

# Continental Programme on Post-Harvest Losses (PHL) Reduction

Rapid Country Needs Assessment



Mozambique



WORKING PAPER





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## 1. INTRODUCTION

1.1 This note describes the post-harvest situation in Mozambique for selected commodities. It identifies key constraints, risks and opportunities, and suggests possible priority interventions and actions to be taken that may lead to specific projects to be proposed to AfDB and other donors for financing. The annexes provide additional information on country background, on-going AfDB projects and other donor interventions in the country.

1.2 The post-harvest chain involves a series of interconnected activities from the time of crop harvest, live animal sales at farm gate, milk at immediate post-milking stage, or fish capture to the delivery of the food to the consumer. The nature of the activities varies considerably according to the type of food and there are major differences among plant products (e.g. grains, roots and tubers, fruit and vegetables and pulses), livestock products (meat, dairy, hides and skins) and fish. As a product moves along the chain, losses may occur from a number of causes. These losses fall into three main categories: (i) quantitative or physical losses which cause a loss in weight of the product; (ii) loss of quality which changes the appearance, taste, texture or nutritional value of the product; and (iii) loss of opportunity for value addition to the product.

1.3 Information on post-harvest losses (PHL) in Mozambique was obtained through desk study of existing documentation and a field mission<sup>1</sup> undertaken in August 2009. During the mission meetings were held with various government officials and institutions, such as Agricultural Research Services, Centre for the Promotion of Commercial Agriculture and Extension Services of the Ministry of Agriculture, Ministry of Planning and Development, Ministry of Trade and Commerce, and the Ministry of Fisheries. The mission also met with private sector representatives, NGOs, farmers, traders and food processing organisations. Discussions were held with representatives of development agencies and the donor community, including UNIDO, WFP, FAO, the UN joint programme and SwissAid.

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<sup>1</sup> The mission consisted of Mr Cesar Tique, Agricultural Economist of the AfDB Office in Mozambique, Ms. Yamina Cherrou, Agricultural Economist, FAO/TCIS and Mr Danilo Mejia, Agro-industry Officer, FAO/AGS. An initial version of this report was prepared by Yamina Cherrou and Danilo Mejia. A further step in the preparation of this report was conducted by Divine Njie (FAO/AGS) and involved incorporating further information following an in-depth desk study which relied mainly on documents available on Internet.

## 2. COUNTRY OVERVIEW

2.1 Mozambique has an area of about 799 390 km<sup>2</sup> with 13 000 km<sup>2</sup> of inland water bodies and about 2 700 km of sea coastline. It is a coastal country, with most areas being at a distance of less than 100 km from the sea. The country has a population of approximately 22.4 million people which is growing at a rate of 2.3% per annum. Mozambique is not food sufficient and needs to rely on imported foodstuffs. In 2008 about 900 000 tons of cereals were imported. Currently about 54% of the population live in absolute poverty and the undernourished population is estimated at about 44%. Mozambique is still recovering from the effects of a devastating civil which took place from 1977 to 1992 and led to a collapse of production, destruction of infrastructure and a large build-up of foreign debt. During the war, an estimated 1.5 million people left the country, while some 4 million moved internally. The country remains one of the poorest countries in the world and is ranked 172 out of 177 countries in the UN Human Development Index of 2007/08. (Biblio 3; Biblio 30; Biblio 33).

2.2 Due to its weather and varied topography, there is a great potential for diversified agricultural cropping. The agricultural sector is divided into 4 farming systems spread over 93% of the mainland area. These are: the cereal-root crops mixed farming system; the maize mixed farming system; the root crops system; and the coastal artisanal fishing system. The main export crops are: cotton, cashew nut, sugarcane, tea, cassava, maize, coconut, sisal, citrus and tropical fruit, potato, sunflower, prawns beef and poultry. Domestically consumed food items include: maize, pigeon pea, cassava, rice and beef as well as pork, chicken and goat meat. (Biblio 33; Biblio 32).

2.3 The agricultural sector employs 70% of the population and accounts for 30% of GDP. It relies mostly on small-scale farmers who contribute approximately 95% of agriculture GDP with the balance from a small number of medium and large commercial farms. Average cultivated area per household is only about 1.4 hectares. Women constitute about two-thirds of the total agricultural labour force. Agriculture in Mozambique takes place in a risky environment that is vulnerable to droughts and floods, with 15 over the 25 year period from 1981-2006. The main production areas for maize, sorghum and rice are in the northern and central parts of the country whereas most consumption areas, including the capital city Maputo, are located in the south.

2.4 Only about 4.5 million of 36 million hectares of potentially arable land are cultivated. The country has considerable untapped opportunities for irrigation, with only 14 percent of a potential 3.3 million hectares currently under irrigation and the major river systems (e.g. the Zambezi, Save, and Limpopo) largely unexploited. Mozambique benefits from its location among land-locked neighbours such as Malawi, Zambia and Zimbabwe. Its long coastline and three major ports allow it to provide shipping services to these countries. Informal cross-border trade with its neighbours enables farmers to take advantage of input and output markets in other countries. (Biblio 33; Biblio 32; Biblio 38).

2.5 General country data and social and agricultural statistics on Mozambique are presented in Annex 1, while Annex 2 presents maps indicating the main producing areas for the major food and cash crops.

### 3. CHOICE OF MAIN COMMODITIES TO STUDY

3.1 The choice of commodities considered in this report is based on two main considerations: (i) their economic importance to the country and (ii) the potential for reducing quantitative and qualitative PHL. The main commodities considered for analysis are: maize, cassava, rice, groundnuts, oilseeds (sunflower and sesame), cashew nuts, cotton, fruits and vegetables, meat and fish.

3.2 **Maize** is the key staple and the most cultivated crop in the country. For example, it occupies more than 50 percent of the cultivated land in Niassa, Tete, Manica, and Sofala regions. An estimated 78.6% of households are involved in maize production. Production is predominantly by independent smallholder farmers using very simple technology. In most cases, maize is grown simultaneously with cassava, which explains both crops' broad geographic distribution. Like most of the other basic food crops, maize is grown mostly for household consumption and less than 20% of total production is sold. It is consumed in both rural and urban areas. PHL in the maize value chain are considered high and there is scope for reducing them. (Biblio 1 ; Biblio 33).

3.3 **Cassava** is the second most cultivated crop in Mozambique. It is produced all over the country and is a major staple and food security crop. Its production involves an estimated 63.2% of households. Although maize is considered the most important staple food in the country, the quantities of cassava produced annually allow it to surpass maize in terms of total provision of calories and market value. Apart from the tubers, cassava leaves are consumed as a vegetable in most parts of the country and constitute a very significant source of dietary protein, minerals and vitamins. There are immense opportunities for reducing the high levels of qualitative and quantitative PHL through value addition and processing. Mozambique currently imports more than 330 000 tonnes of wheat each year. It is estimated that High Quality Cassava Flour (HQCF) has the potential to substitute wheat imports into the country for up to 15% in the pastry and bakery industries, constituting savings of at least USD 15 million in wheat imports each year. In addition, there are immense opportunities for the production of starch, in view of the strong market and attractive margins in South Africa where rising maize prices have led starch producers to recently shift their raw material from maize to cassava (Biblio 6; Biblio 12; Biblio 33).

3.4 **Rice** is an important cereal in Mozambique. An estimated 26% of households grow the crop. Like the other basic food crops, most of what is produced is for household consumption. The popularity of rice is growing in urban areas. High levels of quantitative PHL are encountered (Biblio 33).

3.5 **Groundnuts:** Mozambique is the largest producer of groundnuts in southern Africa. The crop is grown almost throughout the country, principally by resource-poor female farmers. It plays an important role both as a food and cash crop for smallholder farmers in the country. It is an important component of the diet in rural areas and provides supplementary cash income (Biblio 34).

3.6 **Oilseeds (sunflower and sesame):** Since the colonial period, the principal oilseed in Mozambique has been sunflower seed. The sector has been expanding rapidly, driven over the last decade and a half by the distribution of manual oil presses. Sesame is grown mostly for export (Biblio 33).

3.7 **Cashew nuts:** In the 1970s Mozambique led the world in raw cashew exports and was a major exporter of cashew kernels. Cashew remains an important cash crop in the coastal areas and it is estimated that about 40% of Mozambique's farmers possess cashew trees. Cashew is of great

importance to smallholders; only about 5% percent of the marketed crop originates from commercial farmers or vertically integrated producers. In the northern parts of the country, about 80 percent of the cashew nuts produced by smallholders are marketed, while in the southern part, where cashew is a significant food crop, only 30 to 50 percent is sold. High levels of losses occur especially due to lack of value addition and non-optimal exploitation of market opportunities (Biblio 33).

3.8 **Cotton:** Long a key sector for Mozambique, cotton involves many small holders, generates significant export revenue, and has strong upstream and downstream linkages through input use and technology, initial processing, value adding, marketing and international trade. Ninety-nine percent of cotton is produced by some 350 000 smallholders. In cotton-growing areas, the crop is the main source of income, ranging from 52-84% of the total value of household cash income (Biblio 33).

3.9 **Fruits and vegetables:** The horticultural sector has great potential in Mozambique because of agronomic conditions (e.g. climate, soils, water and soils, available land) and social and economic factors (e.g. availability of field labour, logistical and transport linkages). An abundance of micro-climates in the country supports top quality bananas, citrus, avocados, mangoes, litchis, pineapples, papaya, passion fruit, strawberry and guava. The sector provides rural employment and generates export revenues, especially given the country's proximity to South Africa's market for tropical produce and its shipping links to the Arabian Peninsula and Asia. Exports to South Africa are estimated to be worth around USD 20 million annually, while recent studies indicate that the horticulture sector in Maputo and Manica Provinces alone could generate revenues of more than USD 25 million per year through both commercial and smallholder (family) production. Export opportunities also exist for a host of vegetables such as baby corn, bell peppers and paprika. Substantial quantitative and qualitative losses of fruits and vegetables are encountered, which have major implications for food security and income generation (Biblio 27; Biblio 33).

3.10 **Meat:** Livestock make a significant contribution to the livelihoods of smallholders and the rural poor. The number of livestock has grown significantly over the past decade. FAO data (Biblio 9) indicates that in 2008 the main species groups in the national herd consisted of 1.24 million cattle, 5 million goats, 182 000 pigs and 28.5 million chickens. Meat from livestock and poultry production is predominantly used for supporting rural households. Where it enters commercial circuits, there are major issues arising from the poor quality of the products offered.

3.11 **Fish:** Mozambique has a coastline of about 2 700 km with two-thirds of the population living within 90 miles of the coast. In addition, the country has various lakes and inland rivers that hold potential for inland fishing. Fisheries are important to Mozambique with regards to the national economy, employment and the diet of the population. Some 1 500 species are believed to be present in Mozambican seawaters, of which 400 are of direct commercial importance. Fisheries products including prawns represent 45 percent of Mozambique's exports. About 50 percent of the people's protein intakes are estimated to come from fish and fish products. About 90 000 people are involved directly in fishing and fish gathering, and a much larger number (close to 500 000) benefit from fisheries through their involvement in fish processing and marketing. Although important, the current contribution of fisheries is much lower than its potential. It is estimated that the country uses only about a quarter of its exploitable fish resources. Substantial qualitative losses are encountered while market opportunities are not exploited fully (Biblio 8).

3.12 Other agricultural products play an important role in the national economy but have not been selected for analysis in this report due to the following reasons (Biblio 32; Biblio 33; Biblio 36):

- ✓ **Sorghum:** About 36% of households grow sorghum. Most of what is produced is for household consumption. As the post-harvest issues encountered are similar to those described for maize, sorghum was not selected for the detailed appraisal.

- ✓ **Sweet potato:** Close to 10% of households grow sweet potato, mainly for household consumption. It was not considered for analysis given that many of the producers harvest the crop gradually, to the extent of their consumption needs and opportunities for local sale. In addition there is very little information available on the post-harvest issues which farmers face.
- ✓ **Beans** are a diversification crop grown as both a food and cash crop. They are typically grown with groundnuts. Most of the reasons leading to PHL for beans are similar to those mentioned for maize or reflected in the discussion of cross-cutting issues.
- ✓ **Sugar:** Among agricultural sub-sectors, sugar stands second in export revenues. However it was not selected for further analysis because of the limited information available on post-harvest issues arising within the large vertically integrated companies involved.
- ✓ **Tobacco.** This is an important sub-sector for Mozambique. Export revenues from tobacco in 2003 are estimated to be more than USD 30 million. However, the sub-sector was not selected for further analysis, because of the limited information available on the post-harvest issues which arise along the chain linking contract growers to companies processing the tobacco into the burley and flue-cured stages for export.

3.13 Annex 3 presents the area under cultivation and the annual production for the major food crops in Mozambique.

## **4. PRESENTATION OF POST-HARVEST SITUATION**

4.1 In this Chapter the general cross-cutting issues that affect the post-harvest situation in Mozambique are presented. This is followed by an analysis of commodity-specific issues, with an attempt being made to avoid repetition of aspects highlighted in the discussion of cross cutting issues and resorting only to focus on individual specificities.

### **A. COUNTRY-WIDE ISSUES THAT AFFECT POST-HARVEST SITUATION**

#### **Issues impacting various stages along the chain**

##### **Investment climate**

4.2 Mozambique's investment climate has undoubtedly improved in the last decade. The advent of peace and two successful national elections have significantly reduced political uncertainty. Economic reforms have improved monetary and price stability, deepened economic integration with world markets, strengthened the financial markets, and reduced state involvement in production. Even with such changes, Mozambique remains a difficult place to do business and its business environment still lags far behind most of its direct competitors in the region. Companies continue to complain about administrative, regulatory, and legal obstacles, and investors assert (in surveys) that Mozambique is still viewed as an extremely risky investment location. The World Economic Forum's African Competitiveness Report for 2004 ranks Mozambique's business environment 20th among 25 sub-Saharan countries. Even by regional standards, the country rates poorly on "contracts and law" as well as "macroeconomic environment" indices. Small and medium-sized enterprises have been especially disadvantaged by the complex and burdensome system of approvals, licenses, and special levies that impede market entry and raise the costs of doing business (Biblio 32). Other issues mentioned in Biblio 38 include:

- ✓ Uncertainty in the policy and regulatory environment.
- ✓ Lack of a reliable system on which firms could rely to settle disputes fairly and speedily.
- ✓ Weak tax administration; for example, tax refunds are often delayed.
- ✓ The long process to register a business, involving significant costs.
- ✓ Difficulty and costly process to acquire land.

##### **Rural finance**

4.3 In Mozambique, lack of rural finance services is pervasive and this is due to several structural factors including: (a) a predominance of low-input/low-output subsistence farming, (b) the extensive poverty level and very low density of the rural population in large parts of the country, (c) effects of frequent droughts and floods, (d) high and volatile real interest rates, and (e) long years of civil war. The government's attempts over two decades to provide rural finance at subsidized rates through the previously state-owned People's Development Bank persistently failed. Although microfinance operations began appearing in the 1990s, they remain concentrated in urban centres and the rural population operate far from the reach of financial sector operators. Nearly all rural districts have no formal banking facilities, while community-based financial arrangements and development credit institutions have a very limited outreach in rural areas. The limited financial services available in rural areas are directed only to large-scale farmers, large traders, and processors. Although a few

organizations are beginning to offer large, wholesale loans to well-organized associations of farmers, such associations are rare and the minimum loan amounts are often too high. As a result, almost all smallholder agricultural finance in Mozambique comes in the form of input credit and short-term crop advances from agribusiness companies and traders (Biblio 29).

### **Systems of Quality Control**

4.4 Mozambique's national system of control comprises multiple government institutions located over various ministries, including Agriculture, Health and Trade. Constraints militating against compliance with official and private standards are mainly related to traceability, hygiene requirements, private standards in certain markets, appropriate use of pesticides and presence of residues in produce, as well as concerns over international transmission of pests. There is weak national capacity to implement control techniques, train personnel for effective implementation of specific measures and strengthen surveillance programmes. Diagnostic capacity across all SPS areas is weak due to a need for upgrading and accreditation of laboratories. The system of official control and of export certification of certain commodities is not in compliance with the requirements in export markets, while several deficiencies exist in relation to the implementation of official auditing, approval, inspection, sampling and certification procedures. All these factors lead to major annual losses to pest damage and restrict access to foreign markets. The *Instituto Nacional de Normalização e Qualidade* (INNOQ)'s standards do not cover all products. Thus, local trade is carried out on the basis of subjective perceptions of quality. The lack of standards and, where they exist, their divergence from the standards used in neighbouring countries such as South Africa and other foreign markets, reduces the capacity to tap into various market opportunities (Biblio 6; Biblio 27; Biblio 29; Biblio 32).

### **Issues related to Primary Production**

4.5 Various issues encountered during primary production increase the propensity for high PHL. These include shortage of improved seed varieties, incorrect farming practices and very low use of fertilizers, irrigation and mechanization. Commercial input supply and use is at a rudimentary stage. All the basic food crops are produced in rain-fed and zero-input agriculture systems, except for maize, which is sometimes used as a break crop for tobacco and may receive some leftover fertilizer. In addition, other than rice, all food crops are produced in association with other crops, which usually results in low yields. In 2001-02, only about 5% of rural households used fertilizer and pesticides. The agricultural research and extension services are of low quality and have limited coverage. Only about 13% of rural households have access to extension services. Similar issues lead to low yields for the commercial crops. (Biblio 29; Biblio 38).

4.6 Smallholders possess low levels of skills in production and marketing techniques and business practices. A key weakness with the production sector is the lack of effective producer associations in the non-estate crops. Only 3.7% of farmers are organised in associations, while the rest operate as individuals and therefore cannot enjoy economies of scale in such areas as input supply, technology transfer, value addition, transport, logistics and storage, produce marketing and access to financial services. (Biblio 14; Biblio 29; Biblio 32; Biblio 38).

### **Transport and other Infrastructure**

4.7 Mozambique's transport infrastructure has long been regionally focused, being directed toward neighbouring landlocked countries and South Africa. Through its ports of Maputo, Beira, and Nacala, it is an important transit country for South African, Swazi, Zimbabwean, Malawian, and Zambian imports and exports. The scant linkages between Mozambique's rural economy and its main transport infrastructure make the commercialization of agricultural produce difficult and expensive. Consequently, freight transport costs are high and railway operations unpredictable, weakening

prospects for producers and exporters attempting to compete in international markets (Biblio 32). Of the 30 400 km of roads within the country only 5 685 km are paved, although there are good connections to neighbouring countries. The density of road network is the lowest in Southern Africa: 32 km per thousand km<sup>2</sup> compared to the median of 90 km per thousand km<sup>2</sup>. When only rural areas are considered the density is even lower at 20 km per thousand km<sup>2</sup>. Only 50% of the road network is in good or fair conditions. In rural areas roads are poorly maintained and many are impassable during the rainy season. The rail system covers 2 983 km and its gauge is compatible with neighbouring rail systems. However, it is not well distributed over the country. The main railway network goes from east to west as do the main roads. The railways need rehabilitation in many parts. Due to the poor infrastructure, transport costs are high which in turn leads to smallholders being poorly integrated into markets, a factor exacerbated by the lack of farmer organisations. As mentioned in Chapter 2, the main production areas for maize, sorghum and rice are in the northern and central parts of the country whereas most consumption areas, including the capital city Maputo, are located in the south. Thus, many crops are transported over long distances which considerably increases the costs for consumers (Biblio 29; Biblio 32; Biblio 38).

4.8 Development of power and telecommunications infrastructure in rural areas is in its infancy. Overall, household access to electricity has increased from 4 to 7% but still remains highly unequal. In rural areas only about 1% of households have access to power and fewer than 10% have access to telecommunications infrastructure (Biblio 38).

### **Agro-processing**

4.9 In Mozambique, small scale agro-processing is carried out for such processes as flour milling (mainly hammer milling), oil extraction and paddy rice milling. These operations face a host of constraints, including the following (Biblio 6):

- ✓ Lack of reliable supplies of suitable raw materials of high quality;
- ✓ Lack of technologies for processing due to limited research and development support which in turn leads to difficulties in technology generation, transfer, management and absorption;
- ✓ Lack of access to adequate equipment for processing due to issues such as lack of finance and reliable maintenance support and spare parts supplies;
- ✓ Inadequate knowledge of processing and marketing techniques and management of business operations
- ✓ Inadequate market information;
- ✓ Absence of updated national food laws, standards and specifications for food products and quality control.

4.10 The cash crops such as cotton, sugar and cashews are processed by large scale agro-processing facilities. A characteristic of these operations is that they are largely limited to primary processing, with very minimal further value addition through secondary processing and utilization of by-products. For example, coconut is exported as copra and unrefined oil, rather than in higher-value forms; molasses are not processed further even though opportunities in alcohol production for export markets exist; cotton is transformed only to lint for export, while cotton seed is exported raw at low prices despite the potential for producing vegetable oil, soap cake and animal feed; cashews are exported mostly raw and unprocessed; tobacco is not processed beyond the burley and flue-cured stages;

and raw hides and skins are exported for processing. A major constraint faced by the large-scale agro-processing sector is obsolescence which leads to high unit costs of operations and poor quality finished products. For example, most of the cotton ginneries were established 50 years ago (Biblio 32; Biblio 33).

### **Warehouse and Storage facilities**

4.11 The following summary of the situation of grain storage warehouses and silos is obtained from Biblio 7.

4.12 Large commercial companies operating in the marketing of cereals in the country own warehouses which are mostly not properly equipped to ensure the best conditions for handling and storage of cereals. Most of the warehouses of the *Instituto de Cereais de Moçambique* (ICM) in the north and centre of the country are currently rented to organizations that use them for storage. There seems to be little transparency within ICM regarding decisions on the rental contracts. Some of the warehouses require repairs. ICM staff have little experience in warehouse management and bulk grain storage of cereals. Ownership of some ICM warehouses is contested, usually by other state institutions, while information on existing warehousing is dispersed, outdated and sometimes inadequate. In addition to inadequate funding for its operations, another key constraint faced by ICM is a lack of a clear policy on the use of its warehouses in cereals marketing as well as its collaboration with the private sector for that purpose.

4.13 Annex 4 presents a summary of the storage capacity in Mozambique. Over the last 40 years some bulk storage silos have been constructed, sometimes inappropriately, with inadequate provision for handling, ventilation, temperature control or drying facilities. Some of the silos are in unsuitable locations or in places where the trade flows have since changed, leaving a number quickly out of use, while some have physically collapsed or have not been able to cope with humidity problems. The clear establishment of criteria for the assessment of storage requirements, particularly for bulk storage options, has to date rarely been undertaken. Detailed knowledge amongst government, private traders, private mills and even Mozambican engineering firms as to appropriate bulk storage facilities, ventilation, handling equipment and use is still limited. Silo management staff has tended to be foreign, or Mozambicans trained in the management of such facilities outside of the country. Little effort has been made to establish appropriate training facilities in the country. In addition there is a lack of programmes to upscale interventions aimed at introducing improved techniques for storage at the level of producers and producer associations.

4.14 Cold storage availability for perishable products such as horticultural crops, fish, meat and dairy products is very limited, making it difficult to compete with imported products and to access export markets.

### **Markets and marketplace infrastructure**

4.15 The national market network is composed of a number of small, poorly developed and serviced rural markets and urban wholesale markets. In rural areas agricultural commerce is done mainly by ambulatory vendors. For perishable products there is inadequate infrastructure in the public markets, with inadequate space, poor conditions of hygiene and exposure of products to the elements, thus leading to qualitative and quantitative losses.

### **Market information**

4.16 In Mozambique, information on crop availability and prices is monitored by national institutions such as MIC and MINAG. In addition, the *Sistema De Informação De Mercados Agrícolas*

*De Moçambique* (SIMA) was established by the Ministry of Agriculture and Rural Development (MADER) in 1991 and charged with the collection and dissemination of information on agricultural markets (on prices, market specific opportunities, information and market insight). However such information is not readily available to smallholder farmers and retailers who rely on informal marketing systems that are generally characterized by weak information systems for reporting local market conditions (Biblio 28).

## B. CONSTRAINTS AND OPPORTUNITIES FOR THE MAIN COMMODITIES

4.17 It should be noted that there is a general lack of data relating to PHL for the main commodities, both within official circles in the country as well as in the documents that were consulted to prepare this report. Annex 5 assembles some of the available data on the levels of PHL occurring. In the light of the dearth of information on the subject, the analysis in the rest of this section will focus on discussing the issues leading to qualitative and quantitative PHL at the differing steps of the chain, non-optimal exploitation of market opportunities due to PHL, as well as opportunities for reducing PHL through value addition and marketing activities.

### Maize

4.18 **Production:** Like other basic crops, maize is produced in Mozambique in rain-fed and zero-input agriculture systems, except in situations in which it is used as a break crop for tobacco and may receive some leftover fertilizer. In 2005 only 5.6% of small and medium producers had access to improved seeds (Biblio 7). Experience from the PAMA project indicates that farmers rely on stored seed saved from the previous season (Biblio 18). All these factors lead to maize kernels that are susceptible to infestation during growing, field drying prior to harvest, as well as after the crop has been harvested. The field drying stage is one of the most important steps contributing to overall losses encountered because the grain becomes infested by pests such as grain borers prior to being harvested and stored in granaries (Biblio 17).

4.19 **Harvest:** The harvest season for maize runs from mid-April to June in most areas and may continue until July and August in certain provinces. During these periods, the grain still has a high moisture-content which leads high levels of infestation during storage (Biblio 7).

4.20 **Storage:** There are various types of traditional warehouses and silos (*celeiros*) at the producer level, differing usually by construction techniques which depend on the building materials available in the particular locality. There are three main categories: field barns of varying sizes, constructed of wood and straw and other locally available materials and used for storage of ear corn; household barns, installed between straw roofs and fire places and holding grains or whole cobs; and warehouses / barns in the yard, with the same features and dimensions as those built in the countryside. These storage structures are rudimentary. They do not offer complete protection against pests and do not allow proper use of pesticides because they have openings and are not air tight. The costly, limited and often wrongly packaged supply of natural and chemical pesticides to producers is a major deficiency (Biblio 7). It is estimated that more than 80% of producers do not treat their grain with preservatives. High losses result due to high humidity, attack by insects/weevils, rodents and large animals and theft. The storage stage is therefore one the key steps in the post-harvest chain where high levels of losses are encountered. A study conducted in southern Niassa in 2002 indicated losses of roughly 33% for storage in traditional warehouses for six months without rat-guards (Biblio 4). Apart from the physical losses that occur during storage, the lack of appropriate storage forces small scale farmers to immediately sell their surplus grain to traders at very low prices. The lack of financial resources has limited the ability of

small scale farmers to build improved storage structures such as the *gorongosa* type barns which were introduced by the Ministry of Agriculture and several NGOs. Despite efforts made in promoting these improved storage structures and better handling practices, it is reported that in 2005 only 12.8% of small and medium producers at national level had access to improved barns (Biblio 7). The quality of maize reaching commercial warehouses suffers from inadequate post-harvest handling practices of farmers and small traders, and is characterised by a high and non-uniform level of moisture in the grain, presence of foreign materials and infestation by insects and micro-organisms (Biblio 35).

4.21 **Handling and marketing:** Farmers transport surpluses to markets in sacks using bicycles or manually on their heads. During this process, the maize is subjected to spillage, cracking as well as exposure to pests, dirt and humidity. Traders, who purchase grain and move it from producer zones and pick-up points, face the problem of lack of adequate storage facilities at these points and resort to the use of makeshift facilities which offer little protection from humidity, theft and attack by pests and animals (Biblio 35). The *Instituto Nacional de Normalização e Qualidade* (INNOQ) set a product standard for maize (Norma 4/2000). Although this standard has common points with the one required by the World Food Programme (WFP), there are still some minor divergences which raise the risk of product rejections. In addition, unlike other producing countries in the region, there are no grade-B standards for maize at national level. As a result, small farmers do not have a standard which better matches their production capacities, while lack of harmonisation with similar standards in the region prevents smallholders from benefiting from regional market opportunities (Biblio 29).

4.22 **Processing:** Many consumers process grain at home or in local hammer mills. Due to issues arising further upstream in the chain, the quality of the raw material used for processing is poor, while the flour obtained is of sub-standard quality and therefore its market opportunities are restricted to rural areas. In urban areas maize flour is increasingly being bought in shops where better quality product is offered. For large scale operators and industrial millers, one of the key issues faced is the quality of dried maize which they receive which is usually made of inappropriate sized grains, has a high level of impurities including grain weevils and has a mixture of varieties. In addition, they have to contend with difficulties in sourcing the quantities of grain needed, the highly dispersed supplier base, low utilization of processing capacity and competition with other domestic users including direct household consumption (Biblio 23).

## Rice

4.23 **Production:** Small holder production, which accounts for about 90% of domestic supply, is rain-fed. It is consumption-oriented which explains the weak market linkages and insensitivity to price changes. Concentrated in Zambezia, small family farms suffer from weak farmer organizations as well as limited use of improved varieties and growing practices. In the irrigated commercial farms, irrigation and drainage management are weak and yields are also lower than optimal (Biblio 33).

4.24 **Processing:** Although small-scale on-farm hulling and polishing technologies are widely available in many rice growing countries, this is not the case in Mozambique. Small scale farmers in Mozambique therefore do not exploit the opportunity to add value in situ to paddy and sell polished rice directly to the local market. The rain-fed production area in Zambezia has very little processing capacity. Once harvested, the rice is transported to industrial milling units located mainly in Chokwe district for hulling and polishing. A high cost of transportation is incurred. Coupled with the lack of rice drying equipment, the transportation of grain leads to poor quality paddy with a high proportion of broken grains (Biblio 33).

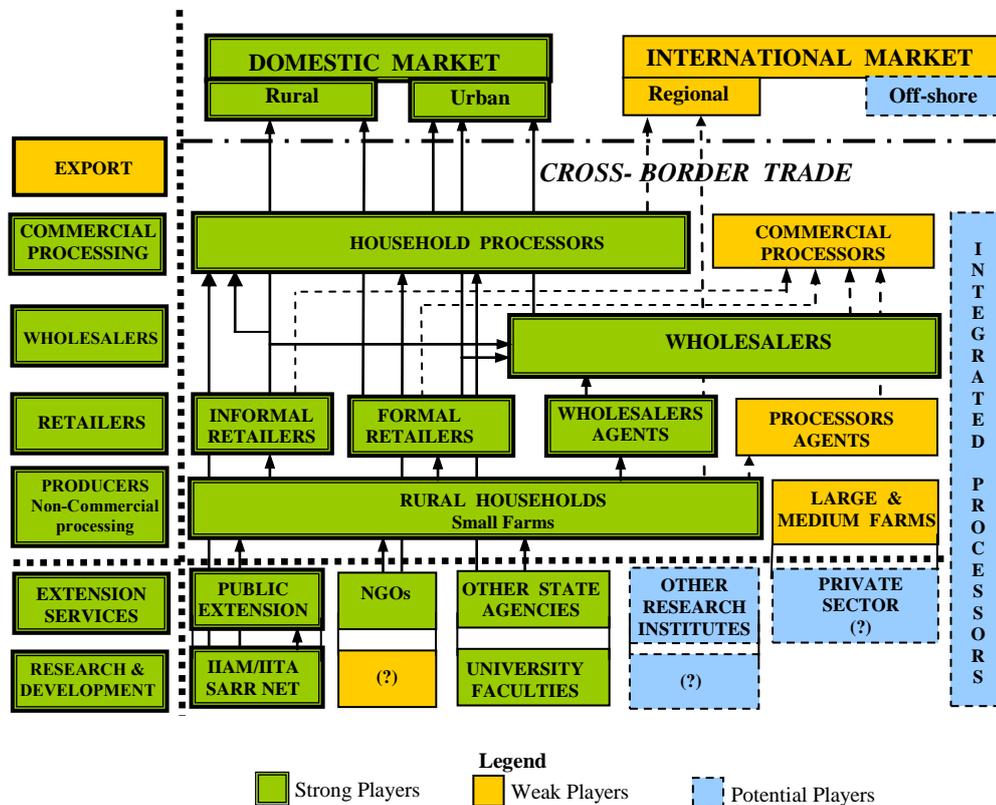
## Cassava

4.25 There is very little information on the level of PHL of cassava in Mozambique. (Biblio 6) mentions that losses are between 10-20% but can be as high as 30%. Further information is not provided as to whether this information corresponds specifically to qualitative or quantitative losses or to both types of losses combined.

4.26 **Production:** Current cassava yields are low due to the fact that farmers are still using low-yielding local varieties and grow the crop without fertilizers, irrigation and mechanization. Ninety-nine percent of the farms are small, cultivating less than 5 ha. Cassava growers sometimes leave the cassava in the fields for as many as one to three cycles, harvesting on an as-needed basis because of the high perishability of the roots once removed from the soil. During this period the starch, sugar and fibre content of the roots changes, thus impacting upon their suitability as raw material for further processing.

4.27 **Processing:** In cassava producing areas, households perform all steps of producing, harvesting, processing, storing and marketing their own product. Traditional methods of cassava processing are used to obtain the two principle end products: dried chips/flour and rale (dry-roasted cassava). These methods depend on manual labour. Problems related to the cost of processing machines, maintenance of the devices and, in certain cases, the habit of eating manually-pounded cassava are hindering the adoption of new technologies. Experiences with improved agro-processing techniques in rural areas are recent. With the assistance of International Institute of Tropical Agriculture (IITA) and SASAKAWA Global 2000, workshops are being trained in the manufacture of agro-processing machines, such as chippers and grating machines. However, the adoption levels are low due to such constraints as the high price of the machines. (Biblio 6).

The cassava value chain in Mozambique  
 (from Biblio 14)



4.28 There is very little cassava processing on the medium/large-scale in Mozambique, with virtually no mechanized industrial processing of cassava for food, feed or other purposes. There is only one small-scale drying and milling enterprise. Attempts to foster industrialization of cassava as a raw material for starch extraction and animal feed are still very embryonic (Biblio 6). Opportunities exist for the production and export of starch to South Africa. However, high logistics costs for raw material supply, caused by the fact that cassava production is dispersed, have inhibited exploitation of these opportunities (Biblio 33).

### Groundnuts

4.29 The following information on the situation in the groundnut chain was obtained from Biblio 13, Biblio 34 and Biblio 18.

4.30 **Production:** There is a lack of improved varieties and farmers often plant mixed varieties. Lack of fertilizers, irrigation and mechanization as well as poor growing practices all result in low yields and grains that have very little resistance to attack by insect and fungal pests.

4.31 **Harvesting:** Often, groundnuts once lifted from the soil are left on the ground to dry out. This allows residual moisture in the soil to penetrate the shell, thereby maintaining moist conditions within the pod and increasing the susceptibility to infestation.

4.32 **Marketing:** Traders face great difficulties as groundnuts are available in low quantities in disperse, distant and unknown locations. Most of the groundnuts produced are a mixture of varieties, which leads to a decline in prices and limits also the potential for export. Aflatoxin concerns also limit export possibilities. South African companies, which are the major contacts for the international export market for Mozambique, discontinued buying groundnuts from regions such as Nampula because of high levels of aflatoxin contamination. Opportunities for special quality products (e.g. fair trade and organic) have not been exploited.

4.33 **Drying:** In-shell groundnuts are left to sun dry. During this process losses may occur from splitting of the shell and spillage as well as attack by rodents and other animals, while split shells expose the grain to fungal and insect attack. There is limited availability of facilities in which drying can be carried out under controlled conditions. This leads to a high risk of aflatoxin contamination.

4.34 **Storage:** One of the major concerns with groundnuts is that farmers use poor storage conditions which lead not only to physical losses from insect and rodent attack but also to high levels of fungal attack and a high risk of aflatoxin contamination. In some cases farmers bag groundnuts too quickly before they are dried to a safe moisture-content, and this results in high levels of mould.

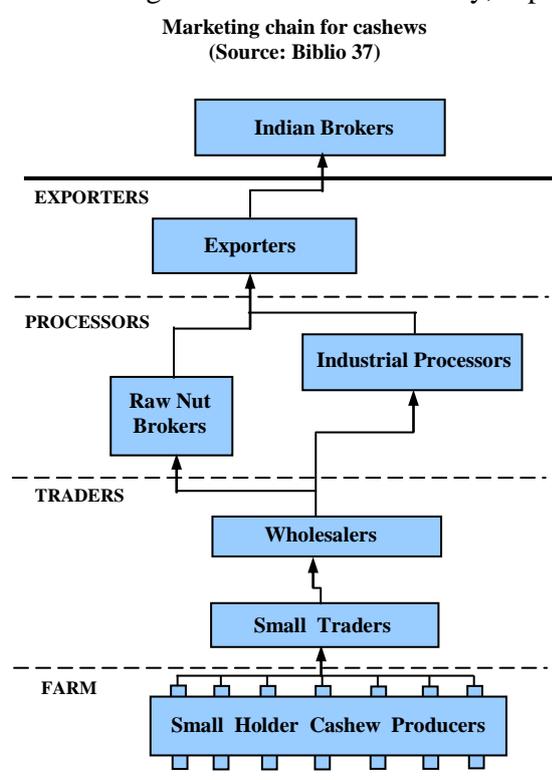
4.35 **Processing:** Small scale farmers typically lack shelling, cleaning, separation and blanching facilities. They resort to labour-intensive manual methods such as hand shelling or beating the groundnuts with a stick which limits throughput, leads not only to quality losses but also quantitative losses through breakage and spilling. In some regions, in order to facilitate removal of the shell, many farmers add water to the shells which increases the risk of aflatoxin contamination.

## Cashew nuts

4.36 **Production:** Cashew trees are often old and diseased, with the most recent plantings dating from the 1960s and having average yields of only 1.5-3.0 kg per tree whereas the potential can be as high as 10-15 kg per tree. Current yields are one-third the level of yields of the 1970s. In addition, raw nut quality has deteriorated because of poor growing practices. Smallholders with few trees dominate the sector and trees are normally scattered which renders collection of the harvest difficult (Biblio 33).

4.37 **Processing:** Small scale factories which process raw nuts are labour-intensive and suffer from highly variable quality of the finished product. Large scale factories have excess capacity and are in a poor state of disrepair. Processors face constraints of reduced availability of high-quality raw cashew and a high degree of competition with traders who export the raw cashews to India. Their inability to compete with traders stems from difficulties in accessing adequately-priced and timely credit for raw nut procurement during the September to February harvest season. The quality of processed nuts is a challenge for the national industry, especially for small-scale factories because they rely on labour-

intensive processing which results in an inconsistent product (Biblio 33).



4.38 A key issue with the cashew sub-sector is that value addition opportunities are not exploited. The pear or false fruit of cashew is discarded after nuts have been extracted. It is estimated that some 965 700 tons of the false fruit were generated during the production of the 96 540 tons of raw cashew nuts that Mozambique exported in 2007/08. This constitutes a large amount of raw material which could have been transformed into other value added products such as juice, beverages and preserves.

4.39 Another aspect of the non-exploitation of value addition opportunities is that, as shown in the diagram of the marketing chain, Mozambique exports large quantities of unprocessed nuts to India for further processing and re-export. This situation is due to the close proximity of India and the relatively low transport costs incurred to ship the nuts there. It is also due to the high installed processing capacity and very low wage rates in India which create incentives to pay more

competitive prices for the raw nut, especially early in Mozambique's harvest season when nuts from India have not yet reached the processing plants. The result is that processors in Mozambique have to compete with many potential local buyers for the raw nut, which substantially increases the risk to them of promoting production through contract farming arrangements. The marketing chain for cashews suffers from a high degree of asymmetry. Farmers' information on markets and prices is weak and the small size of their transactions puts them at a disadvantage when negotiating with traders. Traders are few and tend to deal in large volumes and therefore have strong negotiating positions and good market knowledge (Biblio 1; Biblio 33).

### Oilseeds (Sunflower and Sesame)

4.40 Biblio 18 and Biblio 33 present the following situation of the sunflower and sesame chains.

4.41 **Production:** These crops have low yields due to use of poor quality seeds. Often varieties available are not the ones preferred by the export markets. For example, while the market prefers large, white sesame seeds, this variety is often not available to farmers. Pests are also prevalent.

4.42 **Harvesting:** Farmers lack information on proper harvesting techniques for sesame. For example, improper timing of harvesting leads to discoloration of the seeds and loss of market value.

4.43 **Storage:** The improved white sesame varieties are particularly susceptible to storage losses.

4.44 **Processing:** There are limited processing facilities for cleaning and dehulling oil seeds. This leads to poor quality seeds and losses due to breakage and impurities. Most of the available presses are manual hand presses which have low throughput and low extraction efficiency, and produce low and inconsistent quality. Another issue with the sesame sub-sector is the lack of value addition. White sesame is not processed locally but exported.

4.45 **Marketing:** Oilseeds are available in small quantities in disperse, distant and unknown locations which reduces efficiency in the commercialization process and increases transaction costs. The majority of traders have little knowledge of the international market.

### Cotton

4.46 The following information is obtained from Biblio 33 on the major issues contributing to PHL in the cotton chain.

4.47 **Production:** Cotton yields and quality are low (yields are about 0.4 ton/ha) which is due mainly to difficulties faced by concessionaries in ensuring timely supply of inputs and technical assistance to small farmers. There is very little training to educate farmers on crucial procedures such as grading. This leads to issues with the quality of cotton which are transmitted through the chain to the lint stage. As with most crop sectors in Mozambique, fertilisers and pest management products are hardly used in the cotton sector. Low productivity and production lead to overcapacity in the ginning stage. Cotton seed varieties historically cultivated in Mozambique have low rates of processing efficiency and poor lint quality due to the high seed coat fragment content. While these varieties yield roughly 32% fibre, newer varieties can yield up to 40% fibre.

4.48 **Harvest:** Due to poor harvesting practices, the cotton is contaminated with inorganic matter such as sand, dust, rust, metal, wire and strings. These contaminants impact negatively on processing operations further downstream in the chain and their presence lowers the quality of the cotton.

4.49 **Processing:** One issue with cotton processing is the lack of value addition. The once vibrant textile industry is now defunct; accordingly cotton is only processed into lint which is then exported by lint traders. Industrial processing efficiency, as measured by the outturn rate (i.e. the ratio between the raw seed cotton and the cotton lint obtained from ginning) is also low and stands at about 32-35% (in comparison to the average in West Africa of 42%). Inappropriate ginning also leads to a poor quality product which is contaminated by pieces of plastic, jute fibres and string debris. Another issue is the age of the ginneries (most were established 50 years ago) and consequently their low level of technological sophistication which leads to qualitative and quantitative losses during processing.

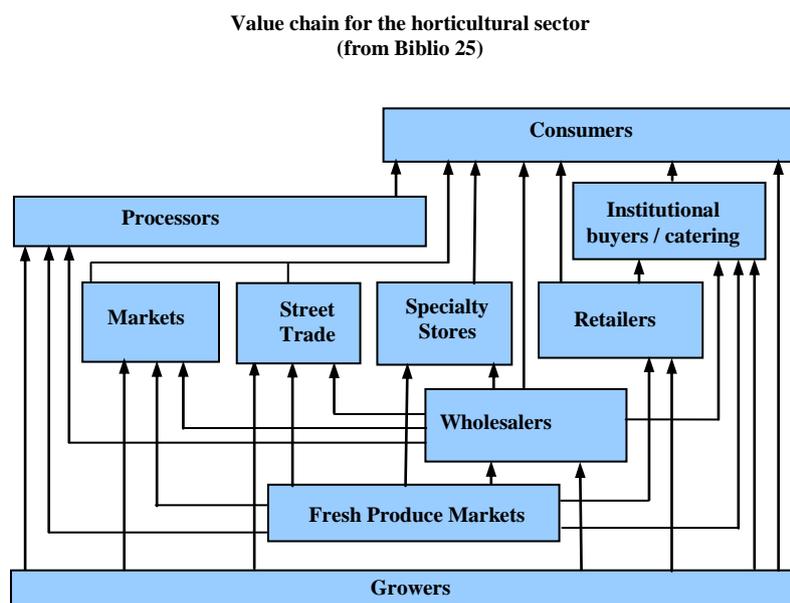
4.50 Apart from the fact that value is not added beyond the lint stage, opportunities to process cotton seed are not exploited, despite the potential for the production of vegetable oil, soap cake and animal feed.

4.51 **Marketing:** As mentioned above, Mozambican cotton lint is highly contaminated due to issues arising during harvesting, collection and processing. One of the impediments against improving this situation is the extra layer in the marketing chain created by middle men traders who buy cotton on a spot market basis, then grade and ship it to spinners abroad. There is no link between producers and consumers, weakening processors' ability to respond to quality requirements of foreign spinners.

### Fruits and vegetables

4.52 **Production:** Many issues arise at this stage which make produce susceptible to attack by pests. As mentioned in the discussion of the cross-cutting issues, the phytosanitary control system in Mozambique is weak, which leads to major annual losses to pest damage and restricts access to foreign markets (Biblio 27). For example, export of bananas and mangoes to South Africa has been very seriously affected by infestation by the fruit fly *Bactrocera invadens*. The negative effect of such pests is not restricted to the commercial sector, but is felt by small scale farmers and informal traders who depend on fruit and vegetable production for subsistence and income generation (Biblio 32).

4.53 **Marketing:** Mozambique's domestic markets for horticultural products are organised along



traditional wholesale retail lines, with a multiplicity of small vendors purchasing from wholesale transport lorries and warehouses to ply their trade at numerous street markets and market squares. Despite their growth, supermarkets still play a minor role in the distribution of fresh local produce. Because the sector has no formal structures to regulate supply and avoid price peaks and troughs, periodic glut afflict highly perishable sectors such as bananas and tomato and lead to high levels of qualitative and quantitative losses.

4.54 **Post-harvest handling:** Rudimentary post-harvest handling methods lead to high levels of qualitative and quantitative PHL ( Biblio 27).

### Meat

4.55 **Production:** Mozambique's animal health status is of major concern. Information on the website of the World Organisation for Animal Health (OIE) reveals the presence of various endemic OIE notifiable diseases in the country, which limits the scope to increase farmers' incomes and access to regional and international markets (Biblio 27).

4.56 **Processing and value addition:** The concerns regarding disease mentioned above also impact negatively upon the value of Mozambique's raw hides and skins exports. Although no information is available, potential shortcomings may exist in sanitary controls at slaughterhouses, handling and processing facilities for meat, dairy and poultry products which lead to a reduction in quality.

## Fish

4.57 The marine fishery sector has three broad segments: industrial fishing (including shrimp), semi-industrial fishing and artisanal fishing. The industrial segment is characterized by foreign vessels outfitted with processing facilities that target shrimp and tuna, and sufficient resources to support modernization of the fleet while exporting their products direct to international markets. The major constraints related to PHL plague the artisanal sector and to a much lesser degree the semi-industrial segment (Biblio 32). The following information on issues contributing to PHL at the differing steps of the chain was extracted from Biblio 8.

4.58 **Harvesting:** The marine artisanal sub-sector is characterised by the following features which lead to high levels of quantitative and qualitative losses of fish: fisher folk are poorly organized and have very little market orientation; a large number of fishers (about 19 000) collect fish along the shoreline without boats; fishers who use vessels, use small non-motorized canoes and traditional fishing gear (about 70% of the vessels used by marine artisanal fishers are canoes and only 2-3% are motorized); low capital; labour-intensive operations; and individual small catches of many fish and invertebrate species landed over dispersed coastal areas.

4.59 **Handling:** Limited access to cold storage facilities limits the levels of fish caught, leads to high levels of losses and limits the scope to add value. Fish caught by artisanal fishers is normally landed on the beach and sold to traders on the spot at prices offered by the traders. Access to export markets is constrained by poor sanitary conditions and poor handling. Marketing of fresh fish occurs primarily near the landing sites and where there is an outlet for high value fresh fish species. Usually fresh fish is transported un-chilled in pick-up trucks to the closest market with all the hygiene and freshness problems related to this practice. At present, Mozambique's fresh fish supply chain has weak infrastructure for handling and distributing fishery products and large numbers of geographically dispersed artisanal fishers with weak communication channels.

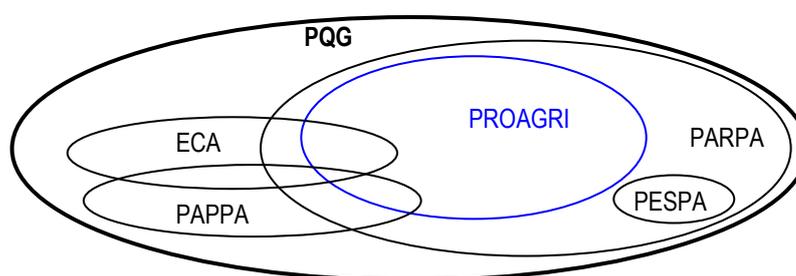
4.60 **Processing:** Because of the lack of cold storage facilities, artisanal fishers dry the surpluses remaining after their immediate food needs have been met. As the profit margins for dried fish are lower than for fresh fish, they forego a portion of the potential revenue that could be generated from marketing fresh fish.

## 5. POLICY AND INSTITUTIONAL FRAMEWORK

### A. POLICIES AND STRATEGIES RELATED TO POST-HARVEST IMPROVEMENT

5.1 Agricultural policy in Mozambique is defined by an array of policy documents, each with their specific drivers, scope, timeframe and audiences. The Figure below identifies the various existing policy documents of relevance to PHL reduction.

Policy instruments in agriculture and related sectors in Mozambique  
(from Biblio 16)



5.2 The Government of Mozambique is strongly committed to sustain overall economic growth and reduce poverty. The Poverty Reduction Action Plan, PARPA II (2006-2009), concentrates on poverty reduction objectives<sup>2</sup>. Agriculture, Fishery and Industry head the list of economic development priorities to achieve sustainable economic growth through job creation schemes. Areas of intervention prioritised are: extension, rural infrastructure development (irrigation, storage and roads), dissemination of market information, regulation and certification, rural financing mechanisms, farmer organizations promotion and capacity building, value chain development. Operationally, these interventions are facilitated by the ongoing transfer of competencies and financial resources to provincial and district authorities through decentralization.

5.3 The five-year Government's Programme (PQG) is the government's main policy instrument which sets objectives and priorities for its five-year mandates. The 2005-2009 PQG focuses on support to smallholder farmers and promotion of commercial agriculture in particular through post-harvest support (storage, agro-processing), livestock processing plants promotion and commercialization promotion. Rural finance services development and road network improvement are also important actions outlined in the PQG and that cannot be ignored in a PHL reduction perspective.

5.4 The agricultural sector benefits from important support from a group of donors, taking the form of a Sector Wide Approach – The National Programme of Agrarian Development - PROAGRI II<sup>3</sup> SWAp (2007-2010). Objectives are aligned with the PARPA and the PQG and focus on market oriented

<sup>2</sup> It is based on four main cornerstones (i) poverty and macroeconomic management; ii) governance; iii) economic development; iv) human capital.

<sup>3</sup> This is the sectoral strategy for agriculture and Rural Development. In 2007, the general budget support mechanism gathered 19 donors<sup>3</sup> (G19) and accounted for over 80% of aid flows to Mozambique.

support for smallholders<sup>4</sup>. The implementation strategy is divided between improving effective public sector governance in the agricultural sector and the direct financing of development projects at local level.

5.5 There is also a range of sub-sectoral strategies of direct relevance for PHL reduction, complementing PROAGRI, including the Agricultural Commercialisation Strategy ECA II (currently in its second phase covering 2006-2009), the Artisanal Fisheries Development Plan PESPA (2007-2011), the Livestock Development Strategy (2009-2015) and the Action Plan for Food Production-PAPPA (2008-2011), to name a few.

- The ECA II is based on a SWOT analysis using a value chain approach for several key commodities<sup>5</sup> and envisages a plan of action for improving internal trade centred on the restructuring and building of storage infrastructure; rehabilitation of local shops; improving quality of production; and facilitating the establishment of linkages between producers and markets (ex. agro-industry, export)<sup>6</sup>.
- The PESPA aims at improving fishermen livelihoods and includes PHL reduction activities on public infrastructure investment such as landing stages, ice plants, wholesale and retail markets, and also on improving conservation, processing and marketing. Access to finance is also considered as key to achieve the project objectives.
- The livestock development strategy presents 2 specific objectives directly related to PHL reduction; ‘*improving livestock production, commercialization and processing*’ and ‘*leveraging barriers that prevent livestock enterprise development*’. Indeed, according to the interviews carried out in the National Directorate of Veterinarian Services quality of meat is a major issue to compete with imported meat. Animal fattening practises are promoted in order to get a less leathery meat.

5.6 The PAPPA ensues from the 2007 food crisis and was created to ensure national food security through increasing production and productivity of staple foods. The strategy takes the value chain approach as an entry point to improve each stage of the chain (production, storage, processing, and commercialization) which fits well with a PHL reduction objective and integrates ECA priorities and situation analysis. The strategic priorities regarding PHL reduction are as follows<sup>7</sup>:

- For maize and rice: i) building/rehabilitating storage facilities (silos, etc.) in strategic areas (for a total amount of USD 36 million), ii) reducing PHL through capacity building on storage techniques, iii) promoting small agro-processing units<sup>8</sup> and attracting private sector to invest in large-scale mills (credit facilities are planned) and to rehabilitate existing factories<sup>9</sup>, iv) strengthening markets and commercialization. The total amount for this component is about USD 14 million.

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<sup>4</sup> ‘Transformation of subsistence agriculture into one that is more integrated in the functions of production, distribution and processing, in order to achieve the development of a subsistence agrarian sector which contributed with surpluses for the market and the development of an efficient and participatory entrepreneur sector’ PROAGRI II.

<sup>5</sup> It includes: maize, rice, sorghum, millet, cassava, sweet potato, bean, groundnut, sunflower, soya bean, sesame, copra, cashew nut, tobacco, cotton.

<sup>6</sup> The plan of action comprises six pillars<sup>6</sup>: i) policy development for agricultural commercialisation; ii) administrative and legislative enabling environment; iii) infrastructure development (market infrastructure & organization, road rehabilitation & maintenance, silos building); iv) market information development (statistic improvement, market information dissemination, market studies); v) national production & commercialisation promotion (credit for agriculture and commercialisation, inputs, promoting use of national product for industries); vi) Exportation promotion.

<sup>7</sup> MINAG and MIC in collaboration with USAID approved in 2008 an Initiative for Agro industry Enterprises Development (IDEA) of about 500 million US dollars.

<sup>8</sup> Supporting farmer organizations to access equipment for small-scale processing (300 kg to 1 ton/hour capacity in rice).

<sup>9</sup> Credit will be provided to invest in equipment and agro-processing.

- **Soy Bean:** i) promoting small-scale units to extract oil at farm level; ii) encouraging the private sector to reactivate agro-industries related to oil extraction and animal ration production; iii) discouraging from exporting raw material; iv) building facilities to store oil and branch off soy bean; v) facilitating information on markets and prices, enabling contracts between producer organisations and private sector.
- **Poultry:** i) investing in poultry infrastructures (poultry houses, incubators, etc...) and in equipment (heaters); ii) improving credit access through subsidized credit lines and public private partnerships. The budget line for PHL reduction in this sector is about USD 8.6 million.
- **Fish:** i) supporting ice production facilities; ii) improving techniques of fish conservation, handling and processing; iii) building primary markets for fresh fish; iv) facilitating information on markets.

5.7 The total envelope for PHL reduction is USD 92.1 (\$75.7 million for storage, USD 5.2 million for processing and USD 11.2 million for marketing<sup>10</sup>). The public investment by commodity is higher for rice, maize and wheat respectively reaching 50%, 33% and 6% of the total amount to be invested, followed by fish and poultry (4% and 2 % of the budget).

## **B. PUBLIC AND PRIVATE STAKEHOLDERS INVOLVED IN POST-HARVEST ACTIVITIES**

5.8 At the public sector level several government agencies play important roles in PHL reduction:

- **Ministry of Agriculture:** Through PROAGRI it is mandated with directing, planning and implementing government policies. MINAG's central structure currently comprises, in addition to a number of ministerial support departments seven national directorates<sup>11</sup> but there is still a lack of leadership and clear definition of roles and responsibilities among these services. A key subordinate institution called **CEPAGRI** is especially involved in commercial agriculture support services. However, in regard to PHL reduction, there is no specific unit focusing on this topic but each National Directorate of MINAG has people dealing with PHL as one of their activities. The **National Research Institute in Agriculture (IIAM) is envisaged to play** a key role on PHL reduction research..
- **Ministry of Industry and Trade:** is responsible for matters related to the commercialisation of agriculture production and industrial development. Under the umbrella of MIC, four institutes are particularly relevant for PHL reduction: i) the Small and Medium Enterprise Institute (**IPME**) which aims to promote private sector development besides small & medium scale processing units; ii) the Investment Promotion Centre (**CPI**) which offers a package of services to assist national and foreign investors facilitating access to the incentives offered by the government, iii) The Mozambique Cereal Institute (**ICM**) and, iv) The National Institute of Norms and Quality (**INNOQ**) which is in charge of establishing quality control regulations and implementation.

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<sup>10</sup> This data include also four other commodities prioritised that are wheat, cassava, sweet potato and sunflower. On the production side MINAG will invest about USD 227 million.

<sup>11</sup> Agrarian services, extension, land and forestry, veterinary services, human resources, planning and finance, and administration.

- **Ministry of Fisheries:** is a key ministry for fishery policies implementation, technical services and extension provision. The **National Institute of Small Scale Fishery Development (IDPPE)** is the organization in charge of the coordination and implementation of small-scale fishery projects, research and technology improvement, policy formulation support and, artisanal fishery assessments. It is currently responsible for the implementation of 3 important projects over the country (see Chapter 6).
- **Ministry of Planning and Development (MPD):** has incorporated the area of rural development which was previously under the MINAG. Despite a limited experience and capability in agricultural aspects, MPD is becoming a key player in planning and coordinating projects monitoring and evaluation at the national level.

5.9 **Mandates overlap in many areas as it is often unclear what the division of labour between different government agencies should be overall among MINAG, MIC and MPD.**

5.10 There are also important stakeholders outside the government. NGOs have been playing a key role in PHL reduction, supporting smallholder farmer associations, improving storage and conservation of products and helping establish better relationships with the commodity traders and other agribusinesses.

- **CARE** carried out the **Viable Initiative for the Development of Agriculture (VIDA)**<sup>12</sup> funded by USAID which worked with farmers to identify markets for crops currently grown as well as new products. Marketing services were provided to members of crop production and marketing associations who assisted farmers to market their produce.
- The **Agriculture Natural Resources Management Programme (ANRM)**<sup>13</sup> of **World Vision** has also a strong post-harvest component. In order to reduce PHL they promote improved harvesting, drying and storage systems, and low-cost processing techniques (e.g. cassava platform for flour, Gorongosa silos, barns and rat guards, pest control in granaries, etc.). They also provide market information to the communities through radios.
- **CLUSA, Tecnoserve and ACDI-VOCA** are three US NGOs working on value chain development mainly for poultry feed (soy bean, maize) and horticulture.

5.11 There are also smaller national and local NGOs working with farmers on PHL reduction (e.g. Kulima), their sphere of intervention is limited and they tend to be concentrated in certain geographical areas<sup>14</sup> where they represent a serious potential partner for the government, in reaching more farmers and vulnerable groups.

5.12 An important farmer association, the União Geral das Cooperativas (UGC), was formed by Maputo-based agricultural cooperatives in the early 1980s. It is the most important federation of cooperatives in Mozambique, gathering 5 000 small cooperatives. It has important activities in poultry and poultry feed production (see Chapter 8 ‘Family enhancement project’). The União Nacional dos Camponeses (UNAC) ‘was created to give small farmers a voice in rural and agricultural policy-making’, but it is more focused on building farmer organization capacities than on PHL reduction.

5.13 It is quite difficult to have an overview of the private sector as it is scattered over the country. It is represented in a confederation of economic associations, Confederação das Associações Económicas (CTA), created in 1999 to promote their interests and contribute to economic development.

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<sup>12</sup> Phase I from 1996-2001 and phase II from 2001-2008.

<sup>13</sup> Funded by USAID, EU, AusAid and MINAG outsourcing.

<sup>14</sup> Care works in Nampula, Inhambane and Zambezia provinces, WV in Nampula, Zambezia and Cabo Delgado provinces.

CTA gathers 60 agriculture, industry and trade-related economic associations but at this stage it is hard to understand whether this umbrella association is representative of the private sector.

5.14 While commercial Banks have currently a very limited role in the agricultural sector, lending only to the largest, most well established enterprises, non-bank financial intermediaries and MFIs such as GAPI<sup>15</sup> or BancoTerra support more and more rural development.

5.15 Conclusion: Several policies and strategies fit into PARPA and PROAGRI including cross-cutting issues such as agricultural marketing policies. However, experience shows that there is usually a problem of shared responsibility between MIC and MINAG. Many agricultural marketing policies have remained in the gap between the two Ministries.

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<sup>15</sup> GAPI's current portfolio is about 40 million MTn, of which 25% is agriculture related. GAPI has various products for the agricultural sector, including lending to groups of associations. It offers short term working capital loan, as well as longer term investment loans for agro processing. Maximum length is five years, with no repayment due in the first year. Minimum loan is 100 000 Mtn. Its interest rates are approximately 19-22% per annum, which corresponds to approximately 1.8%/month but it asks for guarantees such as houses, equipment (year of make), etc. GAPI also offers loans in USD, with an attractive rate 8-11% per annum (this is in principle no longer authorized by the Central Bank).

## **6. PAST, ONGOING AND PLANNED POST-HARVEST ACTIVITIES/PROJECTS**

### **A. PAST, ONGOING AND PLANNED ACTIVITIES OF PUBLIC INSTITUTIONS**

6.1 The large number of ongoing projects that support smallholder farmer's market linkages, reflects the Government's focus on the economic losses due to weak supply and market demand adaptability.

6.2 The past Agricultural Market Support Programme (PAMA) was a smallholder agricultural development initiative of the Government of Mozambique financed by the International Fund for Agricultural Development (IFAD). The aim of the programme was to help smallholder farmers participate more effectively in the market economy by supporting a range of market linkage development activities including development of small to medium-scale agro processing units (project details in annex 4). The design of the Rural Markets Promotion Programme (PROMER) has been prompted by the experience of PAMA; the recognition of persistent challenges of poor performing rural and agricultural markets, which seriously affect the livelihoods of the vast majority of the rural population; and an awakening of new opportunities from emerging market intermediaries and in particular agri-business investment, in traditional concession crops (cotton and tobacco), traditional food crops (groundnuts, maize and beans) and in new emerging cash crops (biofuel crops, sesame and other oilseeds). Important activities in PHL reduction consist of : i) establishing a matching grants facility, and related technical assistance support, to encourage traders and farmers organisations to invest in simple low-cost value-addition activities such as cleaning, grading, packing or blanching; ii) Financing agribusiness through a matching grants facility to encourage investment in smallholder-oriented processing, storage, transport and possibly production, and to at least partially defray the potential risks of entering into partnerships with smallholders, iii) improving market infrastructure (rural feeder roads, construction of markets), increasing access to financial services and improving market transparency through the establishment of a regional market information centre as well as by promoting the dialogue between market participants and Government on relevant issues for agricultural marketing.

6.3 In the same vein, the Market-led smallholders Development Project in the Zambezia Valley funded by the World Bank (WB) aims at improving smallholder's income through community group organization, agricultural production and marketing development and community agricultural and environmental investment funds. The PHL reduction activities focus on small-scale agro-processing (fund) and market orientated activities.

6.4 In the grain sub-sector, the most relevant programme is the joint United Nation Programme called "Building Commodity Value Chains and Market Linkages for Farmers" in which the three Rome-based UN agencies<sup>16</sup> are involved. The overall objective of the programme is to increase the income of smallholders and enhance their livelihoods<sup>17</sup>. The Joint Programme outcome is to increase the amount of maize and beans/peas purchased by WFP directly from smallholders' organisations in Mozambique. The focus is to offer a viable market opportunity through WFP's local procurement activities – and to add value to smallholders' production through the provision of infrastructure; enhancing access to credit (IFAD); and providing technical assistance to improve post-harvest handling and the quality of the final product (FAO). All this will improve the capacity of smallholders to access

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<sup>16</sup> FAO, IFAD, WFP

<sup>17</sup> In line with the Government objectives for rural and economic development (PARPA 2006-2009, PROAGRI II, the ECA) and the UNDAF 2007-2009.

other markets and obtain higher prices in the long-term, as well as enhance farmers' organizational capacity<sup>18</sup>.

6.5 From its side, UNIDO provides technical assistance to MIC projects on agro-processing, trade and quality enhancement for vulnerable groups (youth/women). These projects bring small amounts of money (USD 1 to 3 million)<sup>19</sup> mainly allocated to capacity building and on site demonstrations<sup>20</sup>.

6.6 PHL reduction in the artisanal fishery sector is considered in 3 projects which cover the entire coast of Mozambique: the Sofala Bank Artisanal Fisheries Project (SBAFP) funded by IFAD NORAD and BSF, the Artisanal Fisheries Development Project (PPANCD) funded by AfDB and the Artisanal Fisheries Development project (Italian Cooperation funds) technically supported by FAO. All these projects have a common holistic approach and have a common objective to contribute to sustained improvement in social and economic conditions in fisher communities. PHL issues are regarded along the fish products chain from production to handling and commercialization with infrastructure development activities (roads, market infrastructure, ice plants, etc.) and credit mechanisms.

## **B. DONOR (TECHNICAL & FINANCIAL PARTNERS) ACTIVITIES**

6.7 Although the global international aid passes through the Government (PROAGRI), donors still have their specific projects in the country.

6.8 Emprenda is a consortium of three NGOs ACDI-VOCA, Tecnoserve and CLUSA funded by USAID which aims at empowering rural enterprises. ACDI-VOCA has been implementing a three year project (2005-2008)<sup>21</sup>, that has targeted three value chains, including horticulture, soy bean and maize for poultry feed. This project has worked with approximately 130 associations or groups, and has provided support to organization and legalization, capacity development in accounting and management, technical advice on horticulture production, market linkages and access to finance, and small-scale irrigation development, to allow all-year round production<sup>22</sup>. A second project has started recently<sup>23</sup> (2008) for a three year period, focusing on soy bean production for chicken feed.

6.9 ADIPSA is the Danish Embassy private sector support component of its Agricultural Sector Support Programme (ASPS)<sup>24</sup> formally under the auspices of Ministry of Agriculture (MINAG) with its private sector promotion unit. A main objective of ADIPSA is to enable small holders products' improved access to the market by better access to financial services and input supply. Technical advice through local service providers<sup>25</sup> is enabling farmers groups and organisations to set up out-grower schemes and increase productivity. Furthermore, the component facilitates support to business plan

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<sup>18</sup> Specific results expected are: i) improved storage facilities at producer level managed directly by producers or through farmers' associations; ii) improvement in post-harvest handling: reduction of PHL, product quality upgrading; and implementation of quality monitoring procedures by targeted producers associations; iii) alignment of National Standards with WFP and regional standards to improve access to market for national producers in the long-run; iv) reduction of commercial risk attached to the WFP purchase and improved capacity of smallholders to plan production of maize and beans/peas; v) improved access to credit for targeted producers' organisations.

<sup>19</sup> Except in projects related to trade facilitation and funded by EU/WTO.

<sup>20</sup> For instance Within the UN Joint Programme on Gender Equality and Women Empowerment the UNIDO component is focused on Income generation for women- through pilots on agro/fruit processing- food fortification- labour saving technologies- Nampula, Sofala, Gaza.

<sup>21</sup> With USAID funding, worth 1.5 million USD/year

<sup>22</sup> Project has been successful with horticulture products being sold to Beira market through informal arrangements. Associations also supply Shoprite with tomato, cabbage and onions.

<sup>23</sup> USDA funding, title 2, wheat monetization and represents 0.7 million USD/year.

<sup>24</sup> The phase II of the Danida ASPS started in January 2006 and will end in December 2010. The overall budget frame for the present 5-year phase is 315 million DKK.

<sup>25</sup> CLUSA won a contract to support sesame and soy value chains in Manica province. A partnership with Banco Terra for a 5 million guarantee fund (nation wide) has also been reached. In Tete province, ADIPSA contracted GAPI to provide support to potato producers.

development, developing of credit schemes, agro-processing and marketing initiatives and micro-projects of various kinds<sup>26</sup>.

An analysis is provided in Annex 6 of donors and other stakeholders' ongoing and planned activities/projects which are related to or affect PHL reduction.

### C. PRIVATE SECTOR ACTIVITIES

6.10 At this stage, detailed information is not available.

6.11 **Conclusion:** Important investments have been made to support smallholder farmers and fishers in the country in their effort to improve production and market linkages. It is clear that priority is given in all projects to value chain improvement with a view to promoting economic growth, and also that due consideration is being given to the reduction of PHL. As a next step, it would be interesting to estimate for each project what is the budget allocated to PHL reduction. However, in addition to the projects mentioned above, many activities are carried out at decentralized level (province and district). Given the weak capacities of provincial offices, these activities have only a limited impact on communities.

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<sup>26</sup> ADIPSA does not finance infrastructure rehabilitation or equipment.

## 7. GOVERNMENT INTEREST IN PHL REDUCTION

7.1 Because the field visit coincided with preparations for the Presidential election campaign, it was not possible to meet high-level representatives of public institutions. However, discussion with the Ministry of Planning and Development allowed the mission to obtain an understanding of Government priorities. A recent document (not yet available) sets 59 ‘‘Potential projects to speed GDP growth ’’, among them, almost 50% concern the agricultural sector (6 target fisheries, 8 agro-industries and commercialization while 14 target agriculture.). Unfortunately, detailed project descriptions were not available.

7.2 The Government of Mozambique prioritizes PHL reduction in the PAPPA, adopting a value chain approach to improve all stages of the product chain. As the PAPPA is mainly focused on national food security, staple food such as cereals (maize, rice, wheat<sup>27</sup>) and pulses are prioritized. Overall, rice is a priority as Mozambique imports annually about 350 000 tons of rice from Asia at a cost of about USD 150 million. While the total demand for rice in Mozambique is estimated at 550 000 tons<sup>28</sup>, the local production is estimated at about 200 000 tons. Through the National Directorate of Agriculture, the country plans to focus on building capacity on storage techniques at farmers’ level and has already financed the building and rehabilitating of silos in the central part. Priorities remain in building a strong private sector and revitalizing old milling facilities to add value to national cereals.

7.3 Poultry is also a prioritised commodity because it is the most affordable source of protein for urban Mozambican households. Market opportunities are immense. However, a critical issue relates to competitiveness of local poultry vis-à-vis imported frozen chicken. Some efforts have been made to promote national production through communication campaigns, enabling contacts between soybean producer organisations and the private sector to avoid importing raw material for animal feed.

7.4 In a global vision of economic development, transport infrastructure is a priority to improve traffic flow within the country and to lower costs. The Government of Mozambique has since 2002 reflected on a rural finance reform, exploring new opportunities and mechanisms to promote the development and expansion of rural finance which can ensure that smallholders, community traders and often disadvantaged members of rural society are able to access these services<sup>29</sup>.

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<sup>27</sup> Although it is a priority for the Government, the situation of this commodity was not analysed due to a lack of information.

<sup>28</sup> Equivalent to about 23kg/person/year or about 10% of total calorie consumption.

<sup>29</sup> Project funded by IFAD and AfDB.

## 8. OPPORTUNITIES FOR AfDB INTERVENTION IN PHL REDUCTION

### A. ANALYSIS OF ONGOING AfDB-FINANCED PROJECTS

8.1 AfDB finances four ongoing projects that are related to PHL reduction. The proposals made in this section are more orientated to identify priorities and provide recommendations for future AfDB projects as the current ongoing projects are almost ending.

8.2 The Artisanal Fisheries Development Project aims at increasing incomes of fishermen, fish traders, processors and allied industries by improving fish marketing and processing and introducing sustainable fishing practises and fish resource management system. The implementing institution is IDPPE<sup>30</sup>. The project strategy includes PHL reduction activities such as building conservation infrastructure (ice plants), improving transport and market access (roads rehabilitation, refrigerated trucks purchase, etc.), building fisher's capacities to preserve their fish...etc. Main issues raised are: i) lack of technical capacities to propose new technologies for such a broad range of initiatives; ii) shortage of private sector investment in marketing activities; iii) budget line missing for technology demonstration and adoption; iv) lack of institutional support (budget) to rural finance institutions.

8.3 The Family Income Enhancement Project is a very innovative project implemented by UGC which received the AfDB loan through the Government of Mozambique. The project's specific objectives are to promote household food security and raise income through poultry activities enhancement<sup>31</sup>. Since 2000, UGC has a breeder farm with a productive capacity of 100 000 chicken per week but the incubator was near the breeding chickens so production losses were high<sup>32</sup>, about 10% instead of 2%. Therefore, the project has moved the breeder farm by 90 km. Since then, the production losses are around 4%. Animal feed in Mozambique is also an issue for poultry farms and in 2006 the project built a feed mill with modern equipment installed in order to produce the required 18 000 tons of feed per year. Although this investment was necessary, the purchase of local raw material for the factory has been problematic as the local supply is not well organized<sup>33</sup>. According to the project coordination, project design in term of PHL reduction is good even if the market still remains an issue. Indeed, when Brazilian frozen chicken arrives in Maputo, the market is flooded and it is almost impossible to sell locally produced chicken. Farmers' coping strategy is to sell live birds in the local market but losses during transportation are high (about 10 to 15%). In a second phase or in a future project it would be relevant to finance stocks and a packaging/marketing strategy to compete with imported meat.

8.4 The Small Scale Irrigation Project comes under the umbrella of the PROAGRI. The objective is to improve agriculture production and productivity of smallholders through irrigation. The project has no PHL reduction strategy except for enhancing market access; the Kulima NGO brings support to farmers on preparing business plans for financing and on linking them to the market (agreements with traders). The project design does not include any storage facility or agro-processing plants considered necessary especially for rice, onions and Irish potato seeds.

8.5 The last project is the Rural Finance Intermediation Support Project which provides a comprehensive planning and policy framework to guide the development of rural financial services that are accessible and useful to poor people. The USD 34.3 million programme is partly financed by a USD 9.46 million loan from IFAD.

8.6 An analysis of AfDB financed projects is presented in Annex 7.

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<sup>30</sup> IDPPE is legally and administratively independent but Ministry of Fishery is the supervisory ministry.

<sup>31</sup> And also crop productivity and production improvement but this component has not been developed.

<sup>32</sup> Mainly due to the New Castle disease

<sup>33</sup> Currently the main supply (cereals) comes from South Africa.

## B. SCOPE FOR NEW PROJECTS

8.7 Programmes and projects listed above include elements that relate to post-harvest management, financial and infrastructure access, value chain development and marketing. It is strongly advised that any future intervention should take into account the ongoing activities and form collaborative partnerships with existing key institutions and stakeholders. Newly proposed PHL activities should build on existing programmes, replicate best practices and/or address current gaps, and be based on the priorities identified by the Government. For all interventions proposed, capacity building for the Government institutions and relevant NGOs is essential. Also, a clear division of labour between the three Ministries (MINAG, MIC and MPD) has to be defined in order to avoid overlaps.

8.8 The following recommendations to support PHL reductions can be made:

### **a. Support PHL reduction at production level**

Starting from the beginning of the value chain, it would be important to raise farmer's awareness on PHL. Indeed most of the time, better practises such as adopting varieties suitable for longer term storage, harvesting at the right time, drying grains just after harvesting, etc. make a huge difference. For example, for rice it is demonstrated that farmers usually harvest too late and at too high a moisture content which contributes to high physical losses. Adequate resources need to be committed to build capacity at the country level and especially for advisory support services. Within the context of the national extension service reform, training on PHL reduction should be prioritized for technicians and extension workers (national, provincial and district level). In order to reach a significant number of farmers, capacity building should be accompanied by development of farmer organisations, farmer field school creation, service provider contracting (NGOs, private companies, etc.) and sensitisation by radio broadcasts.

A proactive support to IIAM and other specialized research centres (such as ICRISAT) is recommended as they are key partners for variety development and post-harvest technologies improvement. Research should focus on low-cost technologies (equipment) already known but not disseminated, that could reduce PHL.

### **b. Enhance storage and conservation capacities**

Government prioritizes building medium to large-scale storage and drying capacities (mainly for cereals) in strategic areas as part of PAPP and ECA II. It is also planned to reduce PHL through capacity building on storage techniques. In addition, incentive measures for private sector investment are promoted (credit facilities, temporary tax exemption). But despite this policy, the private sector still complains about the high level of taxes and difficulty to access low rate credit mechanisms. AfDB could play a key role as a financial partner (lender) for the private sector (unions of farmers, union of processors, etc.) adopting the same mechanisms that allowed UGC to access a loan from AfDB. However, a simplification of AfDB administrative procedures would be needed.

In parallel, small-scale storage infrastructures have to be promoted and farmers' organisational capacities strengthened in order to facilitate gathering a significant volume of products suitable for storage, transport and marketing. From a medium-term perspective, the objective is to rely on farmer organisations to group and store their harvest most likely using the medium or large-scale facilities and to become price makers instead of price takers (selling their harvest when prices are attractive, developing their bargaining power). Thus, organisational support accompanied by credit facilities should be encouraged as well as market linkages development.

**c. Promote national capacity to process raw materials**

In Mozambique PHL arise due to losses of market opportunity mainly because there is little internal capacity to process raw material and so to add value to the agricultural products. Actions have been taken to encourage medium to large scale private sector investment but costs remain high because of transport costs<sup>34</sup>, scattered production limiting economy of scale, expensive access to credit and energy, and lack of management capacities.

Various initiatives tried to improve the national capacities to produce poultry feed with national raw material but the attempt failed for several reasons: seasonality of raw material availability (soybean mainly), lack of water and energy, etc. AfDB could help to create an enabling environment for private businesses through support to private sector umbrella organisations.

At a smaller scale, processing units should be promoted to help farmers benefit from value addition. For instance, small husking units are well developed in the Niger basin and could also be promoted in Mozambique to encourage farmers to sell their husked rice instead of paddy rice. As mentioned before, these activities can only be carried out if they are accompanied by capacity building support, credit access and creating enhanced market linkages.

**d. Improve commercialization along the commodity chain**

Following the Agricultural Commercialization Strategy (ECA II), the main points to focus on are:

- *Supporting physical access to markets and building market infrastructures:* Large road investments have been made in Mozambique. Projects focusing on value chain development should invest in roads, electrification and market infrastructure.
- *Investing in transport capacity:* Appropriate transport (such as cooling vans) for perishable commodities would significantly contribute to PHL reduction and improving quality standards. Investment should also be made in appropriate transporting materials to reduce spillage, breakage and bruising.
- *Supporting commercial farmers, traders and processors to invest in marketing:* the poultry sector in Mozambique experienced constraints in marketing due to competition between imported frozen chicken and locally produced ones. While awareness campaigns have already been launched by the government to inform consumers on quality standards, improvement in packaging and labelling of local products remains critically needed.
- *Supporting introduction and enforcement of grading systems and quality standards:* The UN joint programme on value chain and market linkages for farmers is introducing grading systems and quality standards as incentives for farmers, traders and processors. This requires building capacity, including government capacities, along the value chain. At the same time, enhancing the quality of local stores, and capacity building in storage management and practices is required to preserve the quality of the graded products. There is a need to simultaneously raise consumer awareness on food safety and quality standards to increase demand for certain quality products and willingness to pay based on consumer priorities and purchasing power.

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<sup>34</sup> Mozambique is a huge country and despite the current road improvement oil is still expensive.

- *Promoting price information and direct contact between producers and traders:* A national statistical system collects prices on main commodities but does not disseminate information at the farmer level. Activities developed in other countries such as in Zambia could help the supply to meet the demand. The Zambian National Farmer Union (ZNFU) developed an SMS based system that facilitates information exchange between traders to contact suppliers. Information on quantities, prices and location of the products are provided and such a system should be piloted in Mozambique.

**e. Create stakeholder dialogue along the chain**

- *Strengthening commodity/value chain specific knowledge within MINAG at the national, regional and district level:* Create a real interest within MINAG by establishing working groups on commodity chains.
- *Promoting coordination among the different Ministries:* MPD is given the mandate to coordinate, monitor and evaluate programmes and projects related to agricultural development, rural development, trade and industry. This function is quite recent and should be supported (organisational skills, M&E system, financial resources, etc.) to achieve its mandate.
- *Facilitating dialogue and cooperation between value chain stakeholders, including farmers, traders, processors, exporters and policy makers:* The value chains of most commodities in Mozambique are not well developed and the roles and responsibilities of the various stakeholders along the chain are unclear. To have efficient and optimally functioning value chains it is important that dialogue between value chain stakeholders is promoted. These dialogues will be vehicles to discuss issues related to standards and quality, contract farming and outgrower schemes and on how to address constraints to value chain efficiency. Clear understanding of expectations and deliverables can facilitate investment in proper post-harvest technologies as some of the risks related to selling (i.e. for farmers and traders) and buying (i.e. for producers and traders) of the produce are mitigated. Commodity value chain working groups could facilitate this kind of dialogues.

## 9. NEXT STEPS AND FOLLOW-UP ACTIONS

9.1 The following follow-up actions are recommended:

- As it was impossible to meet any national directors from the MINAG during the field visit, AfDB should organize a debriefing meeting with them in order to: validate the priorities identified in this document; determine which directorate(s) would take the lead in PHL reduction initiatives; and organize a validation workshop.
- AfDB should consider contacting the World Bank to start the process of joint planning for a country validation workshop, as had been discussed with FAO within the scope of the World Bank's study on Post-Harvest Loss Reduction Technologies and Practices for Basic Grains in Sub-Saharan Africa.
- AfDB should liaise with MINAG to assume leadership for the organization of the country workshop with technical assistance from the FAO country office in Mozambique, the AfDB Field Office and the WB Country Office. The country validation workshop, which should involve the various stakeholders of the commodity chains of particular importance to Mozambique, should result in the development of specific and relevant action plans (i.e. further commodity specific studies and appraisals).
- Based on the country assessment, the outcomes of the validation workshop and subsequent studies, a series of specific investment plans could be developed which target PHL reduction.
- An IFAD/FAO/AfDB joint lesson learning exercise should be organized in order to learn from other PHL reduction experiences and to guide the integration of PHL reduction activities in the future programme.
- With regards to grain PHL reduction, successful experiences from the Joint UN programme (P4P) could be used to re-design AfDB projects and the Bank could consider replication in other regions.

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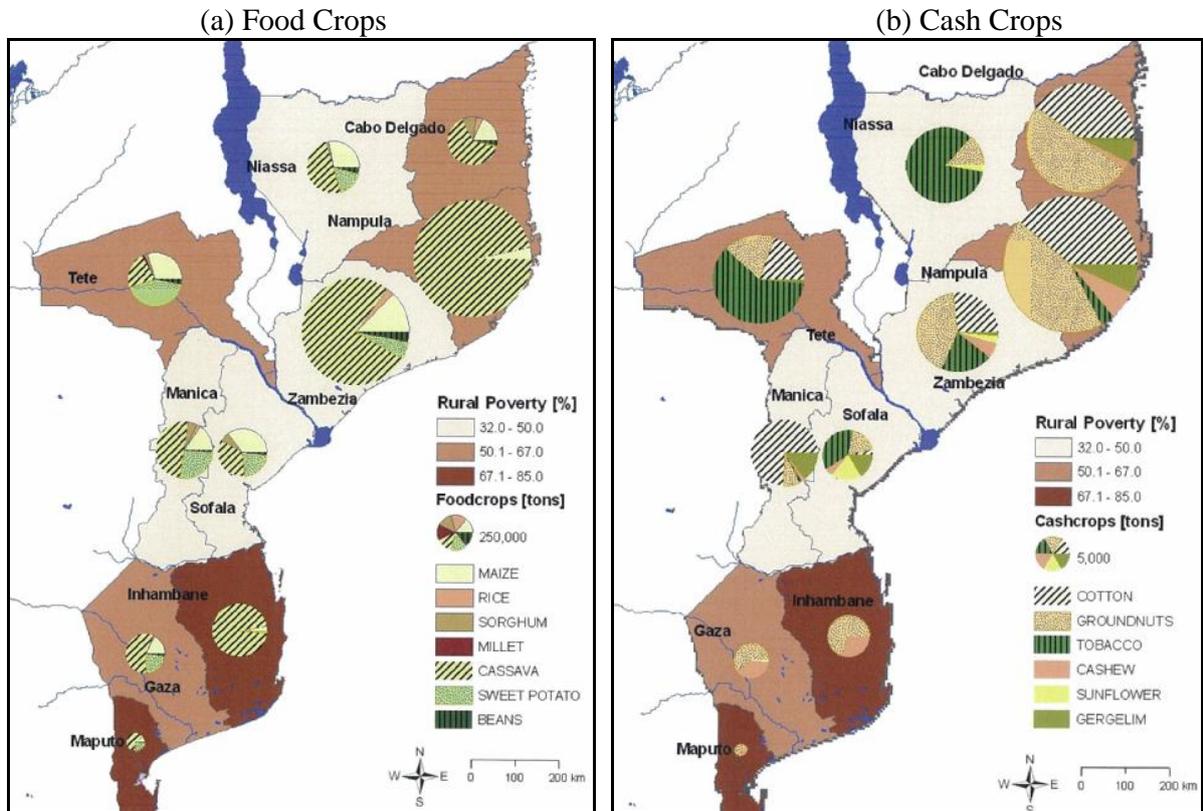
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## **ANNEXES**

**Annex 1: General country data & social and agricultural statistics**

			Source
<b>General</b>	<u>Surface Area (thousand km<sup>2</sup>):</u>	799.4	Biblio 39
	<u>Population (millions) in 2008:</u>	22.38	Biblio 39
	<u>Pop. Growth rate (annual %) in 2008:</u>	2.3	Biblio 39
	<u>Altitude range:</u>	0 to >1000 m	Biblio 40
	<u>Temperature range:</u>	18 to 30°C	Biblio 40
	<u>Relative humidity:</u>	-	-
	<u>Precipitation (mean annual): Precipitation Range:</u>	0 to >1200 mm	Biblio 40
<b>Social</b>	<u>Life expectancy at birth:</u>	48	Biblio 39
	<u>% of pop. under poverty line:</u>	70% (2001 est.)	Biblio 3
	<u>Literacy rate: (Male: ;Female: )</u>	60%; 29%	Biblio 30
	<u>UNDP Human development index (2009 data):</u>	172 out of 182	Biblio 39
<b>Market Access</b>	<u>Paved roads (km):</u>	5 685	Biblio 3
	<u>Unpaved roads (km):</u>	24 715 (2000 est.)	Biblio 3
	<u>Railways (km):</u>	4 787	Biblio 3
	<u>Landlines:</u>	78 300 (2008 est.)	Biblio 3
	<u>Mobiles (million):</u>	4 405 (2008 est.)	Biblio 3
<b>Agricultural stats.</b>	<u>Land cultivated:</u>	-	-
	<u>Area under irrigation:</u>	-	-
	<u>Population employed in agriculture:</u>	80% on year 2004	Biblio 30
	<u>Agricultural GDP as share of total GDP:</u>	26.1% in year 2003	Biblio 30
	<u>Agricultural trade balance (exports-imports):</u>	-	-
	<u>Fertiliser use:</u>	-	-
	<u>Major crops (in order of importance, in ha or production):</u>		
<u>Major agricultural exports (in order of importance, either MT or value)</u>	prawns, cashews, cotton, sugar, citrus, timber	Biblio 3	
<u>Major agricultural imports (in order of importance, either MT or value)</u>			

## Annex 2. Map showing production zones of the major crops in Mozambique



Source: Biblio 38

**Annex 3: Cultivated area and quantities of main commodities produced in 2007/08 season**

<b>Crops</b>	<b>Area</b>	<b>Production</b>
	<b>(‘000 ha)</b>	<b>(‘000 ton)</b>
Maize	1,546	1,709
Sorghum	569	380
Millet	104	53
Rice (Paddy)	210	213
<b>Total Cereals</b>	<b>2,429</b>	<b>2,355</b>
Beans	481	255
Groundnuts	330	155
<b>Total Pulses</b>	<b>811</b>	<b>410</b>
<b>Cassava</b>	<b>1,173</b>	<b>8,847</b>

Source: Biblio 19

**Annex 4. Storage Network in Mozambique**

	State sector			Private sector capacity			National Capacity (tons)			
	Silos	Ware-houses	Total	Silos	Ware-houses	Total				
Province	Capacity (tons)	Number of Units	Capacity (tons)	Capacity (tons)	Capacity (tons)	Capacity (tons)	Capacity (tons)	Silos	Ware-houses	Total
Maputo	45000	5	6140	51140	0	80000	80000	45000	86140	131140
Gaza	0	13	20580	20580	0	5000	5000	0	25580	25580
Inhambane	0	5	6700	6700	0	5000	5000	0	11700	11700
Manica	2000	11	13900	15900	13000	8900	21900	15000	22800	37800
Sofala	0	8	7400	7400	28000	60000	88000	28000	67400	95400
Tete	0	14	23100	23100	0	6000	6000	0	29100	29100
Zambézia	0	25	43520	43520	0	0	0	0	43520	43520
Nampula	0	28	35427	35427	43000	56000	99000	43000	91427	134427
C. Delgado	0	20	24338	24338	0	0	0	0	24338	24338
Niassa	0	14	20730	20730	0	7000	7000	0	27730	27730
<b>Total</b>	<b>47,000</b>	<b>143</b>	<b>201,835</b>	<b>24,835</b>	<b>84,000</b>	<b>227,900</b>	<b>311,900</b>	<b>131,000</b>	<b>429,735</b>	<b>560,735</b>

## Annex 5: Estimated losses during post-harvest operations

### General information

- Biblio 17, which presents the proceedings of the First National Symposium on Post-harvest Technology which was held in November 2006 in Gorongosa District, Mozambique, states that 40% of harvested products are lost. Because the symposium addressed a broad spectrum of food crops, including grains, fruits and vegetables and cassava, this level of PHL appears to be a global figure for all these crops. No further details are provided on the types of PHL (qualitative and quantitative) and the value of losses at each step of the chain.
- Most references make general comments which point to very high levels of PHL in Mozambique. Examples include:
  - Biblio 32 states that, unprotected from the risks of pests and disease by effective SPS services and infrastructure, the agriculture sector in Mozambique suffers from major pre- and PHL each year.
  - Biblio 33 mentions that for diversification crops such as groundnuts, pigeon peas, oilseeds, beans and cowpeas, crop yields are below what can be achieved with or without inputs because of poor seed, incorrect farming practices and PHL.

### Grains

- Biblio 17 states that peasants suffer an average loss of 30-40% of grain. It states further that this loss comes about especially during periods of pre-harvest on-farm drying and post-harvest storage in barns.
- Biblio 7 gives a level of PHL of 20-40% for cereals. However, details of the magnitude of losses occurring at each step of the chain are not provided.
- A draft agricultural policy paper prepared in the Ministry of Agriculture and Fisheries indicates that PHL are estimated to be equivalent to around 20% of grain production (Biblio 10).
- According to Biblio 4, a study conducted by OXFAM in Southern Niassa in 2002 indicated losses of roughly 33% for storage in traditional warehouses for six months without rat-guards.
- Biblio 24 gives the following data for the “quantitative weighted PHL” in Mozambique for the years 2003 through 2007.

Crop	Year				
	2003	2004	2005	2006	2007
<i>Maize</i>	21.6	19.0	19.4	21.1	21.0
<i>Sorghum</i>	12.7	13.1	12.7	12.8	12.8
<i>Rice</i>	11.4	11.4	11.4	11.3	11.4

### Cassava

- Biblio 6 mentions that in Mozambique PHL in cassava ranges from 10-20% but could be as high as 30%.

### Annex 6: Donor and other stakeholder investment projects affecting PHL reduction

Donor/ Stakeholder	Name of Project + Description of components/activities + Total cost (USD or Euro Million) and/or loan	Status (ongoing/ closed) & Start date/end date	Scope/ Area of intervention (Regional/ national/ local)	Relevance/importance for PHL activities, (including transport development, value addition and marketing)
Ministry of Fisheries (IDPPE)/ IFAD	<b>Sofala Bank Artisanal Fisheries Project (SBAFP)</b> The project has 5 components 1. Community development 2. Fisheries development 3. The development of markets and access roads 4. Support to financial services 5. Institutional support, policy formulation and legislative initiatives	On going 2002-2008 30.6 million US dollars	Coastal zone of Sofala Bank (950 km from the district of Mogincual in Nampula to the district of Machanga in Sofala)	<ul style="list-style-type: none"> <li>• Improve fisher' access to fisheries resources and promote sustainable exploitation and marketing</li> <li>• Improve the linkages between fisher communities and markets for both the supply of fishing gear and the sale of fisheries products,, through means including the rehabilitation of access roads</li> <li>• Establish savings and small scale credit mechanisms, widen business opportunities and improve the access to credit for small and medium scale enterprises</li> <li>• Improve the political and regulatory environment for supporting the artisanal fisheries development</li> </ul>
Ministry of Fisheries (IDPPE)/FAO/ Italian Cooperation	<b>Artisanal Fisheries Development project</b> The project aims at improving the livelihood of artisanal fisher folk.	Ongoing 2008 – 2011 US \$ 3.871.297	South Mozambique provinces of Gaza and Inhambane	
Ministry of Planning and Development/ IFAD	<b>Rural Market Promotion Programme (PROMER)</b> The <u>goal</u> of PROMER is to improve livelihoods of poor rural households; and central to achieving this goal the <u>purpose</u> of PROMER is to enable smallholders to increase their agricultural income by marketing their surpluses more profitably. This will be realized by developing interventions that promote more efficient marketing by a range of market intermediaries while at the same time capitalizing on opportunities linked to agribusiness investment within specific value chains and will be complemented by policy, institutional and management support. Thus the programme will combine a horizontal 'market linkages' approach aiming at building the capacity of market intermediaries (traders, agri-dealers and farmers' organisations), with a 'value chain' approach looking at seizing and facilitating opportunities for vertical integration between smallholders and agribusinesses.		The Nacala corridor: Niassa & Cabo Delgado provinces.	<ul style="list-style-type: none"> <li>• Improved smallholder access to and participation in agricultural markets and value chains;</li> <li>• More efficient market intermediaries, and more effective partnerships, stimulating increases in agricultural production and value addition;</li> <li>• A more conducive environment for agricultural market operations.</li> </ul>
MMAS/MIC/UN	<b>Gender equality and women empowerment</b>	Sept 2008	Nampula, Sofala,	5 pilot & demo installed on agro-fruit processing including cashew

<b>Donor/ Stakeholder</b>	<b>Name of Project + Description of components/activities + Total cost (USD or Euro Million) and/or loan</b>	<b>Status (ongoing/ closed) &amp; Start date/end date</b>	<b>Scope/ Area of intervention (Regional/ national/ local)</b>	<b>Relevance/importance for PHL activities, (including transport development, value addition and marketing</b>
IDO		3 million US dollars (one UN)	Gaza	apple fruit, food fortification.
MIC/AIMO/CAD I/UNIDO	<b>UNJP promotion of youth employment</b>	Sept 2008 1 million US dollar (one UN)	Maputo, Inhambane, Nampula	3 enterprises and investment promotion units established focusing on coir (coconut fibre) processing, rice de-husking.
MIC-MISAU/MINAG/MIP/UNIDO	<b>Enhancing Quality Assurance System for Trade and Food Safety.</b>	Closed Sept 08 2.3 million US dollars (SECO)	Maputo/ Nationwide	Improved public sector quality infrastructure to locally test and certify 4 product-sectors: fruit & veg., nuts/cashew, edible oils and honey.
MIC/UNIDO	<b>Business environment support and trade facilitation project</b>	Sept 08 6.5 m Euro (EU-UNIDO)	Maputo/ Nationwide	IPEX strengthened on providing trade information and advisory information
MIC/MINAG/MIP/UNIDO	<b>UNJP building capacities for effective trade policy formulation and management</b>	Signed July 09 1.5 m US\$ (one UN)	Maputo/ Nationwide	Increased supply capacity of agricultural commodities and fishery products Increased capacity of agro-enterprises to produce and compete locally and internationally through meeting international standards
MIC/UNIDO	<b>Strengthen productive and Trade capacities in Mozambique</b>	5 m euro (WTO)	Maputo/National	Implemented industrial policies and strategies targeting on value chains for selected product sectors and improved economic competitiveness; Improved production capacities for export and conformity with international standards Upgraded 45 selected manufacturing SMEs (priority sectors agro-processing, fisheries and manufacturing)
Joint Programme UNDAF (WFP/FAO/IFAD)/ MINAG/MIC/ MPD/ INNOQ <sup>1</sup>	<b>Building Commodity Value Chains and Market Linkages for Farmers</b>	On going 2008-2013	Nampula, Sofala, Manica, Zambézia, Tete provinces.	<ul style="list-style-type: none"> <li>• Direct contracting with selected small farmers' organizations;</li> <li>• Promoting the creation of storage infrastructure like community warehouses (150-300 tons) and improved grain silos (1-2 tons)- to improve smallholder post-harvest handling and subsequently improve the quality of grains marketed;</li> <li>• Providing equipment to improve the quality of stored products (e.g. cleaning machines);</li> <li>• Training beneficiaries in post-harvest handling (e.g. basic cleaning and drying techniques, storage conditions, warehouse management, etc.);</li> <li>• Assist in developing national standards for maize (grade B) and beans that are in conformity with regional WFP standards and ensuring that WFP procures quality commodities;</li> <li>• Facilitating access to credit.</li> </ul>

<sup>1</sup> National Institute of Norms and Quality.

<b>Donor/ Stakeholder</b>	<b>Name of Project + Description of components/activities + Total cost (USD or Euro Million) and/or loan</b>	<b>Status (ongoing/ closed) &amp; Start date/end date</b>	<b>Scope/ Area of intervention (Regional/ national/ local)</b>	<b>Relevance/importance for PHL activities, (including transport development, value addition and marketing</b>
MINAG/WB/GE F	<b>Market-Led Smallholders Development in the Zambezi Valley</b> <ul style="list-style-type: none"> <li>• Community Group Organization and Local Institutional Strengthening</li> <li>• Agricultural Production and Marketing Development</li> <li>• Community Agricultural and Environmental Investment Fund</li> <li>• Project Management, Coordination and Monitoring and Evaluation</li> </ul>	On going 2006- USD 26.5 million	Zambezia province	Technical support is provided for market driven, broad-based sustainable agricultural development. Through a strengthened extension service, technical assistance is provided to stakeholders involved in production, marketing and processing of agricultural products. Contracted studies, applied research, specialized training and awareness campaigns are undertaken in such areas as market opportunities identification and development, crop diversification, sustainable land and water management, market information etc.
INAQUA/AFD- French cooperation	<b>Support to Shrimp Farming in Mozambique- Trade Capacity Building Programme (PRCC)</b> The main objective of the support to the shrimp farming in Mozambique is to promote sustainable improvement of this high potential sector's international competitiveness.	On going 2009-2011 1.5 million euro		From an PHL reduction point of view, the project will strengthen shrimp sale and exports, hence contributing to the improvement of financial and institutional sustainability of the main shrimp farms in the country.

### Annex 7: Analysis of AfDB-financed country projects

Project name	Sub sector	Status of project	Start date	End date	Total cost in UAC	% disbursed	Post-harvest and storage activities	
							Existing (type)	Proposed/ potential
Rural Finance Intermediation Support Project	Rural development	On going	2003	2009?	18,636,000		<ul style="list-style-type: none"> <li>Community based rural finance infrastructures.</li> </ul>	
Family farming income enhancement project	Agriculture	On going			15,010,000		<ul style="list-style-type: none"> <li>Building of a feed mill with new modern equipment to produce 18 000 tons of feed/year.</li> <li>Construction of 630 sq m of a breeder farm to accommodate 40 000 breeder chicks/year, with 8 laying houses, 4 rearing houses, sanitary facilities, annexes, office blocks.</li> <li>Rehabilitation of the slaughterhouse and installation of equipments</li> <li>Equipment for market access: vehicles, scales, freezers, cold room.</li> </ul>	<ul style="list-style-type: none"> <li>Before moving to a new breeder farm analyze cautiously water availability.</li> <li>Investing in packaging and marketing (logo) to compete with Brazilian meet.</li> <li>Planning stock funding (when the market is flooded by Brazilian chickens)</li> </ul>
Artisanal Fisheries Development Project (PPANCD)	Fishery	On going	2002	extended to 2011	18,498,400		<ul style="list-style-type: none"> <li>Improving preservation method.</li> <li>Provision of credit to establish ice plants and acquire transport facilities (5 refrigerated trucks and 10 pick-up), insulated boxes, plant for producing fish packaging material,</li> <li>Rehabilitation of 220 km roads</li> <li>Construction of a fish handling complex, 15 landing sites, improving potable water supply, rehabilitation of 2 important fish markets.</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrations of new technologies were not budgeted, fishers need to first test the technology before investing in it.</li> <li>Difficulty to find locally technical assistance in fishery.</li> <li>Plan a budget line for institutional support for micro credit institutions (problem recovering the credit)</li> </ul>
Small scale irrigation project	Agriculture and rural development	On going	2002	2006 extended to 2009	15,440,000		<ul style="list-style-type: none"> <li>Supporting farmer organizations to prepare business plans to access to credit/loans.</li> <li>Linking farmers to the market through agreement with traders.</li> <li>Credit scheme provides by GAPI</li> </ul>	<ul style="list-style-type: none"> <li>Commodities produced in the irrigation scheme are sold directly without any processing. For rice, could set up small rice units to husk and package.</li> <li>Implement storage facilities and introduce conservation technologies.</li> </ul>

### Annex 8: List of Persons Met During the Assessment Mission

Name	Institution	e-mail/phone
Abu Yarmah	WorldVision	Abu_yarmah@wvi.org (+258) 21350605/0
Agnélio de Chicava Pita	Ministry of Agriculture Centre for promotion of Agriculture	agneliopita@cepagri.gov.mz (+258) 21307957
Albertina Alage	Ministry of Agriculture Nacional Directorate for Agricultural extension	albertinaalage@yahoo.co.uk (+258) 823147990
Alejandro Acosta	Food and Agriculture Organization Mozambique	Luisalejandro.acosta@fao.org (+258) 21491136
Billy Mwiinga	United Nations World Food Programme	Billy.mwiinga@wfp.org (+258) 21482277
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Paulo Guilherme Negrão	GAPI Investments Society	Paulo.negrao@gapi.co.mz (+258) 21491505
René Celaya	CARE Mozambique	rcelaya@care.org.mz (+258) 21492064/6
Susana Mafuiane	Ministry of Industry and Commerce	smafuiane@mic.gov.mz (+258) (01) 300664
Steven Dils	UNIDO office in Maputo, Mozambique	tel: (258) 21-481 489/449 s.dils@unido.org

**Annex 9: Programme of the Assessment Mission 23-29 August 2009**

Time	Status	Meeting	Participants	Venue	Objectives
<b>Monday (24/09)</b>					
9.00		Briefing with FAO Representative	Ms. Zimmermann, Ms. David de Silva	FAO	To communicate the mission objectives
11.00		Briefing with AfDB	Resident Representative and Agricultural Expert - AfDB.	AfDB	To communicate the mission objectives
12.30		Ministry of Agriculture-National Directorate for Agrarian Services (DNSA)	Mr. Boaventura Novunga	DNSA	To exchange information about post harvest losses
14:30		Ministry of Agriculture - Centre for the Promotion of Commercial Agriculture – (CEPAGRI)	Mr. Roberto Mito	CEPAGRI	To exchange information about post harvest losses
<b>Tuesday (25/09)</b>					
9.00		Meeting with WFP Representative	Ms. Lola de Castro	WFP	To communicate the mission objectives
11.00		United Nations Joint Program on Value Chain	Mr. Billy , Mr. Acosta, Mr. Machanguana	FAO	To exchange information about the UNJP/093
15.00		Ministry of Agriculture-National Directorate of Agrarian Extension (DNEA)	Ms. Albertina Alage, Ms. Julieta Ziote	DNER	To exchange information about post harvest losses
<b>Wednesday (26/09)</b>					
9.00		Ministry of Commerce and Trade (MIC)- National Directorate of Commerce	Mr. James Nichols	MIC	To exchange information about post harvest losses
11.30		Agrarian Research Institute of Mozambique (IIAM)	Mr. Calisto Bias, Mr. Manuel Amane,	IIAM	To exchange information about post harvest losses
15.00		World Vision	Mr. Jackson	World Vision	To learn about the experience of the World Vision on Postharvest issues in Nampula and Cabo Delgado
<b>Thursday (27/09)</b>					
9.00		Swiss Cooperation	Mr. Fernando Pililao	Swiss Cooperation	To learn about the experience of the Swiss Cooperation in Postharvest issues in Nampula and Cabo Delgado
11.00		Ministry of Planning and Development	Mr. Adriano Ubisse	MPD	To exchange information about post harvest losses
14. 00		Ministry of Fisheries - Institute for the Development of Small Scale Fisheries (IDPPE)	Mr. Simeão Lopes	IDPPE	To exchange information about post harvest losses in Fisheries
<b>Friday (28/09)</b>					
8.30		Debriefing with FAO Rep	Ms. Zimmermann	FAO	To communicate the main results of the mission
10.00		Debriefing with AfDB		AfDB	To communicate the main results of the mission
11.30		CTA –Private Sector		CTA	To exchange information about post harvest losses
15.00		CARE	Mr. Casimiro George	CARE	To exchange information about post harvest losses



# Continental Programme on Post-Harvest Losses (PHL) Reduction

## Rapid Country Needs Assessment

### Mozambique

Reduction of post-harvest losses (PHL) is a priority area of collaboration between FAO and the African Development Bank (ADB). It was one of three pillars identified by ADB within its African Food Crisis Response (AFCR) of June 2008, in response to the rise of food prices in 2007 and 2008. In 2009, collaboration between FAO and ADB on PHL reduction was organized along two pillars: (i) screen the ADB agricultural portfolio and sensitize/train ADB staff to improve PHL activities within ongoing and future projects; and (ii) prepare a framework paper for a continental programme on PHL reduction in Sub-Saharan Africa (SSA), based on needs assessments undertaken in 14 African countries. These needs assessments were carried out by FAO's Rural Infrastructure and Agro-Industries Division (AGS) and Investment Centre Division (TCI) through joint field missions undertaken with ADB in six countries (Cameroon, Ghana, Malawi, Mali, Mozambique and Sierra Leone). Additional data were also obtained from ADB and FAO country offices and concerned stakeholders in another eight countries (Chad, Ethiopia, Kenya, Nigeria, Rwanda, Senegal, Uganda and Zambia).

In 2010, six working papers entitled: "Continental Programme on Post-Harvest Losses (PHL) Reduction: Rapid Needs Assessment" were prepared for Cameroon, Ghana, Malawi, Mali, Mozambique and Sierra Leone which analyzed needs and opportunities for investing in PHL reduction in SSA. These reports provided the foundation on which ADB could begin developing its strategy to assist SSA countries in integrating the recommendations provided on key areas for intervention for PHL reduction.

# Mozambique

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