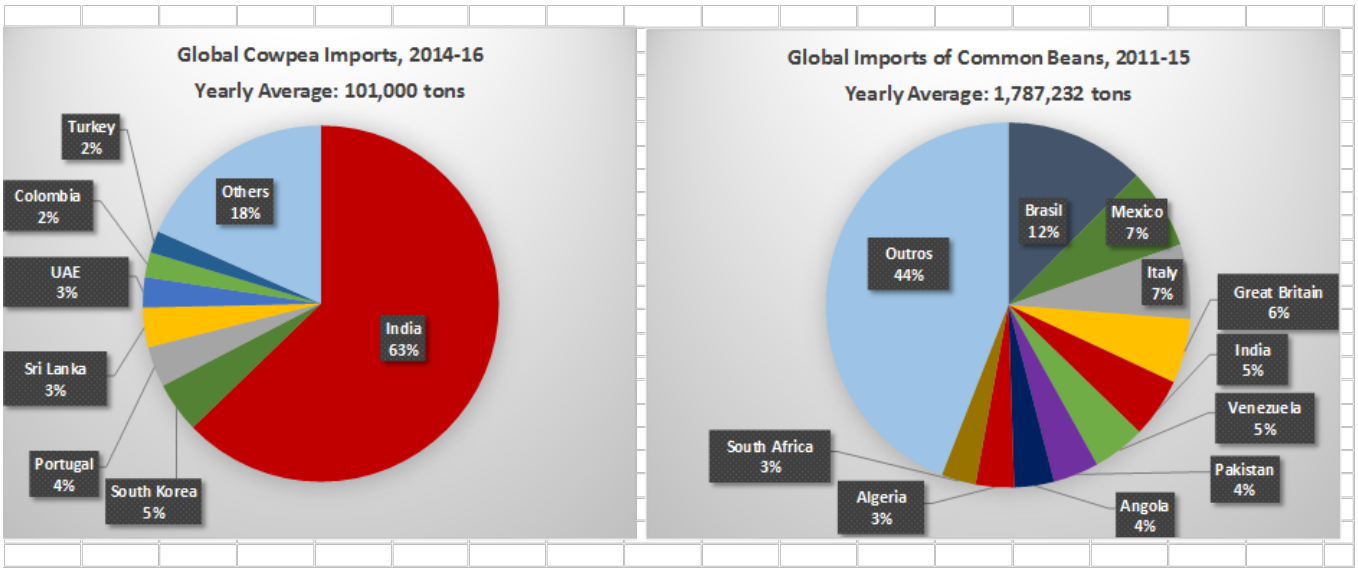
In addition to pulses used for dhal production, it is important to also consider the potential of diversification towards other types of beans, such as cowpea (*Vigna Unguiculata*) and common bean (*Phaseolus vulgaris*). One advantage of concentrating on these crops is that the tradition of local consumption is much stronger, both in Mozambique and neighbouring countries. Therefore, for the Mozambican farmer, the market may be much less volatile, as there is more flexibility for regional markets to adjust consumption on the basis of price and availability.

A rapid analysis of trade data suggests that the international market for cowpea is small, at around 100,000 tons per year, and even more importantly, that India also dominates this market, accounting for a substantial 63% of global imports (Figure 15). On the other hand, the international market for common beans is very large, at almost 1,800,000 tons per year and extremely diversified. It is interesting to note that Angola and South Africa are among the largest importers, absorbing on average 63,000 and 55,000 tons per year, respectively. Despite the difficulty in determining the exact types of beans [19] imported by these countries from the trade data, it is clear that the speckled sugar bean[20], widely produced and consumed in Mozambique, represents a significant part.

Figure 15. International Market for Cowpea and Common Beans, in Tons, 2011-15

[19] The Common Bean (Phaseolus Vulgaris) includes many varieties of beans.

[20] Known as *feijão catarino* in Mozambique and Angola, and in many countries as pinto bean.



Source: Authors, based on COMTRADE data.

In summary, the international market for pulses is vast, dynamic and diversified. In this context, it will be important for Mozambique to diversify its participation in this market, in addition to pigeon peas. In particular, this diversification effort could focus on mung bean and common bean, crops that are suitable for cultivation by Mozambican smallholders, and which have more diversified markets at the international, regional and national level.

6. Recommendations

The Mozambican pigeon pea value chain developed largely in reponse to Indian demand. During the last decade, its promotion was stimulated by NGOs, with the support of international donors. It is estimated that at least 1.2 million smallholder farmers were engaged in pigeon pea production in 2017 and that the export of pigeon peas from the 2016 season generated at least USD 120 million in foreign exchange earnings.

Despite this success story, reported in several studies, the current context, as described in this study, shows that the market for pigeon pea is not guaranteed, being excessively dependent on one single country, India. The 2017 season clearly revealed the danger of this depedence, causing hardship for the farmers who relied on pigeon pea as their main cash crop, and indicates the importance of defining a strategy and a set of measures to deal with this reality in a structured manner. The measures discussed below are summarized in Table 12.

6.1 Short-Term Measures

An estimated 1.2 million Mozambican farmers invested in pigeon pea production in the 2016-17 season, with an expected total harvest of approximately 250,000 tons. However, contrary to all forecasts and expecations, India, the destination of 90% of global pigeon pea exports, had a record pulses production in 2017, largely satisfying domestic demand. In the particular case of pigeon pea, production increased by more than 80% compared to the year before, meaning that, if well managed, India would not need to import any pigeon pea during the next two years. This situation led the Indian Government to introduce a pigeon pea import quota, which resulted in the drastic fall of the pigeon pea price to the Mozambican farmer, from approximately MZN 45/kg in 2016 to MZN 5/kg in 2017.

At this price, and taking into account estimated costs of production, an emerging farmer who had hired additional labour will face a loss of up to MZN 9000/ha, while the smallholder farmers using exclusively family labour will not earn the money they had expected and consequently will not have the financial means to sustain basic expenses. Even if India honours its commitment to purchase 125,000 tons from Mozambique in the 2017/18 financial year, this would amount to approximately half of total production, meaning that the other half of the production is at risk of getting spoilt, due to a lack of market demand and storage capacity. This scenario represents a calamity, with a severe impact on the income of many Mozambicans. Considering an average of 5 people per household, this crisis is estimated to directly affect 6 million Mozambicans, or more than 20% of the total population, and may have further multiplier effects. The resulting lack of purchasing power on the part of the farmers generated local economic crises in those districts where farmers depended most on pigeon pea and had few other cash crops, which is particularly the case in Middle and Upper Zambézia. In addition, the situation has left farmers unable to invest in the next agricultural season, which could impact the local labour market.

As a way of mitigating the negative impact caused by the price collapse, the Government of Mozambique, together with its partners, could take the following actions:

- Clearly define procedures for export under the Memorandum of Understanding with the Government of India. In 2017, uncertainties regarding the validity of the MoU and non-transparent methods of allocating quotas and Certificates of Origin paralyzed exports and intensified the price fall. In order to avoid such uncertainty, it is important to establish a platform for regular dialogue between pulses exporters and the Mozambican Government. A first meeting should be convened as soon as possible and thereafter every six months, and whenever necessary.

- Further meetings should be organized in the main pigeon pea producing provinces, in order to inform farmers and other value chain actors of recent developments, understand their impact and implications and to discuss prospects for the next season. These meetings would have a much broader audience than just the exporters, specifically targeting farmer associations, local traders and local government officials.

- In relation to the next agricultural season, MASA should urgently disseminate information on current and expected market conditions. The Indian Ministry of Agriculture´s first official estimate of 2018 pigeon pea production, which will be harvested soon, is 3.99 million tons. Although this represents a decline from 2017, it would still constitute another bumper harvest, above the normal demand of the Indian market. Therefore, there is no prospect of a substantial price increase to the Mozambican farmer in 2018.

- Evaluate the possibility of animal feed producers buying a part of the excess production, to integrate in feed for poultry, fish and other animals.

- Support farmers, particularly in the districts of Middle and Upper Zambezia, with access to seeds of alternative cash crops, such as mung bean, which has the advantage of being a short-cycle crop. Such an intervention could guarantee a much-needed injection of cash into the rural economy at the time of the mung bean harvest in April-June 2018. Given that, in the context of the MoU between India and Mozambique, the donation of a considerable amount of improved pulses seeds for

the 2017-18 season was being prepared, MASA should request the Government of India that the originally planned pigeon pea be exchanged for seeds of other pulses, such as mung bean.

6.2 Measures to Improve Information Systems

6.2.1 Production Statistics and Price Information

The design and implementation of effective public policies depends on access to structured and reliable data. In the case of pigeon pea, no statistical information is available in the major data systems, whether national or international. Pigeon pea production statistics are hidden in the general category of beans, even though the various types of beans and peas are distinct products with different markets. The following points should be considered for improving pigeon pea statistics:

- In recent years, some Mozambican districts started, independently, to specifically monitor pigeon pea production. This provides a useful basis for the inclusion of pigeon pea, in an itemisedmanner, in official national-level statistics. MASA should, as soon as possible, structure the process of pigeon pea related data collection, in the first instance by encouraging the other districts in the major producing areas to follow the example of the pioneering districts in this respect. Secondly, MASA should compile the pigeon pea statistics of all districts in a systematic way, so that they can be integrated in the official national-level reports on the agricultural sector. In this way, MASA will be able to closely monitor local dynamics and inform public policy aimed at the sub-sector.
- MASA should request FAO to include estimates of pigeon pea production on FAOSTAT. Many studies and market analyses, including in India, use this platform for information on global production. In these documents, however, Mozambique does not even appear, which has a negative impact on the recognition of Mozambique as an important player in this market, among key actors in India and the rest of the world.
- Finally, MASA should include detailed and district-specific information on pigeon pea prices in the Agricultural Market Information System (SIMA).

6.2.2 Market Intelligence

Although almost all of Mozambique´s pigeon pea production is destined for export, the information gathered in the field revealed that only the exporters themselves are effectively aware of international market dynamics. Intermediaries and warehouse operators only have superficial knowledge of the international market, while most farmers have no idea at all.

The 2017 season provided a stark reminder of the danger of making production decisions without prior and profound knowledge of market conditions. Therefore, MASA should create a pulses market intelligence group, by identifying and training staff who will be tasked with closely following international market developments and presenting their analyses in the internal councils of the Ministry on a quarterly basis. Special attention should be paid at the end of September, when the Indian Ministry of Agriculture publishes the first official estimate of *kharif*-season pigeon pea production, which is harvested in January of the following year, based on estimates of cultivated area and the evolution of monsoon rains. In September 2016, more than two months before farmers started planting in Mozambique, the forecast that 2017 would witness a record pigeon pea harvest in India was already available. While it would have been difficult to prevent the current situation based on that information, it would have been possible to mitigate the negative effects, or at least to anticipate them.

Thus, better knowledge of the international market can serve as a strategic tool for MASA to guide farmers, farmer associations, local traders and NGOs about likely market dynamics, which could help to avoid the repetition of the scenario experienced in 2017. As a first step, it is suggested that MASA should identify a partner that can support the capacity-building of selected staff and the organization of relevant statistical information.

6.2.3 Monitoring of Trade Data

According to official Mozambican data, the total export value of pulses amounted to just over USD 20 million per year in 2015 and 2016. In contrast, international trade data show that India reported the import of more than USD 110 million of pulses per year from Mozambique over the same period, revealing a massive discrepancy. In the case of Tanzania, no such discrepancy between national export data and Indian import data was found (see Annex I). The causes of the discrepancy in the case of Mozambique have not yet been investigated in depth, but it could point at significant tax evasion and/or a very serious failure in properly recording exports. Considering this, it is recommended that the Ministry of Economy and Finance launch an assessment to determine the causes of the discrepancy and identify mechanisms to address these.

Finally, given its weight in the balance of payments, customs should ensure that pigeon pea exports get reported under the correct code of the tariff schedule (*Pauta Aduaneira)*. At the international level, a specific line was created for pigeon peas in the 2012 revision of the Harmonized System (HS), with the code 071360. However, the Mozambican authorities (customs) have not yet started to use this line, usually reporting pigeon pea exports under 071390, which refers to “other" pulses.

6.3 Measures to Promote Diversification

During the last two decades various organizations have invested a great deal of effort in promoting pigeon pea cultivation among Mozambican farmers, in the belief that the market was guaranteed and growing. However, for the reasons analysed in this study, access to the most important pigeon pea market was suddenly compromised in 2017. As a result, farmers were forced to accept prices far below their expectations, if they could find any buyers at all. The most important underlying reason of this calamity is the strong dependence on a single market, namely India. In this context, there is an urgent need for diversification, in the following dimensions:

6.3.1 Market Diversification

For the specific case of pigeon pea, Mozambique has little room for manoeuvre since the market is heavily concentrated on a single country, India. Having said that, the government can promote the country's image as an important producer of pulses in general, using its network of diplomatic representations in key markets. Encouraging further investments in pigeon pea processing facilities, to produce dhal, can also support the diversification effort. While India is practically the only importer of raw pigeon pea, the *tur* dhal market is much more diversified, even if small, with pockets of demand in countries with a sizeable Indian diaspora.

Finally, from a long-term perspective, Mozambique should seek to identify partners in Europe and North America to promote the consumption of pigeon pea and other pulses. For vegetarians, a rapidly growing consumer segment in these key markets, pigeon pea and other pulses are an attractive alternative source of protein. A focused marketing strategy, emphasizing the advantages of pigeon pea consumption, from a nutritional and climatological perspective, but also in terms of poverty reduction effects, certainly has the potential to stimulate consumption in the Western world.

6.3.2 Promote Domestic Consumption

Pigeon pea is a low-cost, high-nutrient food rich in starch, protein, calcium and an excellent source of vitamin A. Due to the lack of statistical data, it is difficult to determine the level of domestic consumption, but it is estimated to have been equivalent to approximately 10-15% of production in recent years, when prices were high. However, in neighbouring Malawi at least half of production is consumed locally, suggesting there could be scope for increasing domestic consumption in Mozambique. This notion is further supported by anecdotal evidence that consumption patterns differ substantially between different Mozambican districts and regions.

Considering that more than 45% of the Mozambican population lives below the poverty line and at least 40% of children suffer from chronic malnutrition, increased pigeon pea consumption could help to improve food security. Moreover, the rapid expansion of pigeon

pea production, which also has substantial agronomic advantages, shows that pigeon pea cultivation is suitable within the productive system of Mozambican farmers, particularly through its aptitude for intercropping with maize. Thus, promoting domestic pigeon pea consumption can serve various different objectives simultaneously. Besides improving food security, it is also a way of developing an alternative market for a crop that is highly suitable for Mozambican farmers. Therefore, the government and its partners could raise awareness among rural and urban communities on the benefits of pigeon pea consumption and introduce it in national food assistance programs, such as school meals and humanitarian aid.

6.3.3 Diversification of Pulses Production

The international market for pulses other than pigeon pea is vast and diverse, certainly offering room for Mozambique to increase its share of global exports. In this sense, MASA should promote diversification of production towards other pulses with larger and more diversified markets, such as mung bean and common bean.

- Mozambican production of most major pulses that are used to produce other types of dhal, such as chickpea, lentils and urad beans, is very limited or non-existent. Therefore, as a first step, a detailed mapping exercise of agro-climatic potential should be carried out for each of these crops, like Ghanem et al. (2015) do for lentils (*Lens Culinaris*) in East Africa.
- In the case of mung beans, production of which is already taking place in some areas, such a mapping exercise should also be carried out for the whole country. Simultaneously, however, the government and its partners can already start to promote the expansion of existing production, by addressing the issue in public-private dialogue with traders, and by improving access to mung bean seed. In particular, IIAM should carry out the necessary research to develop officially released mung bean varieties.
- In relation to common beans, which are widely consumed in Mozambique and neighbouring countries, further value chain studies should be carried out, because

there is currently very little information available on the various types of common bean.

- Finally, the government should encourage donors, NGOs and the private sector to focus their agricultural interventions and promotion efforts among farmers on pulses other than pigeon pea, which has already been well established in rural Mozambique.

Table 12. Action Matrix

INTERVENTION MEASURES				
ACTION	**RESPONSIBLE**	**STEPS**	**PERIOD**	**EXPECTED RESULTS**
SHORT-TERM MEASURES				
Public-Private Dialogue	MIC	• National meeting with pigeon pea exporters to clarify the methods and criteria used for allocation of export quotas and issuing of certificates of origin.	First meeting December 2017.	Improved transparency and clarity among exporters regarding export procedures, mechanisms and regulations.
		• Establishment of a platform for ongoing dialogue between pulse traders and the Government.	Every 6 months	Improve the quality of public policy related to the pulses sector.
Dissemination of Information on the Pigeon pea Market	MASA	• Workshop in Zambezia with farmer associations, development partners, traders and exporters.	January 2018	The main value chain actors are informed about the factors responsible for the 2017 price collapse and about what can be expected for the coming year.
		• Inform all SDAEs and extension workers about the prospect of the 2018 pigeon pea market, so that they can then further disseminate the information among farmers.	December 2017	
Promotion of Short Cycle Crops	MASA	• Promote cultivation of mung bean, common bean and sesame, particularly in the districts of Middle and Upper Zambézia.	Dec 2017 - Jan 2018	The peasants received the seeds and the technical assistance plan.
		• Request the Government of India to send seeds of pulses other than pigeon pea in the context of the Memorandum of Understanding.	December 2017	The Government of India received MASA letter and seeds shipped to Mozambique.
MEASURES TO IMPROVE INFORMATION SYSTEMS				

Improved Production Statistics and Price Information	MASA - MIC	• Systematic and periodic compilation of statistical data on the production of pigeon pea by season and by district.	From the 2017-18 season	Data compiled and included in national reports on the results of the agricultural season.
		• Request FAO to include estimates of pigeon pea production on FAOSTAT	December 2017	National Production estimates available online on FAOSTAT.
		• Include pigeon pea prices in different districts on SIMA	From the 2017-18 season	Pigeon Pea price dynamics presented in SIMA reports, and disseminated among SDAEs and farmers.
Market Intelligence	MIC - MASA	• Identify and train staff at MASA/MIC to monitor dynamics of the international pulses market, particularly pigeon pea, and disseminate the conclusions of the analyses, inside and outside the Ministry.	2018	Staff have been identified and trained, and monitoring platform and market analysis in operation.
Monitoring of Trade Data	MEF, BM, INE, MASA e MIC	• Improved monitoring and recording of export of pulses	First Half of 2018	Identification of (i) causes of the discrepancy between Mozambican export data and Indian import data, and (ii) measures to reduce the discrepancy.
		• Train Customs and MASA officials in the ports to correctly distinguish and record different types of pulses. For pigeon pea in particular, start using the correct line of the Customs Tariff Schedule, number 071360.	2018	Port officials trained on identification of different pulses and correct corresponding tariff lines for reporting of exports.
MEASURES TO PROMOTE DIVERSIFICATION				
Market Diversification	MASA - MIC	• Promote the country's image as a producer of pulses using diplomatic representations in key target markets.	2018	Leading buyers are aware that Mozambique is a reliable source of quality pulses.
		• Identify partners in Europe and America to promote consumption of pulses produced in Mozambique	2019	Exports of at least 20 thousand tons of Mozambican pulses to European and American markets in 2019.
Promote Domestic Consumption	MASA - MINEDH	• Promote domestic pigeon pea consumption through awareness creation campaigns.	2018	Expand domestic pigeon pea market, increasing local consumption, reaching 150,000 tons by 2020.
		• Introduce pigeon pea in school feeding and food assistance programs	2018	
Diversification of Pulses Production	MASA	• Detailed mapping of agro-climatic potential of other pulses, such as mung beans, chickpeas, lentils and urad beans, and corresponding market studies	2018	Studies compiled and shared with development partners, farmer associations, traders, exporters, among others.
		• Encourage development partners and NGOs to focus on other pulses in their		Commitment of development partners to promote other

		interventions and programs in the agricultural sector.	2018	pulses, based on a detailed plan of action to promote diversification.
		• Release of improved varieties of other pulses, particularly mung bean	2019	Mung bean varieties released

Annex I – Discrepancies in Trade Data

Table 13 compares the official INE data on the Mozambican export of pulses (HS 0713 category, which includes pigeon pea and other beans) with other countries' data on the import of pulses from Mozambique, revealing a very significant discrepancy, of USD 100 million per year in 2015 and 2016.

Table 13. Discrepancy in Trade Data on Mozambican Pulses

Year	MOZ Export of Pulses – INE data (Million USD)	World Import of Mozambican Pulses (Million USD)	INE data as % of real exports
2012	23.8	43.8	54 %
2013	22.5	51.0	44 %
2014	43.3	67.0	65 %
2015	19.6	108.9	18 %

2016	24.7	119.0	21 %

Source: INE, ITC Trade Map

This discrepancy suggests that foreign exchange earnings from the export of pulses are under-recorded on the Balance of Payments, compiled annually by the Bank of Mozambique, using INE data, which are in turn based on Customs data. Looking at the balance of payments report of 2015, for instance, pulses are not even mentioned in the accompanying analysis, while judging by partner import data, pulses may have been the third largest agricultural export product that year, following tobacco (USD 257 million) and sugar (USD 137 million). In 2015, the sum of all exports excluding megaprojects was USD 1,356 million, which means that this figure would be higher by 6.6% if the actual value of the export of pulses had been taken into account.

It should be noted that this issue of an enormous discrepancy in pulses trade data does not appear with respect to the export of pulses by neighbouring Tanzania, the largest African exporter of pulses to India. Tanzania's pulses export data correspond almost perfectly with the Indian data on the import of pulses from Tanzania.

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