Demand Analysis Report- Republic of Mozambique

Programme Management Unit (FTF-ITT)

National Institute of Agricultural Extension Management,

(An autonomous organization of Ministry of Agriculture & Farmers Welfare, Government of India)

Hyderabad – 500 030, India

www.manage.gov.in

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DEMAND CANALYSIS OF AGRICULTURAL DEVELOPMENT IN MOZAMBIQUE

Country Background and Agricultural Sector

1. General and Economic Context of Mozambique

Mozambique is one of the world's poorest developing countries located on the east coast of Southern Africa, covering an area of 801.590 km2, 13.000 km2 of which are inland waters. A number of international rivers flow through the country, including the Zambezi River in the central part and the Limpopo River in the country's south. These two rivers provide water resources estimated at an annual volume of 216 km3, 46% of which are generated internally. The demographic profile shows an estimated population in 2012 of 237 million people, 69% of whom live in rural areas. The estimated average population density is 19 inhabitants/km2. The population growth rate is estimated at 2.8% per year, the same as in 2011. Life expectancy is 52.8 years for a median age of about 17 years. The infant mortality rate is estimated at 84.5 deaths per 1000 live births. In 2011 the proportion of adults living with HIV/AIDS was 11.5%.

As far as economic development is concerned, the real GDP growth rate was 7.2% in 2011. The current unemployment rate is 27% in the formal economy concentrated in the urban areas, which accounts for 32% of total employment. The efforts of the Central Bank to maintain a restrictive monetary policy supported by a Fiscal Policy have led to a reduction in the inflation rate. Annual inflation in 2011 was 9.5%. Meanwhile the country depends heavily on foreign aid.. The 5 biggest donors of Mozambique in 2010 were the United States (USD 267 million), the European Union (USD 199 million), the World Bank (USD 192 million), Germany (USD 100 million), Portugal (USD 93 million) and Sweden (USD 92 million). In 2012, the list of partners included the World Bank (WB), the African Development Bank (AfDB), the European Union (EU), the United Nations Food and Agriculture Organization (FAO), the International Fund for Agricultural Development (IFAD), the World Food Programme (WFP), the United Nations Development Program (UNDP), the Millennium Challenge Corporation (MCC), the U.S. Agency for International Development (USAID), in addition to Austria, Belgium, Canada, Denmark, the United States of America, Spain, France, the Netherlands, Italy, Ireland, Japan, Portugal, Sweden, Switzerland and the United Kingdom.

2. Poverty, Food and Nutritional Security in the country

Of late, the country has built up high expectations with respect to economic growth due to the recent discoveries of natural gas resources in the country's northern part. Despite the natural connections between future revenues from the extraction of hydrocarbons and the picture of poverty and food and nutritional security, the country at present is still considered one of the world's poorest. The Poverty Reduction Plan (PARP, 2011-2014) of the Mozambique Government in 2010 had concentrated on increasing agricultural production, promoting the development of small and medium enterprises (SMEs) and on investment in human and social development. However, statistics indicate that the average annual rate of poverty reduction in Mozambique between 1996 and 2009 was 1.17%. To reduce the poverty at a faster rate, an efficient and systematic planning process is essential and the country was attempting the same through the operationalization of the PARP.

With respect to human development, the literacy rate among adults increased from 45% in 2001 to 56.1% in 2010, with the highest among men (70,8%) against 42,8% among women. The enrolment rate of girls in both primary (109%) and secondary education (23%) remains lower than that of boys (121% and 28% respectively). However, the HIV/AIDS prevalence rate among adults was 11,5% in 2011, and this continues to be a disease that poses major challenges to the country. The infant mortality rate decreased from 125 % in 2001 to 86.2 % in 2011, while life expectancy for 2012 was estimated at 52.8 years.

National statistics of the country show food insecurity rates of 35% of the population while stunting (height for age <-2 SD) affects 43% of children (DHS, 2011). According to the WHO, the high levels (> 40%) of chronic malnutrition represent a serious public health problem for the development of human capital. As a result of malnutrition, 50% of the children under 5 years in Mozambique cannot achieve the full potential in terms of physical, mental and cognitive development. It is worthy noting that 75% of children and 48% of mothers suffer from anemia or low iron in the blood. Anaemic children show slow growth, apathetic, anorexic and without energy. Vitamin A deficiency affects 69% and 11% of under-5 children and mothers in Mozambique respectively. Vitamin A deficiencies is associated with weakened immunity against infections and poor eye sight leading to blindness.

The poor performance of the agricultural sector is largely identified as one of the reasons for the slow progress made by efforts to reduce poverty and strengthen food and nutritional security in Mozambique. Agriculture has the potential to benefit from the current dynamics of the hydrocarbon sector through increased production of food crops and a growing income. In the recent past, focus on these two subsectors together with those of fishery and livestock breeding was targeted in the country for agricultural sector development (PNISA).

3. Background of Agriculture in Mozambique

3.1. Scope of Agriculture: Agriculture of Mozambique contributes between one fifth and a quarter of the gross domestic product (GDP) and provides livelihoods to more than 80% of the population (IFAD, 2010). Almost all the labour involved comes from the households. In Mozambique, all members of the family contribute towards farming. Organized farming is slowly increasing but most of the work is carried out by individual farmers. In fact modern use of agricultural tools such as tractors, electrical ploughs, good quality fertilizers and pesticides is picking momentum by the small scale farmers in Mozambique.. The non-farm economy including small businesses and increased self-employment related to extracting natural resources, as well as increased wage labour opportunities are also being focused for improving rural economy.

Farming is conducted by some 3 million peasant families, a small number of commercial farmers cultivating a total of less than 60 000 hectares, and refurbished agro-industrial units growing about 40 000 hectares of sugar-cane. Production of food staples is dominated by smallholders, with an average of 1.2 hectares of cultivated land. Use of purchased inputs is very limited; according to a national survey conducted in 2007, only 4 per cent use fertilizers. Mozambique's diverse soils and climatic conditions offer a wide range of production opportunities. However, as agricultural systems are predominantly rainfed, production can fluctuate widely from year to year. According to Ministry of Agriculture, the potential for irrigation exists, but the basic infrastructure is absent, which can be created. Currently, only 55 000 hectares are under irrigation. More than half of those are under sugarcane and the remaining under rice and vegetables. Tree crops, especially coconut and cashew, grown by small farmers are an important source of foreign exchange earnings, and contribute to household food security. The number of trees are particularly significant in the heavily populated coasts of Inhambane and Gaza, where the contribution to the household food economy of such crops is substantial as individual farm families may own from 100 to 200 trees. Other major cash crops grown by small farmers

include cotton and tobacco, which generally occupy between 150 000 and 180 000 hectares and between 30 000 and 35 000 hectares respectively. These cash crops, along with oilseeds, tea, citrus and horticultural crops (particularly tomatoes), offer alternative sources of income to the small farmers in inland districts, where coconuts and cashews are not grown. On a larger scale, about 40 000 hectares of industrial plantations of sugarcane (35 000 under irrigation) are grown at four operational sites surrounding sugar mills in Maputo and Sofala provinces. Maize and cassava are the major staples; other food crops of significance include sorghum, beans, groundnuts, millet and rice.

Cassava is grown mainly in the north where it is the main food staple, and it is being introduced, along with sweet potatoes, under a Government initiative in drought-prone areas throughout the country. The area under sweet potatoes is also increasing. The use of purchased agricultural inputs, (improved seeds, fertilizers and pesticides) is limited to a small number of modern farm enterprises growing cash crops and vegetables and to out-growers of tobacco and cotton, producing crops on contract. The yields of cereals in the peasant sector are generally low, and losses in the field and stores are high.

3.2. Major crops, Livestock and Fisheries: The production of food crops is mostly allocated to maize and cassava. The yields for maize are very low at around one ton per hectare. Cassava is grown by small scale holders, and sometime the record of output are not known given consumption as well as timing of planting and harvesting. Other food crops include rice, millet and sorghum. Their yields are even lower than those for maize. Maize takes up most of agricultural cultivation area. Cassava uses about half as much land as maize. The total land area for maize and cassava is about two thirds of the total arable land. Peanut cultivation area is half of cassava, which is followed by sorghum, cowpea, and rice. The government has defined sugar as a priority agricultural commodity, along with cashews, citrus, cotton, tea, tobacco, timber and copra. .Mozambique has the potential for development of the horticulture sector, especially in the central region, there are opportunities to cultivate high-value vegetable crops and flowers for export to Europe. Zimbabwe farmers are already investing in Mozambique because of the political situation in their own country. The public sector can support such endeavors to develop the quality standards required for higher income markets.

Important subsectors are: Sugar, fruit and vegetable processing, edible oil, milk and dairy products, grain milling, cashew nut, intensive poultry production. Agro-processing units

predominantly geographically located as follows: maize (Maputo, Nampula and Sofala), sugar (Maputo and Sofala), cotton (Nampula, Zambezia, and Cabo Delgado), cashew (Nampula, Gaza/Inhambabe and Maputo), and Tea (Zambezia). Some important agro-processing firms are: Companhia Industrial DaMatola (CIM) (largest agro-processing firm), Mozfoods SA (seeds), Parmalat Productos Alimentares SARL (dairy products), GrupoMadal SARL (coconut oil), Riz Industria Limitada (biscuits), Nguluzane Agro-pecuaria Ltd. and Empresa Orizicola de Zambezia (EOZ) (rice). However in agro-processing, meeting modern food hygiene standards requires relatively expensive processing machinery and environmental conditions which remains constraint in Mozambique.

The use of modern technologies and irrigation facilities is limited to a small number of commercial farms growing cash crops and vegetables and to out-growers of tobacco and cotton-producing crops on contract. Agricultural inputs such as tractors, ploughs, fertilizers, pesticides and other inputs are low and the irrigated area is limited to larger farms in the lowlands. Average crop yields are about half of the regional standard estimates indicating huge scope for improvement.

Animal husbandry is an underdeveloped sector. Cattle, goats, sheep and pigs are reared in extensive grass-based (ruminants) or back-yard scavenger systems. There is also a small fast-growing modern poultry industry. In 2009, livestock accounted for 1.2 million of head of cattle, 4.5 million sheep and goats, 1.3 million pigs, and 18 million poultry. Beef production was estimated at 22,000 tons; pig meat- 91,000 tons; poultry meat-22000 tons; cow's milk-75000 tons and hen eggs-14 million. The high prevalence of disease is the main constraint undermining an increase in livestock numbers. For example, Newcastle disease is a major ubiquitous problem for poultry, in the northern provinces tsetse flies affect cattle and African swine fever affects pigs. The southern region is the heart of livestock activities because animals there are less prone to diseases. At household level, pigs and poultry are kept mainly under back-yard. There is a fast-growing modern poultry industry which has almost replaced the importation of chicken from Brazil

In the fisheries sub-sector, some 1500 species are believed to live in the Mozambican seawaters, of which 400 are of commercial importance. In 2008, captures of fishery and aquaculture production totaled 120000 tons. The potential catch is estimated at 500000 tons of fish. South African trawlers are allowed to fish in Mozambican waters in return for providing a

portion of their catch to Mozambique. The European Community, Italy, and Japan have each entered into agreements designed to help develop the fishing industry.

4. Agroclimatic Zones: The most fertile areas are in the northern and central provinces. Annual rainfall in the north ranges from 1,000 to 1,800 mm. The overwhelming part of agricultural production takes place in the north. Farmers in this region use a combination of food and cash crops — cassava and maize are the most important food crops, followed by rice, sorghum, beans, and sweet potatoes. Important cash crops are cotton, cashew, and groundnut.

The central region also has good potential for agriculture with good soils and annual rainfall ranging between 1,000 and 1,200 mm. In central Mozambique, cassava, maize, and sweet potatoes are the most important food crops, followed by beans, sorghum, millet, and rice. The central region is also an important producer of several horticultural products, as well as coconuts, principally in the coastal areas. Important cash crops in central Mozambique, although produced in much lesser quantities than in the north, include cotton, groundnuts, and some cashew.

The southern region is drier with sandy, infertile soils, and a higher risk of drought losses. Total agricultural output from the southern region, compared to the central and northern regions, is relatively low. The main crop is cassava, followed in very low quantities by maize, rice, groundnuts, sweet potatoes, and cashew. In the southern provinces, cassava and maize are still the most important crops in terms of land area, even though maize yields are lower and the agro ecological conditions are not conducive to grow maize. The southern region is also the heart of Mozambique's livestock activities because animals there are less prone to diseases.

4.1. Relevance of extension: Rural extension significantly affects rural crop production. Agricultural extension in Mozambique is primarily benefiting the rural poor. Another interesting finding is that NGO extension has a slightly higher and more significant impact than public extension services. Public extension, however, is better oriented toward poorer households. Despite very limited coverage — (only about 13 percent or rural households have access to extension services from fewer than 700 public extension workers), research for this strategy reveals a positive impact. A recent study shows a positive and significant impact of agricultural extension on rural livelihoods in Mozambique. The main impact of extension is introduction of new seed varieties, natural pesticides, and soil conservation and crop commercialization techniques. Expansion of natural resource extraction is a coping strategy for lack of alternative income in rural Mozambique. To a lesser extent, trade of farm and non-farm goods and processing

activities are also common. Natural resource activities are mainly related to handicrafts, fishing, and collection of firewood and charcoal.

5. Agriculture policies/ Frameworks in Mozambique

Agricultural policy in Mozambique focuses on executing the country's poverty reduction plan (PARPA II). The overall aim of this policy is to strengthen governance, improve human capital and enhance economic growth through integrating the agriculture sector and the rural economy with the national and world economy. Government support to the agricultural sector have been focusing on on three main strategies, the green revolution (2007), the food production action plan (PAPA, 2008-2011) and the strategic plan for development of the Agricultural Sector (PEDSA, 2009-2019). The green revolution strategy and the action plan had aimed to increase agricultural production by focusing on increasing agricultural productivity. These initiatives are believed to have led to increased investment in the sector enhancing domestic production of main food staples, market integration between regions and agricultural value chains which has reduced the country's reliance on imported food commodities. Presently, under the PAPA's strategy one of the objectives is to enhance the country's storage capacity, which is cited as a key obstacle preventing small scale farmers participating in the commercial maize market as well as restricting an increase in inter-regional trade. The national capacity (silos and warehouses) both private and public is estimated at 560 735 tonnes, however, there is still a need for the construction of small scale rural silos to incorporate farmers into market system, in addition this will allow farmers to store maize until prices rise. Mozambique approved biofuel policy in 2009 (CEPAGRI, 2011). Sugar cane and sweet sorghum are the major crops which are earmarked for ethanol production. A land of approximately 50 000 ha has been allocated for these crops. Approximately $700 million was invested in this project (CEPAGRI, 2011).

A two-pronged strategy is required in the agriculture sector to promote growth in the rural sector. Given the subsistence nature of smallholder agriculture and emerging out-grower schemes, two elements are required. For the smallholder whose efforts produce food grains and other products for the domestic market, enhancing productivity is critical. For the growing number of smallholders who participate in out-grower schemes, strengthening their power to bargain for better farm-gate prices and improve industries that add value are essential.

The key policy and strategy documents on which the government depended were- : the Government Five-Year Programme (PQG, 2011-2014) and the Action Plan for the Reduction of

Poverty (2011-2014). The primary objective of the PQG **was** the fight against poverty by improving the living conditions of Mozambicans through inclusive and sustainable socio-economic growth. Critical for the development of the agricultural sector is the government focus on the development of basic infrastructure, the creation of employment opportunities and the promotion of a business environment that enables private investment and private sector development.

In addition to the PQG, the government had the Action Plan for the Reduction of Poverty (PARP) 2011-2014, with medium-term strategy to fight poverty in the country. This strategy operationalizes the recommendations of the PQG concerning actions against poverty. The general objective of the PARP is to fight poverty and promote a work ethics. Being of particular interest for the development of the agricultural sector, the poverty reduction strategy had focuses on three key objectives: (i) increase in production and productivity of agriculture and fishery; (ii) the promotion of employment; and (iii) human and social development.8 adding to these objectives were the support pillars on (a) good governance, and (b) macroeconomics. The PARP is a key link in the National Planning System (SNP) and is aligned with other important documents, such as Agenda 2025, with which it contribute to achieving the Millennium Development Goals (MDG). The financial allocations for the PARP are reflected in the Medium Term Fiscal Framework 2010-2014 (CFMP) and operationalized through the Economic and Social Plan (PES) and the State Budget (OE).

The planning and coordination instruments of the government for agricultural sector issues are based on a political-legislative framework with a series of policies and strategies, standing out among which are the Agricultural Policy and Implementation Strategy (PAEI), the Strategic Plan for the Development of the Agricultural Sector 2011-2015 (PEDSA), the Fishery Policy and Implementation Strategy (PPEI), the Fishery Master Plan 2010-2019 (PDP), the Development Plan for Small Scale Aquaculture 2009-2013 (PDAPQ), the Rural Development Strategy (EDR), the Food and Nutritional Security Strategy II (ESAN II, 2008-2015), the Multisectoral Action Plan for the Reduction of Chronic Malnutrition in Mozambique (PAMRDC) 2011-2020, the National Programme for the Strengthening of Commodities (2011-2016), and the Green Revolution Strategy (ERV).

The vision established for Mozambique for its agricultural sector in the medium / long run is the development of "a prosperous, competitive, equitable and sustainable agricultural

sector" whose main objective is "... to contribute to food security, income and profitability of agricultural producers and to a rapid, competitive and sustainable increase in market oriented agricultural production" based on 3 priorities, namely food and nutritional security, competitiveness of domestic production and higher income levels of producers, and the sustainable use of natural resources and environmental conservation. The vision is based on 4 strategic pillars, namely: (i) Agricultural Productivity and nutrition - referring to the increase in productivity, production and competitiveness in agriculture in particular in nutritious food value chains in order for it to contribute to a proper diet; (ii) Market Access – through improving services and infrastructure for better market access and making the guiding framework of the agricultural sector conducive to agricultural investment; (iii) Natural Resources, referring to sustainable use and the integral exploitation of land, water, forest and wildlife resources; and (iv) Institutions - by strengthening agricultural organizations and institutions.

Under the above stated vision, the target groups of the plan of ***Mozambique are small, medium and large producers with the potential to produce for the market, and small and medium-sized enterprises (SMEs) that market agricultural inputs and/or technologies. Five specific strategic objectives have been established to this end: (i) increasing food production (including decreasing post-harvest losses) and the nutritional quality of foods; (ii) increasing market-oriented production with particular attention to the marketing of nutritious foods; (iii) improving the competitiveness of agricultural and fish producers; (iv) sustainable use of soils, water and forests; and (v) development of the institutional capacity of the agricultural and fishing sector.***

The implementation approach is based on the concept of value chain, so it is important to take into account actions related to: (a) the generation and transfer of technology and the provision of agricultural inputs; (b) agricultural and fishing production; (c) processing and marketing activities that add value to agricultural, livestock, fishery, forestry and wildlife products; and (d) the sustainable management of natural resources.

6. Constraints / Challenges of Agricultural Development

In Mozambique, most of the constraints facing the agricultural sector are of a structural nature and they are fundamental in overcoming the challenges of poverty and growth. These constraints concern the lack of basic services that allow the producer to make the best use of the relative abundance of the country's natural resource base. . The long years of conflict in the

country had destroyed the basic infrastructure and institutions that were created during the colonial period. Rebuilding roads and bridges is now a priority and a necessary condition for any growth in the agriculture sector. The vast terrain and scattered and sparse population makes it all the more critical to ensure rural connectivity. Currently, the Ministry of Agriculture formulates policies and regulations, and the private sector supplies inputs and markets.

1. **Low Agricultural Productivity and low nutritional value of crops**

The biggest concern is raising productivity and production and distribution of food and other agricultural products. The **main challenges are the difficulties in increasing the use of inputs and modern technology, the limited availability of technical advice and support services in the sector and producers being spread out over wide areas separated by poor communication and transport networks.** Despite efforts by the government and donors who support the sector to diversify crop production and promote the use of modern inputs in order to increase yields and farmer income, there is still long way to go. **According to the CAP 2010, only 4% of the producers used fertilizers and only 7% use any pesticides. As a result the currently all the major crops are with very low level productivity (average yield of, for example, maize is 0,9 ton/ha, sorghum yields 0,6 ton/ha, and rice about 1,0 ton/ha,) .**

2. The poor coverage and quality of the public extension and agricultural research network are other major constraints for increasing agricultural production and productivity. The public extension services cover the country's 128 districts and 13 cities. To cover these much area there are only 872 extension agents and technicians. Reports show that they are able to reach and serve a mere 11% of all farming families. Though these services are responsible for disseminating information on technology, particularly in the household sector, which accounts for the bulk of food production, they are unable to perform effectively in the poor strength; Moreover the extension services can only be effective in their mission if the current research system is able to meet the demand for innovation and adaptation required to achieve the objectives of increasing production and productivity. The public agricultural research system in Mozambique employs a total of 1087 people, only 16.7% of whom are researchers, and only 10.4% of these have a PhD. Most researchers work at the Directorates of Agriculture and Natural Resources (DARN); Animal Sciences (DCA), Training, Documentation and Technology Transfer (DFDTT) and in the Zonal Centers Center (CZC), South (CZS) and Northeast (CZN). A major issue for many public sector entities is the lack of trained personnel. Colonial Mozambique did not train an adequate number

of people and after the war many who were trained left the country. Today this deficit is a major constraint so that the country continues to rely on outside technical assistance. Public sector activities such as research and extension services must be demand-driven and reach out effectively to farmers. Given that most farmers are women, extension staff should reach out to this group and ensure that appropriate technology is gender-oriented.

3. Lack of food and nutritional policy-A food security with nutritional policy be introduced in the country with focus on the crops and cropping pattern required for alleviating the nutritional maladies. Even if productivity and production are increased, malnutrition and stunting will remain serious, if a more diverse portfolio of crops is not cultivated in all regions and if more diverse diets are not promoted and adopted at large scale. According to the Food and Agriculture Organization (FAO), the food supply in Mozambique has "dramatically low" levels of micronutrient rich food. Despite strong government commitment to increasing national nutritional standards, the Global Food Safety Index rates Mozambique 5.8 on a scale of 100 for the availability of iron and vitamin A in the food supply with the world average of 53.7 This situation can be attributed to production practices leading to a standard diet that is overwhelmingly dependent on high-starch, low micro-nutrient staple foods – maize, cassava and rice – and which is lacking in protein and nutritious fruits (except in season) and vegetables. This issue is closely related to both production (smallholders must be supported to cultivate a wide variety of nutritious foods) and to research: biofortified varieties of staple foods must be introduced and widely disseminated. For example, cassava varieties with higher levels of beta-carotene, which the body converts to vitamin A, as well as iron and protein, have been developed in Nigeria and Kenya.

4. **Poor Market Access and Infrastructure -** The factors contributing to the poor use of improved inputs are its availability and high acquisition and transaction costs. Access to the market, both of inputs as well as of products is particularly constrained by the poor quality and sometimes by the absence of: (i) **rural financial services; (ii) rural roads connecting consumer markets to production centers; (iii) agricultural information systems**. What is needed is coordination of ongoing efforts to improve transport infrastructure, to foster market linkages, to control inflation and exchange rates, to liberalize prices and to reduce import tariffs of inputs, without which any intervention aimed at increasing productivity and encouraging the adoption of technology and return on investments will be difficult.

A two-pronged strategy is required in the agriculture sector to promote growth in the rural sector. Given the subsistence nature of smallholder agriculture and emerging out-grower schemes, two elements are required. For the smallholder whose efforts produce food grains and other products for the domestic market, enhancing productivity is critical. For the growing number of smallholders who participate in out-grower schemes, strengthening their power to bargain for better farm-gate prices and improve industries that add value are essential

The role of the state is to ensure the **transparent functioning of rural markets through the provision of information on opportunities and quality standards**; with policies that encourage the development of markets for products with a high commercial value; and strengthens the functioning of markets for tradable inputs. So that the **private sector also will respond with the necessary investments in storage and processing infrastructure necessary to add value to products, in particular of products from small producers organized in groups.**

The cash crop sector, already an important source of income growth, has substantial potential. Depending on the crop, there is a need to develop expertise and mechanisms to balance the interests of out-growers, companies, and the institutional environment. For example, out-growers need fair prices, companies do not want to be undermined by side-selling, and both groups need the results of research and extension to keep a competitive edge.

Farmers need to organize into producer organizations so that they have the power to negotiate with companies. Companies need to feel the confidence to invest, and it is important that competitors with very short-term agendas do not undermine their efforts. Side selling is a major issue, and building a long-term relationship will need additional efforts.

5. Developing Infrastructure and restoration of facilities after disasters

Part of the food insecurity in Mozambique results from sporadic food shortages **caused by natural disasters.** The latest and largest natural disaster with dramatic effects on the food security situation occurred in 2000. **Torrential rains and cyclones cause severe flooding in the provinces of Maputo, Gaza, Inhambane, Sofala and Manica, causing devastation. Apart from the displaced people and extensive material damage caused to public infrastructure such as schools, hospitals, water supply and electricity systems, road networks, railways and telecommunications, damages include the loss of crops, particularly perishable nutrient-dense food crops and livestock/livestock products. The period of flooding was then followed**

by two years of drought that affected a significant part of crops, thus leaving many families facing severe food shortages.

6**. HIV/AIDS and Health care**

The effects of food insecurity are even more severe when many families in the country are weakened by diseases such as HIV/AIDS and malaria. These families lack manpower at crucial moments of agricultural activity, such as sowing, weeding and harvesting, and this has an adverse impact on cultivated acreage and yields. These families also suffer from malnutrition. Their nutritional state is poor and the lack of production that can be sold means there is no money available for health care. The low agricultural yields associated with little of modern inputs such as fertilizers and improved seeds, and the lack of proper water management also contribute to chronic food insecurity. In addition the poor quality of rural roads means that it becomes difficult for traders from other areas to effectively address food shortages. 8. Malnutrition, however, is not limited to the food-insecure, the sick, or those affected by natural disasters, though these factors contribute to its extremely high prevalence. Chronic malnutrition affects half of all children and almost half of all adults, and has not shifted in recent years despite improvements in poverty levels. **Three-fourths of children and half of mothers suffer from anemia or low iron in their blood, and 43% of Mozambican children are stunted. The main cause is a non-diverse diet lacking protein and micronutrients, which is exacerbated by intake, high levels of infection and premature pregnancies.** Malaria and gastrointestinal parasites affect half of the population. Half of the women who are attended in antenatal clinics have sexually transmitted diseases while half of those pregnant are still children. Only 40 percent of children under six months of age are exclusively breastfed. **The underlying causes of malnutrition are due to limited access to and use of nutritious foods, poverty and inadequate practices in the care of adolescent girls, mothers and children, as well as insufficient access to health, water and sanitation services. Further exacerbating factors are the low level of general and nutritional education and gender inequality (the latter being responsible for premature marriages and pregnancies).**

7. Lack of Women Inclusive Agriculture Development: The SOFA Report of FAO (2011) had reported the major problems of lack of women inclusive farmer support –services and technologies in African countries including Mozambique. In the country these emerge as serious issues with respect to the observations on the increased dependence of the farming households on women and family labor. This in turn demand the extension and research of agricultural systems sector to

be gender sensitized and to introduce agricultural policies which are women inclusive. Priority need to be introduced on research agenda for evolving and or adapting and popularising technologies which are women friendly from elsewhere. The farmer support services- credit, insurance, co-operatives, marketing agencies etc need to be evolved as women inclusive .Focus is needed to introduce women empowerment programmaes in agriculture with best practices of poverty alleviation programmes from other countries (eg.SERP(AP)/ Kudumbashree (Kerala) experiences of India)

8. Dominance of food sector- .The food crop sector currently dominates and will continue for years in the future. Production and productivity increases are required through the use of improved seeds and other inputs such as fertilizer and irrigation. Cashew, an important smallholder cash crop, needs to be revitalized. Given the age and diseased nature of most trees, structural characteristics of domestic and foreign markets, and the past controversial liberalization, experience should be reviewed. Replanting is important and farmers need the power to negotiate prices with processors and export marketers.

9. Smallholders have limited access to capital, and are with little schooling, Together sufficient supply of best quality inputs, **effective technology training, credit and insurance programmes are to be in place to reduce the risks.** Majority of the farmers are at the mercy of highly variable rainfall, and suffer seasonal price risks. Hence the farmers typically use little or no purchased inputs.

10. Lack of use of machine power is a major constraint not only in crop production, but also post production phase, especially in value addition. However in **agro-processing, meeting modern food hygiene standards requires relatively expensive processing machinery and skill among the users remain constraints to be overcome in Mozambique**. Lack of Warehousing and cold storage facilities are contributing to loss of whatever being produced as well.

6. 1 From the Suggestions of the IARI Team, India Suggestions

A team of IARI Scientists had recently visted Mozambique (during March, 2016) and the team had identified based on their discussions and consultations with stakeholders and field visits following areas for cooperation between India and Mozambique:

1. Increasing Productivity and Production

- Utilization of arable land: Major part of the good land can be put under cultivation by (i) motivating the farmers for cultivation of crops through awareness creation and, (ii) through

Contract Farming by encouraging private partnership in development and/or government to government cooperation in production and marketing.

- Input Management: Seeds, fertilizers and pesticides are the basic inputs and making them available of right type at right time for right place is critical. For this,
  - Identification of suitable crop and varieties
  - Exchange of germplasm of rice, maize, millets, sugarcane, sesame, sunflower, beans, mango, banana, cassava, coconut, oil palm, fruits & vegetables. Some high yielding Indian crop varieties may perform well in Mozambique which may be tested and popularized.
  - Soil test based fertilizer application and popularization of soil testing kit developed by India.
  - Availability of fertilizer and pesticides, their quality, and credit mechanism for facilitating their purchase.
- Improvement of the existing cropping systems to increase cropping intensity for higher productivity and income.
- India may help Mozambique in strengthening their R&D through short /long term trainings in identified areas, development and execution of joint research projects with India, Mozambique or third party financial support in improvement, production and post harvest technology and marketing of products in crops, livestock and fisheries sectors. This will help in their infrastructure and manpower development and, will provide them long term benefits.
- India may support mechanization of agricultural operations: use of farm implements such as tractors, combined harvesters, threshers, farm implements etc. may be increased and the seed processing units may be utilized. Mozambique has developed Machinery Banks/ Centers at a few places where the machine or equipment can be hired on payment of nominal amount (pay by use system). Such Centers may be replicated at district level in Mozambique and India may extend help in such effort by exporting the machinery and implements and providing training on their efficient use, operation and maintenance.

- Production of tissue culture raised planting material of banana and tuber crops for improving productivity and quality.
- Mozambique has long coastal belt and India may help in development of rice-fish cultivation.
- In the livestock sector, India may help through knowledge exchange in improvement of breeds of cattle and poultry, health management, poultry and goatary development, feed supplementation and management, milk and meat production, and processing and marketing.
- India may share its rich experience in fisheries sector particularly in feed formulation, health management, fish processing, quality, value addition and marketing.

2. **Human Resource Development for Sustainable Development and Posterity**
   - Under India- Africa Forum Summit, India is offering fellowships for African national for pursuing master and doctoral level degree programmes in Agriculture in India. Mozambique may use them.
   - India with its strong network of agricultural universities, may help universities in Mozambique to develop educational programmes in crop improvement including molecular biology, agricultural extension and others wherein besides curriculum development, infrastructure and manpower support (on contractual basis) may be extended. Some post-graduate degree courses may be started in joint degree mode wherein the course work is taken in an Indian university and the thesis work in the home country, on topic of local relevance with student's supervisor being both from India and Mozambique. Some courses may also be taken up in distant mode of education. For such arrangements, universities in both countries may sign an agreement.
   - India can extend technical support through workshops, customized trainings and exchange of experts in the areas of seed and planting material production, production technology, integrated pest management, soil and water management, resource conservation technology, mechanization, protected cultivation, micro-irrigation, organic farming in crops including horticultural crops; breed improvement, health and feed management in poultry, livestock and fisheries, and post harvest management and value chain development in crops, livestock and fisheries sectors.
3. **Increasing Profitability from Agriculture**
   - India's experience in marketing of agricultural products and policy prescriptions etc. may be shared with Mozambique.
   - India has rich experience in processing and value addition of several crop, animal and fisheries products like in maize, sugarcane, cotton, fruits and vegetables, milk, meat, fish and others which may shared.
   - Activities like mushroom cultivation, beekeeping, handicrafts development, floriculture, medicinal and aromatic plants etc. may be promoted.
4. **Strengthening Technology Transfer**
   - India's rich experience of creation of awareness about the benefits of using improved materials and methods in crops, livestock and fisheries sectors and their demonstration through peoples participation may be shared with the policy planners, scientists and farmers of Mozambique through print and electronic media.
   - Under the India-Africa Forum Summit, India is to help establishment of eight units (one in each of eight RECs) each in Africa of (i) Farm Science Centre, (ii) Soil, Water & Tissue Testing Laboratory and (iii) Agriculture Seed Production-cum- Demonstration Centre. Some African countries have expressed interest and the process to establish is in progress. Mozambique may take the opportunity and provide land for establishment.
   - A Model farm in the Agricultural University at Maputo or at any other agricultural farm (government or private) may be developed. This may be a state of art model farm having all

components of improved crop production and animal husbandry in integrated manner at a single place for demonstration and training. This will serve as a knowledge centre for the stakeholders.

- A Comprehensive Irrigated Agricultural Development Project for Messalo Flood Plain in Muidumbe and Macomia Districts of Cabo Delgado Province, covering the fertile 25,000 ha of alluvial plain lying 30 km upstream the river mouth, with the budget estimate of USD 387.86 million is developed by the Government of Mozambique. The Project is to directly benefit about of 56,000 people in the Project area and indirectly more than 97,000 remaining population of the two districts. This project is well conceived but requires feasibility study and a detailed study of how the sustainable agricultural development and the socio-economic upliftment will take place in the command area.
- Training of officials and scientists in management of irrigation system and enhancing water use efficiency, aspects of production and management of crops, livestock and fisheries and extension systems may be conducted.
- Trainers training in the fields of irrigation, input management, integrated farming system, organic farming, integrated pest management, fertilizers quality control, post harvest technology, agro-forestry, animal husbandry, poultry, fisheries and aquaculture etc.
- Technology for making the supplementary feed block for cattle may be shared and some units may be established in PPP mode.
- For cattle breed improvement, artificial insemination programme may be undertaken.
- Relevant literature on technologies, package of practices and input and health management for important crops, livestock and fisheries may be developed in regional language for dissemination among farmers.
- Farmers' exposure visits from Mozambique to India may be taken up.

7. TRAINING PRIORITIES

Against the background detailed in the previous sessions, the objective of the present exercise is to sketch a demand analysis of capacity development and set training priorities required in the agriculture sector of Mozambique. The general training priorities are enlisted in view of the needs and challenges existing cutting across agriculture – for crops,, livestock and fisheries . Hence specific list of training priorities may be drawn specific to each sector in a participatory mode with local stakeholders.

1. In the context of the extremely poor level of input use leading to low productivity of the agricultural sector , it is important to pinpoint the thrust required on **capacity building for sustainable agricultural development**. Though the country is identified as one with poor level of external inputs, from the bitter experiences of intensive chemical input based farming in other

developing countries it is important focus should be on integrated nutrient management and pest management wherein the best practices of sustainable agricultural development models from elsewhere are adopted. (i) With this goal, the farmers, are to be trained, through cascade mode of training – training of trainers to extension development agencies/ field functionaries, farmer groups and or individual farmers. The training of the input agencies in this context is also important wherein the DESI programme of MANAGE deserves special mention.

(ii) In this context, training the research system for participatory technology development with focus on sustainable agricultural development requires special mention here.

2. Capacity development for taking up **the advanced methods of production of quality seed and planting material production – including bio technology** is to be focused among the related systems. This in turn demands building capacity in the research, extension systems and private agencies/ farmer groups to take up seed and agricultural nursery units. Locally compatible farm input production also requires awareness and skill building at various levels

3. **Capacity development for effective crop management, irrigated farming and compatible crop pattern for nutritional security** is another focus required training of trainers, field functionaries and farmers

4. To improve the use level of machine power in farming demands availability of appropriate machines/ farm implements in sufficient numbers along **with skill training in using the machines. Along with popularisation of tools among farmers, for popularising machinery use it is important that skill building among farmer groups is promoted and custom hiring centres are set up at grassroots. Community polytechnics be established trained technicians and skilled youth. It's important women inclusive skill building programmes be introduced with focus on women friendly technologies.**

5. Awareness programme on crops **to be grown / food items / dietary pattern required nutritional security is another area on which sufficient focus is required for capacity building and training.** The importance vegetables and green leafy vegetables are to be populraised through kitchen garden promotion and awareness classes at grassroots among women groups.

6. Setting up federated and regulated markets, market intelligence, training **on ICT for using market intelligence and other farm services** is another area of capacity building required through cascade mode to grassroots.

7. Financial inclusion, credit accessibility and financial literacy are three other essential factors for profitable farming. Here account keeping is to be promoted among the farmers and farmer groups through training. The accessibility of insurance is also to promoted in same line for reducing the risk and increasing compensations in uncertainties. The field functionaries and farmer groups need training on these aspects.

8. The technical know- how and infrastructure development needed for improving volume and quality in, post harvest handling , produce transportation , storage, harvesting, grading, packaging, processing, in turn knowledge and skill on **technical know- how and local skill among technicians and users of the facilities to be built/ improved** along with accessibility of machineries/ other physical structures.

9. Awareness and model promotion on formation and setting up of farmer collectives, Producer companies, Self Help Groups, Joint liability groups is another area of capacity building

10. The gender perspectives needed in **agricultural education, research and extension demands capacity building and cascade mode of training from policy makers to grass roots.**

11. Training for **Preparedness and Mitigation of Natural Disasters** in the context of agricultural development cannot exaggerated. Hence training on disaster management is another area priority

12. **Healh care and the social security** system to be established in the agricultural sector prevention, and rehabilitation of HIV affected farm families through appropriate technologies and enterprise need special mention in the context of Mozambique.

13. Awareness campaign among Smallholders on quality inputs, **effective technology training, credit and insurance programmes are to be in place to reduce the risks.** Majority of the farmers are at the mercy of highly variable rainfall, and suffer seasonal price risks. Hence the farmers typically use little or no purchased inputs.

14..Lack of use of machine power is a major constraint not only in crop production, but also in post production phase , especially in value addition . However in **agro-processing, meeting modern food hygiene standards requires relatively expensive processing machinery and skill among the users remain constraints to be overcome in Mozambique**. Lack of warehousing and cold storage facilities are contributing to loss of whatever being produced as well.

Farm level value addition and processing can increase profitability and reduce the wastage of produces. Training on advanced technologies of food processing and value addition is to be planned for the country among individual farmers, women groups and private sector with the focus on food security and nutrition security.

15. Training on entrepreneurship development among the youth and women for taking up farming based enterprises, cluster based agribusiness is another priority required in Mozambique.

16. Since large number of NGO/ private agencies are involved in the agricultural development undertakings in the country, successful models of PPP mode of agricultural development initiatives where in the local people, local governments, private agencies can be parties.

17. Adaptive trials of new crops and new varieties of crops suitable required for improving food security through the nutritional security in the country be planned and implemented with capacity building among research and field functionaries.

18. Climate change mitigation is another priority that is to be planned for the country with focus on the existing and emerging constraints of agricultural development of the Mozambique

Training programmes may be imparted through cascade mode of training for faster reach wherever required. Exposure and apprentice trainings be adopted for skill development among master trainers from identified host countries / institutions.

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