

**Smallholder Agricultural Intensification
in Africa -**
– Mozambique Micro Study Report –
– AFRINT -

Undertaken by:

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1 INTRODUCTION

Mozambique is a less developed country in southern Africa. It is located between the Latitude S 10° 27' South and the Longitude E 30° 12' and 40° 51' of Greenwich. The country is large and possesses a wide range of agro-ecological zones. It covers a total surface of 799 380 km² with an estimated population of about 19 million people, of which about 52% are women (INE 2005)¹.

More than 70% of the country's population lives in rural areas. Agriculture is the most significant livelihood activity to which rural households depend on for income and food security. At an average annual growth rate of about 6 percent, agriculture represents about 70% of national employment, and currently contributes with about 25% of GDP (World Bank, 2005).

Farming systems are mainly agro-forestry and diversified in the northern region where farmers practice shift cultivation of maize, sorghum, millets, cassava and groundnuts as the main food crops. Maize and groundnuts are highly marketable. Tobacco, cashew and cotton are the traditional cash crops. In the central region, maize, beans and cassava are the major food crops, though beans and potatoes are highly marketable. The southern region lacks suitable cropland, which leads farmers to practice extensive agro-pastoral activities. In the section that follows, we provide a brief description of the main features of the sampled geographical area of the Afrint study sites.

2 THE AFRINT HOUSEHOLD SAMPLED GEOGRAPHICAL AREA

According to the Afrint study in other countries, the sample of farmer households for the interview is random and selected from a purposive sample of villages and agro-ecological zones. Thus, the Mozambique study conducted two structured questionnaires complemented with informal interviews to village leaders, administrative post authorities. The informal interviews insights about common constraints on livelihood conditions, market access, land use patterns and availability, rainfall information, state and NGO activities.

¹ <http://www.ine.gov.mz/população/indicadores/pidsp0020>

2.1 Agro-Ecological Zones²

Mozambique's agro-ecology consists of 10 zones from which the Afrint study purposively selected three zones. Table 1 below presents general information on selected agro-ecological areas from which the study draws the farmer households for the formal and informal interviews.

Table 1: *Main Characteristics of Selected Agro-Ecological Regions of Mozambique*

Agro-Ecological Region	Altitude (m)	Rainfall (mm)	Humidity Index ³	Predominant Soils ⁴	Population density
II	0-200	800-1,000	Semi-arid humid, with some spots of sub-humid in the coast	Arenosols, fluvisols, and Manangas	24
IV	200-1,000	1,000-2,000	Sub-humid to semi-arid humid	Ferralsols and luvisols	13
VII	0-200	800-1,200	Semi-arid to humid with spots of sub-humid and an extensive semi-arid and dry area	Lixisols, Leptosols and Arenosols	30

Source: *Adapted from Amane, M (2002) Zonas agro-ecológicas. Censo Agro-Pecuário 1999-0 (CAP), Maputo, Moçambique.*

Below the study provides a synopsis of each agro-ecological zone in terms of general features of the study sites, which is location, soil type, rainfall, and crop and livestock potential, infrastructure availability and constraints to agricultural development.

2.1.1 The Northern Agro-Ecological Area

According to the Mozambique National Mapping System (NMS), the northern area is part of the agro-ecological zone VII. The latter covers the mid-highland areas of Zambézia province, as well as Nampula, Tete, Cabo Delgado, and Niassa. This is

² For the purpose of this study, agro-ecological zones are defined as areas with specific natural characteristics which make them particular for the development of certain agricultural and livestock activities that the development elsewhere would be difficult. (CAP 2000:1).

³ Usually, arid zones have less than 500 mm of rainfall; semi-arid has 500-800 mm; semi-arid and dry 800-1,000; sub-humid 1,000-1,400 mm; humid above 1,400 mm of rainfall.

⁴ This is based on FAO soil classification.

the largest agro-ecological zone in Mozambique. The altitude varies from 200 to 1,000 meters with an average temperature ranging between 20 to 25 degrees centigrade. There are areas with temperatures above 25 degrees. Rainfall index varies between 1,000 to 1,400 mm, and most of the rains falling between March and April. The most dominant soils are ferralsols and luvisols.

The Afrint study selected only areas in Nampula and Zambézia provinces and those are in the districts of Murrupula, and Gilé, respectively. The region's topography is almost plane and lightly undulated which gives to it a great potential for production of various crops. The most important crop cultivated in the region is manioc/cassava, followed by maize, peanuts, beans, sorghum, *millet*, sunflower, horticulture and fruits. Tobacco and cotton, sunflower and sesame are the traditional cash crops. A limited number of big companies are involved in cattle raising under great sanitary care measures due to the tsetse flies.

The northern area is within the Nacala Development Corridor, a major development undertaking, but yet to promote agriculture. Only recently, some investments from the CDN⁵ partnered with CFM⁶ have taken initiatives towards exploiting the development potential that the corridor has in the region. As for agriculture, the main constraints to agricultural development are, among others the weak and deficient rural extension network coverage, pricing problems and lack of markets for agricultural outlets.

2.1.2 The Central Agro-Ecological Zone

The central region is in the Agro-ecological Zone IV. The zone includes the majority of Manica and Sofala provinces. The altitude varies from 200 to 1,000 meters. The annual average temperature is 24 degrees with a rainfall index varying from 800 to 1,000mm. The predominant soils in the region are ferralsols and luvisols. The population density is about 13 inhab. /square kilometers. For the Afrint study, we purposively selected the districts of Gondola and Nhamatanda from the Manica and Sofala provinces, respectively.

Most of the region is suitable for agriculture, particularly for crops such as maize, beans, sweet potatoes, bananas, mangos, and paw-paw. Mixed cropping of maize and sorghum characterizes the farming system in this region. Tobacco is the main cash crop. The area is well served in terms of infrastructure, as the Beira development corridor crosses over the region. However, weak rural extension and

⁵ Nacala Development Corridor, SARL – A private company managing the corridor's development.

commercial network, and lack of credit to promote agricultural development are the major constraints to agricultural intensification.

2.1.3 The Southern Agro-Ecological Zone

The southern zone is part of the agro-ecological zone II in the NMS. It covers three provinces, namely Maputo by its coastal districts, some inland districts of Gaza province and almost the entire province of Inhambane up to the Save river. AFRINT areas of interest are located in the inland district of Chibuto in the province of Gaza. This predominantly arenosols area has an altitude that ranges from zero to 200 m, and a rainfall index of 800 to 1,000 mm. Some of the soils are *machongos*, though in areas along the Limpopo and Save rivers and its affluent, soils are fluvisols.

The area's population density is 24 inhab/square kilometers, the second to highest in the country. Rainfall decreases from the coast to inland areas, and November to March are the rainy months, which alternates with drought periods. Average temperatures vary from 22 to 26 degrees Celsius. Mixed cropping often of maize and cowpeas, and cassava and groundnuts dominate the farming system. Livestock is an important activity in the household farming system. Other crops found in the area include sorghum, millet and beans. Sugar cane and cotton may be cultivated for cash purposes. Other agricultural activities include fruit growing with cashew and coconut been the main cash crops.

This area is prone to droughts. According to CAP (2002), the drought and low use of modern inputs and fallow reduce the soil fertility, which all constitute critical constraints to rapid agricultural growth and development in the area. Other constraints include disease spread and lack of pest controls measures in main food and cash crops, as well as lack of improved seeds and credit. In the following section, we present a brief description of selected villages and selected households.

2.2 Selected Villages and Sampled Households

As mentioned above, agro-ecological characteristics guided the purposive selection of the districts to meet Afrint criteria. Thus, the choice felt on medium to low and high agricultural potential districts. Following the country's administrative structure, within each district the research team in consultation with district agricultural extension officials sampled the administrative posts. After explaining

⁶ Mozambique's Railroad Company, EP – A public company focused in providing railways services

the criteria for selection of research sites to the officials, researchers finalized the sample of *aldeias* or *comunidades*. Table 2 presents the distribution of the sampled households interviewed by region and districts.

Table 2: *Distribution of Interviewed Households by Region and by District.*

Districts/Villages		Region			Total	Agricultural Potential
		North	Centre	South		
Murrupula	Naminyalo	40			40	Medium to high areas
	Nacocolo	40			40	
Gilé	Nacuali	40			40	
	Namali	40			40	
Gondola	Bendegar		40		40	Medium to high areas
	3 de Fevereiro		40		40	
Nhamatanda	Bairro 1		27		27	
	Bairro 5		29		29	
	Bairro 8		24		24	
Chibuto	Bairro 2			38	38	Medium to low areas
	Bairro 4			40	40	
Total					398	

Source: Afrint Micro Study Survey, 2005, by EconPolicy Research Group, Ltd.

In all cases, the draw of the sample of households was random from a list in the frame. In order to allow female-headed households into the sample, researchers dropped randomly few male-headed households and replaced them with female-headed households. Female-headed households accounted for about 21% of the whole sample, as shown in Table 3 below.

Table 3 *Regional gender representation in the Afrint study sample, 2005*

Gender of the Head of the Household	Region			All respondents (%)
	Northern	Central	Southern	
	--- % ---			
Male	42.4	43.7	13.9	79.4
Female	31.7	26.8	41.5	20.6
Total				100 (n=398)

Source: Afrint Mozambique survey, 2005

In each of the sampling area, the research team selected 40 families for the household survey and 10 for the reserve list.⁷ In addition, a representative group of

⁷ A total of 400 households were selected. However, the final data set contains only 398 households because at the final cleaning of the data, 2 questionnaires from the southern region were dropped due to bad quality of the responses in critical aspects of the study.

villagers participated in the village diagnostic survey, particularly community leaders.

Three teams administered survey instruments, one each for the northern, central and southern regions.⁸ Prior to the survey, each team received training by going through both household and village level questionnaires. There were seven (7) enumerators in each of the teams. With one exception in the central region, all enumerators were male. Among the seven enumerators, one played the role of supervisor of all field activities, in the absence of the principal researchers. The selected enumerators had prior experience in conducting field surveys.

3 THE AGRICULTURAL INSTITUTIONAL SETTING

Agriculture is critical to poverty reduction in Mozambique. Poverty measures and actions are contained in the first government Poverty Reduction Strategy Paper (PARPA, 2001-2005), now under revision for its second phase. PARPA sets a strategic vision for reducing poverty, and the key strategic actions for implementation. The main objective is to reduce poverty by 50% by the year 2010. To achieve such ambitious goal, PARPA puts an emphasis on factors beyond agriculture as it recognizes that its growth and development depend on factors such as education and training, transport infrastructure and market development (PARPA, 2001).

The organizational structure for the agricultural sector is the *Ministry of Agriculture (MINAG)*, a government organization whose primary responsibility for institutional setting is to conduct analysis, formulate and monitor agricultural and land policies, provide research and extension services, as well as adopts both external and internal mechanisms for regulating and auditing the sector. MINAG basic principles evolve around the empowerment of producers to increase productivity and influencing policy to change the role of public institutions are the principles embedded in the agricultural policy and strategy documents.

MINAG draws on its main policy and strategy document - the *Política Agrária e Estratégias de Implementação (PAEI)* - whose aim is to contribute to Mozambique's development objectives in the areas of food security, sustainable economic development, reduction of unemployment, and poverty reduction. To materialize these objectives MINAG developed in 1998 its *National Agricultural Program (ProAgri)*

⁸ The regions include: (1) the provinces of Nampula and Zambézia in the North; (2) the provinces of Manica and Sofala in the centre; and (3) the province of Gaza in the South.

whose first phase ended in 2004. During this phase, ProAgri laid its institutional foundations. After an evaluation, the government embarked on a new approach for the design and implementation of a second phase of the program (ProAgri II).

As a result, ProAgri II's main objectives included:

- Supporting the family sector in developing agriculture and enhancing their livelihoods;
- Stimulating increased agricultural production, to ensure domestic production to meet basic food needs of all citizens and stimulate the export of the country's main crops; and
- Guaranteeing sustainable natural resource management to bring economic, social and environmental outcomes based on appropriate management and conservation plans, education, information and monitoring systems involving communities, public sector and private sector interests (ProAgri II document, 2004).

Thus, ProAgri comprises a broad framework on how to improve agriculture to play the critical role of providing for the majority of rural households the necessary means to pursue the goal of reducing poverty and food insecurity. As such, it promotes (1) development of input and output markets, (2) rural finance, (3) technology; (4) natural resource management; (5) development of infrastructures to promote rural development; and (6) enabling environment for smallholder and private sector development, all of which the main pillars for agricultural growth and development in Mozambique.

4 SMALLHOLDER AGRICULTURAL INTENSIFICATION: INSIGHTS FROM MOZAMBIQUE'S MICRO-LEVEL DATA

Smallholder farming households dominates the agricultural sector in Mozambique. As Table 4 below shows, nationwide, from 2000 to 2003 the size of the smallholder agricultural sector grew at an average annual rate of about 2.3%. This growth corresponds to an annual average increase of about 11% in cultivated land area. Each farming household cultivates about 1.2 hectares allocated to a range of mostly food crops, and a limited number of cash crops.⁹

⁹ Benfica et al (2005) found that "... over 90% of adult population, both male and female, is engaged in agricultural production" (p. 13) in tobacco and cotton growing areas of the Zambezi valley in Mozambique.

Table 4: Trends in the number of farming units and cultivated land area 2000-03

Survey year	Farms		Cultivated land area	
	(Units)	(%Δ)	(Ha)	(%Δ)
1999-2000	3,064,286	-	3,866,806	
2001-2002	3,127,493	2.02%	4,577,045	15.52%
2002-2003 ¹	3,209,595	2.56%	4,846,404	5.56%

Source: Taken from Mole, P. (2006) “Dynamics in Land Tenure and Use Patterns”. MINAG forthcoming.

Data on gender ownership of land holdings shows that, despite the fact that more male own farms the total number has grown less from 2000-2002, compared to the number of female owned farms. Female owned holdings grew in about 7% annually, whereas male owned holdings grew by less than one percent.

The large or commercial agricultural sector in Mozambique is very small, and limited to a small number of cash crops. This sector has also experienced some growth. With an approximate estimate of 429 farming units in 2000, the commercial sector registered in year 2003 about 600 large agricultural holdings.

There is recognition that with such size of both the smallholder and large agricultural sector, with major focus on subsistence crops the farm sector cannot carry onto the higher levels of income to deviate from the course of poverty and food insecurity. Increased income can come from increased intensification, on selected cash crops¹⁰ that take farmers increasingly linked to markets and improved off-farm employment opportunities for a greater share of household income.

The following sections present insights from the household survey. The objective is to provide a brief description of the key issues relating to agricultural intensification as perceived by smallholder farmers interviewed during the study. The study searches for lack of, or patterns of intensification in the study area based on the analysis of demographics, regional distribution of farming households by reference period, yield levels and technological change through use or lack of use of modern inputs, and irrigation, and marketing.

4.1 DEMOGRAPHICS OF FARMING HOUSEHOLDS

The study stratifies the analysis by time when the household came into existence in relation to the beginning of the structural adjustment program (SAP) in Mozambique. About 1986 Mozambique entered into negotiations with the International Monetary Fund (IMF) and the World Bank for a structural adjustment

¹⁰ In this context, cash crop includes marketable food crops such as maize and rice, and the traditional cash crops such as cotton, cashew, and tobacco, so and so forth.

of its economy. The extent of the civil war that ended in 1992 affected effective implementation of the program in 1987. With the signature of the peace accord in 1992, the country was back on the track seeking to meet the Breton Woods requirements for financial support. The households are stratified according to these periods. Thus we divided the households into groups of those formed before and up to 1986 (pre-SAP), households formed between 1987 and 1992 (SAP - end of the civil war) and from there on to the survey moment (post-SAP).

Table 5: Age distribution of Heads of Households by time period, and region (n=341)

Period when household was formed	Age head of household (Years)	Region			All respondents (%)
		Northern	Central	Southern	
		--- % ---			
Pre-SAP (-1986)	52	37	26	56	36
SAP (1987-1992)	40	16	20	16	17
Post-SAP (1993-)	37	47	54	28	47
Total	43	100	100	100	100
No. of farmers					359

Source: Afrint Mozambique survey, 2005

According to Table 5, the sample contains more post-SAP households and fewer SAP households. Among those formed in the pre-SAP more than half are from the southern region, whereas the majority of the post-SAP households are from the central and northern regions.

4.2 CAPITAL GOODS AND EXPENDITURES

In the following sections, we present data on household capital investments, cash expenses on household items and agricultural activities. We also present a brief note on saving prospects and perception about household quality of life and poverty. This descriptive presentation provides a basis for the productivity and intensification prospects analyses that follow.

4.2.1 Household capital investments

Capital investments most common in the study area include radio, bicycle, and tape recorder. Table 6 shows that, among the goods radios are owned by 65% of the households whereas 44% and 27% of the households owns bicycles and tape recorders, respectively. We note that both radios and bicycles play a crucial role in agricultural marketing activities in rural Mozambique.

Table 6: *Households reporting possession of different goods by type of input and time period (n=359).*

Type of Goods	Time when farm/household was formed			All Sellers
	Pre-Sap (- 1986)	Sap (1987-1992)	Post-Sap (1993-)	
	--- % ---			
Wired electricity	-	-	1	<1
Mobile or stationary phone	8	11	7	8
Water pipe to house	1	-	-	<1
TV-set	2	3	4	3
Radio	63	73	63	65
Tape recorder	18	44	28	27
Bicycle	38	54	45	44
Sewing machine	2	6	2	3
Kerosene stove or other	3	5	6	5
Battery torch	8	10	11	10

Source: *Afrint Mozambique survey, 2005.*

Radios are an important source of agricultural price information, and bicycles are means of transport for accessing input and output markets in areas with limited access by other means of transport due to lack of rural roads. The Ministry of Agriculture runs a national market information system (SIMA). In some provinces, locally produced information disseminated among other means via radio in local languages complements SIMA information. As the data shows, less than a percent of the interviewed households report access to wired electricity (only post-SAP households) and water pipe in the house (only pre-SAP households).

4.2.2 Expenditures

Household expenditures were reported in terms of whether the households had or had not incurred in a given type, the extent that such expenditure entailed cash outlay, or if it were relatively costly or not for two main categories: (1) cash expenses to obtain services of inputs, and land improvement measures, and (2) non-farming expenses including food purchases. The household questionnaire also asked families to indicate among the items within the two categories, which ones were most costly expenditures for the household.

4.2.2.1 Cash expenses

Farmers indicated that among purchased agricultural inputs and services transport, hired labour, machinery or implements for land preparation, pesticides and chemical fertilizers were relatively costly expenditures to farming activities in

rural areas. As Table 7 shows, the majority of the farmers mentioned transport as an important cost to farming. Transport costs increase transaction costs to market for both inputs and produce. High transaction costs result mainly due to poor links between production areas and consumption markets.

Table 7: Households reporting “most significant cost” to agricultural activities, by type of input and time period.

Type of Expense	Time when farm/household was formed			All Sellers (# of respondents)
	Pre-Sap (- 1986)	Sap (1987-1992)	Post-Sap (1993-)	
	--- % ---			
Seeds	5	2	4	4 (337)
Fertilizers	24	21	18	21 (149)
Pesticides	26	21	15	20 (150)
Hired labour	32	32	24	29 (177)
Land rental	4	-	6	4 (154)
Machinery for land preparation	25	21	22	23 (156)
Transport	47	45	47	47 (264)
Land improvement measures	2	3	2	2 (150)

Source: Afrint Mozambique survey, 2005;

Note: In parenthesis is the number of respondents.

Traders often blame on lack of, or bad rural road access that make transport investments and maintenance costly for profitable marketing. Another important cost to farming has been hired labour. Despite the low opportunity cost of labour within rural areas, real wages tend to be high because of migration, which leaves villages without sufficient labour for agricultural activities. Thus, lack of labour is one of the constraints to agricultural activities particularly because of an ageing farming community.

In addition to transport, and hired labour the third most significant costly item is machinery or implements for land preparation. Land preparation can be labour intensive. Land preparation services by tractor or animal traction are in

most parts of the study sites non-existent. Only in the southern parts of Mozambique where there is potential for livestock these services can be found. Unfortunately, this is the region with the least agricultural potential particularly for cereals.

Few farmers use chemical fertilisers and pesticides. Those using these inputs are about 16% of the 3.2 million smallholders (90% of total Mozambique population) involved in cotton and tobacco out growers' schemes in Northern Mozambique (Benfica et al., 2005). Farmers often regard these schemes as charging very high input prices. As the data shows, about 20% of the surveyed farmers indicated that chemical fertilizers and pesticides were a significant cost in farming activities.

Furthermore, only 4% of the households interviewed mentioned seeds as an expensive input. This result reflects the fact that the majority of smallholder farmers do not obtain seed via the market. Those who do, they either obtain it through input trade fairs organized by the government with donor funds or via contract farming with private sector companies. The majority of the households (about 74%) had no cash outlay on seed in the year preceding the survey. The majority of the households in rural areas exchange seed from past harvest among themselves. The results show that such phenomena occur across households by the reference period, and within the same period.

4.2.2.2 Food and housing expenses

Housing costs and food purchases are, among the list of items considered as costly expenditures in the study area. Among the surveyed households, 35% indicated housing as the most costly expenditure in the family. Food items fell second, mentioned by about 30% of the households. The latter reflects the severity of the impact of natural disasters on food security situation. Drought and floods in the country's southern region and the latter in some parts of central Mozambique often force rural households to depend on either food aid or food market purchases as opposed to food self-sufficiency to ensure minimum consumption standards¹¹. With no surprise, only about 6% of the households referred to farm inputs and implements as the most costly expenditures in the household.

¹¹ A considerable number of households purchased agricultural products in the market. The majority purchased rice, beans, vegetables, groundnuts, and bananas. Data indicate that 58.5% of the 359 sampled households purchased rice in the year preceding the study; 52.6% purchased beans; 51.5% purchased vegetables; 50.4% purchased groundnuts; 48.2% purchased bananas; 40.9% purchased sweet potatoes; that 29.8% had purchased Maize; 24.2% purchased cassava; 27.3% purchased Irish potatoes; 19.5% purchased peas; 13.6% purchased sorghum; and 10.1% purchased millet.

Lack of availability and use of modern inputs in rural areas, as well as limited market access due to low rural incomes prevent the vast majority of farmers from taking advantage of potential that these inputs have to increase productivity, and thereby increase incomes to improve access to food and reduce poverty. Other items mentioned as costly expenses to households were medicals (13.4%) transport (10%), and school fees (3.3%).

4.3 INCOME SOURCES

Households derive income from a variety of sources. The household survey investigated all possible sources, paying special attention to agricultural sources. Taking all the households together and ranking the sources by the proportion of households having a given source, by reference period, we found that micro business activities are the major source of income for all household types. As Benfica et al. (1998; and 2005) also found, these micro business activities include mainly trading and processing activities, particularly of food and beverages.

Table 8: *Ranking of sources generating more farmer's income (n=313).*

Type of Source	Crops			
	Pre-SAP	SAP	Post-SAP	All respondents
	--- Ordinal raking ---			
Micro business	1	1	1	1
Sales of food staples	2	2	1	2
Sales of other food crops	3	4	2	3
Sales of non-food cash crops	2	3	4	4
Off-farm income	4	5	3	5
Remittances	3	6	5	6
Others ¹²	5	7	7	7

Source: *Afrint Mozambique survey, 2005;*

Note: *Ranking is ordinal and varies from 1-7 from most to least important source.*

As Table 8 above shows, micro business activities together with sales of staples are the primary source of income for post-SAP households whereas sales of staples and cash crops ranked second by pre-SAP households. The results seem to confirm assertions often made about the lack of off-farm employment opportunities

¹² On average it includes pensions (4%), rent, and interest (1%), large-scale business (1%), and animal sales (1%).

in rural areas. In effect, off-farm employment ranked 4-5th in importance, as a source of household income.

Table 9: *Ranking of agricultural sources generating more farmer's income (n=191).*

Type of Sales	Crops			
	Pre-SAP	SAP	Post-SAP	All respondents
	--- ordinal raking ---			
Food staples	1	2	1	1
Other food crops	3	1	2	2
Non-food cash crops	2	2	3	3
Sales of animals or animal produce	4	3	4	4

Source: *Afrint Mozambique survey, 2005;*

Note: *Ranking is ordinal and varies from 1-4 from most to least important source.*

Within the agricultural sector (Table 9, above), the sales of food crops dominate the ranking. The relative importance of cash crops and animal sales reflects also the characteristics of the agro-ecology in the study area. Crop production is suitable in the northern and central regions whereas livestock dominates the southern farming systems where cyclical dry climatic conditions do not allow profitable crop production.

4.4 QUALITY OF LIFE AND POVERTY

This section seeks to complement evidence presented above on household demographics, investments, expenditures and income. We look at housing characteristics, capacity to borrow resources to cover costly expenditures, and saving ability for future needs. Enumerators' perceptions about each individual household wealth status entered into the analysis.

The study found that mud housing with thatched roof was the most common housing type in rural areas. About 82% of the interviewed households live in mud houses with thatched roofs. Only 11% of the households live in mud house with corrugated iron roof, and as few as 7% have block or brick house or more advanced housing types. The majority of these households (58% of 355 respondents) travels and transports their goods by foot, and another 41% on bicycles. Less than one percent of the households possess a car, and those with a car are older households (from pre- and SAP periods).

According to enumerators' evaluation of household capital and assets, about 46% of the interviewed households are very poor and about 43% classified as below

average wealth. Indeed, the data above does not diverge significantly from national statistics on poverty incidence. Poverty assessments from INE (1997; and 2003) indicated that the overall poverty headcount index decreased from about 69% in 1996/7 to about 54% in 2002-3. Within the same period, rural poverty had declined 16%, about 37% more than the observed reduction in urban areas.¹³

The Afrint survey also found that about 51% of the sampled households were normally unable to save some portion of their income for future needs. However, a significant number did save some of their income. Among these households, those formed during the pre-SAP and SAP periods were more likely to save than post-SAP households were. Thus, time has been a major factor for adjustment to structural changes.

Usually food expenditures absorb most of the household income. In the study area, such expenses fell third as the most costly item in rural household expenditures. This may suggest that households could not rely on rural markets for food. Furthermore, by ranking first housing costs as the most costly expenditure, and with a low proportion of households able to save, it is the case that rural households are investments resources in housing improvements.

4.5 AGRICULTURAL PRODUCTIVITY AND INTENSIFICATION

The sampled households are typically subsistence farmers. These farmers practice shift cultivation, mostly mixed cropping of food staples, and single cropping of cash crops. The main crops produced are often maize, cassava, sorghum, rice, groundnuts and beans. Table 10 shows that overtime the proportion of farmers growing maize and cassava has grown slightly, whereas those growing sorghum and rice have decreased. Disease on cassava root and efforts to combat it explains the significant increase in cassava farming.

Rice imports explain in part the decline in household farming of the crop. In the last decade, national consumption of rice has been around 300 thousand tones per year. Currently, two thirds of rice consumption needs consist of imports. Overall, the trends above seem to suggest that there was some household response to liberalization. Such response varied across household types. In general, the proportion of households cultivating maize and cassava increased, while that of sorghum and rice decreased.

¹³ It was estimated that rural poverty declined from 61.7% to 51.5%, whereas urban poverty reduced from 61.7% to 51.5% in equal period. (World Bank, 2005)

Table 10: *Distribution of farming households by food crop and time period (n=359).*

Food Crop type	Time when farm/household was formed									
	Pre-SAP				SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 -	Present	Outset	Present		
	--- % ---									
Maize	92	90	81	91	84	83	86	89		
Cassava	74	78	67	71	74	80	72	77		
Sorghum	45	35	44	56	42	43	44	42		
Rice	28	12	27	16	16	12	22	13		

Source: *Afrint Mozambique survey, 2005*

However, while the proportion of pre-SAP households cultivating all crops decreased, post-SAP households shifted away from more (maize and rice) to less (cassava) commercial food crops. The shift away from more to less commercial crops depends on the region and type of crops grown. The strongest is in the North where both cassava and maize are the main staple food crops. Since maize is both an export and a locally consumed crop incentives to produce and sell are affected by international prices. Cassava is only for local consumption. The main market is limited to Northern and Central. The main cassava production area is Nampula and Zambézia (a region from which one study site was drawn). When maize prices decline, cassava became relatively more profitable because of lower transport costs and high volume to market. In effect, the shift is correlated with distance to market, a reflection of high transport costs and low prices at the main consumption markets. For instance, groundnuts are highly valued by Maputo consumption markets that are likely to pay a premium. However, maize cannot be shipped to Maputo at a premium. Since, cassava is consumed mainly in Northern markets such as Nampula, relatively lower transaction costs makes it more marketable at local markets than in far most markets.

In effect, with low yields in almost all crops, traditional commercial food crops seems to provide households with a lesser income shield thus forcing them to sell what was more readily available.

4.5.1 Yields

The yield estimates from sampled households are generally low, and below the potential national levels. As Table 11 shows, with the exception of maize, these yield estimates are also below the actual national estimates.

Table 11: *Yields by crop and time period when the household was formed.*

Crops	National yield levels		Study Zone
	Potential	Actual	
	--- tons/ha ---		
Maize	5.0 - 6.5	0.4 - 1.3	0.43 (0.38)
Cassava	5.0 - 10.0	4.0 - 5.0	0.94 (0.79)
Sorghum	0.8 - 2.0	0.3 - 0.6	0.24 (0.21)
Rice	2.5 - 6.0	0.5 - 1.8	0.36 (0.31)

Source: Howard et al (1998) based on MAP (1997), and World Bank (1996) data, and Afrint Mozambique survey, 2005.

Note: In the study zone estimates are means only of those who had grown and harvested a given crop; and in parenthesis are 5% trimmed means.

In assessing yield levels, households indicated whether since they formed their household yields had changed. With respect to maize, about 86 % of the households responded, of which 97 % reported changes in yields. Among those that observed changes in yields, 22% said that maize yields increased overtime. The main reasons for these increases have been the practice of conservation farming/improved tillage (about 58% of the households reported), access to new seed varieties (10%), and mechanized land preparation (2%).

With respect to cassava, 71% of these households responded and about 93% reported had seen changes in cassava yields. Among the latter 43% observed increases in cassava yields, of which about 52% indicated that conservation farming/improved tillage was the main reason for improvement in yields. As for sorghum, about 39% of the households responded, and 95% said that they have noticed yield changes in sorghum. Of the latter 19% indicated increases in sorghum yields, and about 57% of these households indicated conservation farming/improved tillage as the main reason for yield increases. In terms of rice, 20% of the households responded and about 91% have seen yield changes. Of those that noticed changes in yields, 13% reported increases in rice yields, of which 63% mentioned conservation farming/improved tillage, and 18% refer to access to new seed varieties as the main reasons for improved rice yields.

Table 12 shows estimates of yields at the regional level. Yield differences exist and may be significant at this level due to differences in agro-ecological conditions. As mentioned earlier, the level of use of modern inputs at the household level is

very low. As a result, productivity at the farm level is low as well. Agricultural production is dependent on climatic conditions. Only few areas in the southern region are scarcely irrigated. In the Northern and Central regions where agricultural potential is higher, crop production is mainly rain fed.

Table 12: *Yield Distribution by crop and Village in the Afrint Study, 2005*

Crops	Crops			All Study Areas
	North	Central	South	
	--- tons/ha ---			
Maize	0.46 (0.42)	0.39 (0.36)	0.50 (0.39)	0.43 (0.38)
Cassava	0.91 (0.82)	1.09 (0.80)	0.59 (0.55)	0.94 (0.79)
Sorghum	0.26 (0.23)	0.23 (0.20)	-	0.24 (0.21)
Rice	0.42 (0.48)	0.10 (0.09)	-	0.436 (0.31)

Source: *Afrint Mozambique survey, 2005.*

As a result, variations in yields within villages are not significantly different (see Table 44, in Annexes). As we noted before, markets are mainly output markets by few farmers dispersed across villages where marketing is highly influenced by high transaction costs and trader monopsony. Under these conditions, markets are not integrated, resulting in literally no significant variations in farm level yields.

The evidence shows a large number of households reporting changes in yields for the majority of crops. According to these households, the main reasons for the changes have been either conservation farming/improved tillage or access to new seed varieties. Yet, yields remain low and below both the national actual and potential levels. Access to improved research and extension service is required, and indeed needed to maximize the existing potential or at least to bring the current yield levels to the actual national levels in the study sites.

4.5.2 Technological Change

The current yield levels, and the dynamics described above reflect the state of the technological change in the country. Apart from a limited number of cash crops grown by smallholders, there is little use of modern inputs. Thus, looking at technological change in mainly food grain and staple crop production would quickly indicate the low levels of productivity/intensification in Mozambique. Nonetheless, there are efforts underway to rehabilitate rural access roads that would provide an

immense opportunity for farmers to access available technologies to easy constraints in the use of farming resources.

Below we present a brief description of the state of use of modern inputs, and improved techniques by households in search of patterns of technological change in the survey area.

4.5.2.1 Use of modern inputs: Seed and planting material

Use of improved seed and planting material is little. Farmers pointed out that availability of these production factors and low purchasing power are the main reasons for low progress in this area. Despite efforts by the Ministry of Agricultural in distributing inputs initially free of charge, adoption of these modern inputs has not been high, except within the concession system around traditional cash crops such as tobacco and cotton. Despite the country's history in tobacco production, it is only very recently that it plays as critical activity in some areas. Tobacco is an input package that includes seed, fertilizer, and pesticides in some areas. Tobacco cultivation has been so successful that it became the most grown cash crops in the north. Companies involved in tobacco promotion have introduced a package that provides an input use free of charge for the first three year, in addition to joint promotion of tobacco and maize, sesame and beans to enhance farmers' food security.

Table 13: *Distribution of households by period and type of maize seed used (n=298).*

Maize –type of seed	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 - Present	Outset	Present	
	--- % ---							
Traditional	99	97	98	94	96	93	97	95
Improved/OPV	-	1	2	-	-	1	<1	1
Hybrids	1	2	-	6	4	6	2	4
Total	100	100	100	100	100	100	100	100

Source: *Afrint Mozambique survey, 2005*

As Table 13 above shows, the majority of the households in the study area still use traditional maize seed though this has decreased for all household types. The number of households using particularly hybrid maize seed is low though has

increased slightly increased for all types. As noted above, this is an effect of the government attempts to introduce maize intensification through a heavily donor supported through FAO (FAO ITF program) with funds from the South African, UK, and Sweden governments financed an emergency program. Other efforts include the Sasakawa global 2000 and Japanese KRII input programs.

According to the Ministry of Agriculture, cassava productivity seems to have doubled in the last five years (World Bank 2005). The increased yields result from the introduction of improved planting material that yields up to 7 tons per hectare compared to 1 – 2 tons from local varieties. Concerns about the cassava root disease led to a number of NGOs into action by introducing such planting material in the country, particularly in the northern region. These NGOs include Concern and World Vision under their relief and development assistance. However, adoption of improved cassava planting material adoption has not been by all households. As Table 14 suggests, pre- and post SAP households have responded more to the introduction of this material than SAP formed households. Over more than half a decade of experimentation, older households seem to be more responsive to these new technologies, which imply a longer learning curve.

Table 14: *Distribution of Households by period and type of Cassava variety planted (n=248).*

Cassava –variety planted	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 -	Present	Outset	Present
	--- % ---							
Traditional	100	98	100	100	100	99	100	99
Improved	-	2	-	-	-	1	-	1
Total	100	100	100	100	100	100	100	100

Source: *Afrint Mozambique survey, 2005*

Since local planting material is still used, and more by SAP households it seems to be the case that these households are either poorer or more conservative than others are. Field level interviews suggested that though improved and high yielding varieties have contributed to both improved household food security and income, local varieties are still in use because of their resistance to drought.

With respect to sorghum only 3% of pre-SAP households did experiment the use of improved seeds (see in Annexes Table 38), while none of the households did

use improved rice seeds. This is expected since among all cereals more research and extension efforts by both the government and NGOs operating in rural areas did contemplate neither rice nor sorghum as their main food security priority. It was only recently that the government launched a study to design a national rice strategy¹⁴.

4.5.2.2 Use of modern inputs: Fertilisers, pesticides, green and animal manure

Statistics at the national level suggest that very few farmers in limited areas use modern inputs such as chemical fertilisers and pesticides. National agricultural statistics indicate that there was an average increase of about 7% in chemical fertilisers and manure use between 1995 and 2003 (World Bank, 2005). Insights from the Afrint survey provide similar evidence.

Table 15: *Distribution of households reporting use fertilizer on crops by period and (n=359).*

Application of fertilizer on Maize	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 -	Present	Outset	Present
	--- % of those using ---							
Maize	5	-	-	-	1	-	2	-
Sorghum	61	-	57	-	41	-	59	-
Rice	76	-	75	-	87	-	81	-

Source: Afrint Mozambique survey, 2005

In general, with an exception of maize, a large number of households used some chemical fertiliser on sorghum and rice. As Table 15 above shows, recently established households less often use fertilizer on sorghum, while the reverse holds for rice. However, more households did use fertiliser on sorghum and rice than did on maize. As mentioned earlier, chemical fertiliser use is associated to contract farming. Although maize is commonly cultivated in areas where cash crops are cultivated, there is no evidence of joint cultivation of either tobacco or cotton with maize. However, in many concession areas companies have an agreement with the government to promote food crops, but this is neither observed nor enforced. In addition, with an exception of the Northern region where some farmers interviewed grew some tobacco, none of the Afrint study sites had a contract farming company

¹⁴ A research team from Agrifood Consulting International Company conducted the study in 2005 and commissioned by the Cabinet for Promotion of Commercial Agriculture (GAPSCA) of the Ministry of Agriculture and Rural Development.

in operation. These are in part the explanations for the low level of chemical fertiliser use on maize. Table 16 and 17 below present the proportion of households using fertiliser on other food and cash crops, respectively. The responses indicate the general trend that very few households used such inputs.

Table 16: Households reporting use of fertilisers by period and type of Crops (n=359).

Type of crops	Time when farm/household was formed			All respondents
	Pre-Sap	Sap	Post-Sap	
	--- % of those using ---			
Other Food Crops	1	-	-	<1
Cash Crops	-	5	3	2

Source: Afrint Mozambique survey, 2005

Table 17: Households by period and use of pesticides on different types of crops (n=359).

Types of Crops	Time when farm/household was formed			All respondents
	Pre-Sap	Sap	Post-Sap	
	--- % of those using ---			
Other food crops	2	-	1	1
Cash crops	2	5	3	3

Source: Afrint Mozambique survey, 2005

The use of pesticides on crops varies considerably and it depend if the region produces or not cash crops. For instance, in the Zambezi development corridor, where the Zambezi Valley program operates,¹⁵ Benfica et al. (2005) report that about 97% of tobacco growers use pesticides in tobacco farming, and about 2% use these inputs in vegetable crops. However, about 3% of non-tobacco growers use pesticides on vegetables. In cotton growing areas, about 95% of the farmers use pesticides in cotton fields, and slightly less than a percent use it on vegetables.

Our analysis and other research (Benfica et al, 2005; World Bank, 2005; Kyle et al, 2002; and Howard et al, 1998) suggest that intensification has declined overtime. Intensification was region and crop specific and limited to a small number of households. Across household types, younger households were more responsive to intensification on cash crops than older ones. These households took higher risk

¹⁵ Zambezi Valley program is a government-funded program whose objective is to promote economic development of the provinces along the Zambezi River. It consists of major economic and social development initiatives attracted by a number of fiscal incentives for investors in the area.

by applying modern inputs only on more profitable crops, before they adopted them on less commercial crops.

We found that agricultural intensification varied by crop and age of the household head. While older households' heads were more conservative towards the use of modern inputs, younger households did not subject themselves into longer learning curves, and therefore took only high risk on high market potential crops to compensate for risk taking.

Evidence presented above seems to suggest that the successful development and dissemination of high yielding and disease resistant seed varieties for a number of smallholder crops would require linkages between applied research and extension, and market integration as keys to agricultural development in Mozambique. Increased use of these modern inputs has a wide scope for promotion and potential for success. However, since smallholder farmers have limited ability to provide such technologies by themselves lack of adequate support limits their ability to increase yields, profits, and employment. The smallholder sector needs to gain technical knowledge and access to cost-effective and modern agricultural technologies necessary for the required income increase to reduce poverty.

4.5.2.3 Mechanization

The study looks at levels of agricultural mechanization through the analysis of land preparation methods for different crops. In the case of cash and other food crops, there was a specific question about animal traction, though this was a result of translation error that led to animal manure being understood as animal traction.¹⁶ As a result, farmers were asked about animal traction use only in the sections related to these crops and farmers understood them as such.

Table 18: *Distribution of current and reference period users of different land preparation methods for maize (n=292).*

Method for land preparation	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 - Present	Outset	Present	
	---- % ----							
Hoe cultivation	79	83	98	96	92	89	88	88
Oxen ploughing	20	16	2	2	8	8	11	10
Tractor ploughing	1	1	-	2	-	3	1	2

¹⁶ See questions c412 and c433 on the household questionnaire. There was a translation error that was not detected during the review of the questionnaires. This led to the translation of animal manure into animal traction.

Total	100							
--------------	------------	------------	------------	------------	------------	------------	------------	------------

Source: Afrint Mozambique survey, 2005

Tables 19, 20, and 21 suggest that tractor ploughing for maize, cassava and sorghum has been minimal. The main land preparation method for all crops including for cash and other food crops has been hoe cultivation. Oxen's ploughing has been common only in the southern region of Mozambique where there is high potential and suitable climatic conditions for cattle raising.

Table 19: Distribution of current and reference period users of different land preparation methods for cassava (n=249).

Method for land preparation	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 - Present	Outset	Present	
	---- % ----							
Hoe cultivation	77	82	100	97	95	94	89	90
Oxen ploughing	23	18	-	-	5	5	11	9
Tractor ploughing	-	-	-	3	-	1	-	1
Total	100	100	100	100	100	100	100	100

Source: Afrint Mozambique survey, 2005

Table 20: Distribution of current and reference period users of different land preparation methods for sorghum (n=116).

Method for land preparation	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 - Present	Outset	Present	
	---- % ----							
Hoe cultivation	100	95	100	96	100	96	100	96
Oxen ploughing	-	5	-	-	-	-	-	2
Tractor ploughing	-	-	-	4	-	4	-	2
Total	100	100	100	100	100	100	100	100

Source: Afrint Mozambique survey, 2005

Most of the cash crops grow in the central and northern regions of Mozambique. Cultivation of such crops is under contract farming. In the absence of animal traction due to low potential for cattle in these regions (areas prone to Tsetse flies) land preparation is either manual or tractorized. Other food crops are grown as second season crops in valleys and swamps most of which are vegetables and

short cycle maize. In these areas the use of animal traction is not common among rural households. As Table 19 shows, while all household types used animal traction in other food crops, only SAP households used it for cash cropping.

Table 21: *Distribution of households by time period and use of Animal traction on other food and cash crops (n=359).*

Type of Crops	Time when farm/household was formed			All respondents (%)
	Pre-Sap	Sap	Post-Sap	
	--- % of those using ---			
Other food crops	15	4	5	9
Cash crops	-	5	-	1

Source: *Afrint Mozambique survey, 2005*

The data shows that there were no significant changes in the way households prepared land for crop cultivation. The majority of the households used hoe cultivation, which for most of the crops did not change overtime. Furthermore, the percentage of households using hoe cultivation has declined across household types. Oxen and tractor ploughing have been limited. Animal traction was used mostly for second season crops and cash crops. Again, mechanization seems to be crop specific and limited to certain geographical areas.

4.5.2.4 Irrigation

Despite the irrigation potential that exists in Mozambique, irrigated agriculture has been limited. The main obstacle is lack of infrastructure. However, the World Bank (2005) reported that the number of households using small-scale irrigation has increased about 7% from 1995 to 2003. Table 22 shows evidence from the Afrint study sites. The data confirm the bank findings that few households use irrigation.

Table 22: *Distribution of households by time period and use irrigation on different crops (n=359).*

Type of crop	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 - Present	Outset	Present	
	--- % of those using ---							
Maize	4	6	5	5	2	2	3	4
Sorghum	3	-	5	2	1	1	2	1
Other food crops	na	2	na	2	na	1	na	1

Source: *Afrint Mozambique survey, 2005*

na = not applicable, as no question was asked about the reference period.

Overall, the percentage of farmers using irrigation is indeed low. Although, there was a slight increase in the use of irrigation on maize (mostly by pre- SAP households, and some stagnation for the others with no statistical significance), the use of irrigation on other food crops is very low. We did not observe any use of irrigation on cash crops. Increased public expenditures on irrigation infrastructures to tap on the potential that exist are likely to have a significant impact on intensification and productivity. We did not observe any use of irrigation on cash crops.

4.5.2.5 Farm management systems

Farming management systems include the use of different farming techniques to increase crop productivity in the study sites. Farmers were asked to indicate the use of productivity increasing techniques such as crop rotation, intercropping, fallowing, animal and green manure or composts, conservation tillage or breaking the hard pan, and soil and water conservation in a number of crops. Tables 23 and 24 show the results for maize and rice. Data for Cassava and Sorghum is in the annexes.

Table 23: *Distribution of household using different crop management practices on Maize by period.*

Management practices	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 -	Present	Outset	Present
Crop rotation No hhs.	26	22	11	14	16	11	16 (314)	19 (321)
Intercropping with nitrogen fixing crops No hhs.	74	71	70	70	68	66	71 (314)	69 (321)
Fallowing No hhs	26	26	27	16	17	22	22 (311)	23 (318)
Animal manure No hhs	1	2	2	-	1	-	1 (311)	1 (318)
Conservation tillage or breaking the hard pan No hhs	3	1	4	2	3	2	3 (311)	2 (318)
Green manure or compost No hhs	24	28	29	32	27	31	26 (311)	30 (319)
Soil and water conservation No hhs	2	2	6	7	1	2	2 (311)	3 (318)

Source: Afrint Mozambique survey, 2005

The most common farm management practices for improving crop productivity have been the use of crop rotation, intercropping, fallowing, and use of green manure or composts. Due to the small farm size (on average a household farms 1.4 hectares) intercropping is the most common system used for cultivation of food crops. Single cropping is mainly in cash crop cultivation. The use of intercropping has declined though not significantly for maize and sorghum whereas for cassava increased slightly, while stagnated for rice. The use of intercropping by pre-SAP households declined for maize, though not significantly while it increased for pre-SAP and SAP households for cassava.

Table 24: *Distribution of household using different crop management practices on rice by period.*

Management practices	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 - Present	Outset	Present	
Crop rotation No hhs.	31	22	18	8	20	30	24 (82)	22 (50)
Intercropping with nitrogen fixing crops No hhs.	29	26	18	25	21	20	24 (147)	24 (152)
Fallowing No hhs	6	17	6	-	21	16	11 (79)	12 (49)
Animal manure No hhs.	-	-	-	-	-	-	- (79)	- (49)
Conservation tillage or breaking the hard pan No hhs.	-	-	-	-	-	-	- (79)	- (49)
Green manure or compost No hhs.	6	6	12	-	18	5	11 (79)	4 (49)
Soil and water conservation No hhs.	3	-	-	-	-	-	1 (79)	- (49)

Source: *Afrint Mozambique survey, 2005*

The use of fallowing, crop rotation and green manure or compost in maize cultivation has increased though not significantly. The trend in cassava cultivation was opposite. The proportion of households using crop rotation, and fallowing has reduced, though the use of green manure and compost increased. In sorghum cultivation, all management-cropping practices, with an exception of green manure and compost use that reduced overtime. There are two possible explanations for these trends. First, the extension service network is weak in coverage. Second, the quality and frequency of the extension messages is not adequate to the needs and requirements of the households.¹⁷ Both issues affect both knowledge and the level of use of different crop practices at the farm level.

For instance, household level data shows that the average distance to an accessible extension agency/service in the study area is about 10.5 km (at 5% trimmed mean distance reduces to 8.9 km, with a median of 3 km). The households

¹⁷ These issues have been widely discussed, and extensively covered in the Afrint Macro study paper.

leaving far most from nearest extension service are those formed in pre-sap (distance of 11.4 km) compared to Sap and post-Sap households, which are about 10 km away for such services (the difference between the last two is not significant).

Furthermore, 35% of the households interviewed had received an advice from an extension staff at some point during the year before the interview, which by other Afrint countries is very high. Among these households, about 48% were post-sap households, and the difference between the proportion of pre-SAP and SAP households is not significant. In terms of frequency, the data shows that of those receiving some extension services, about 21% received it more regularly than others did. An extension staff rarely visited around 78% of the households. More pre- and post-SAP households received more regularly extension services whereas more SAP and post-SAP rarely received extension services.

The Afrint Macro study report, discusses extensively the issue of frequency of extension services. The current extension system is limited in coverage, and where it exist staff work with the same farmers for a long period. The evidence above confirms the nature and efficiency of the model followed by the public extension network, a concern we have raised at a recent Mozambique Economic Association seminar.

4.6 Marketing

The marketing of agricultural inputs and produce is constrained by a weak rural marketing network. Market access is a problem for both producers and traders in that the weak rural infrastructure increases substantially transaction costs. Although road access in some study sites was reasonable, farmers complained about the frequency by which traders entered into production areas. Prices offered by traders were often low in areas where they frequently reached farmers due to monopsony power. However, despite this fact, farmers recognized that some crops were particularly profitable. Thus market access and trader monopsony are equally important constraints in many of the surveyed villages.

4.6.1 Market access: sales and expenditures

Market access analysis reflects household responses to sales and expenditures dynamics. Questions asked households that have sold what the trend of sales since when their households came into existence. The data indicated that among the 32% of the households that produced maize have sold some quantity in the most recent season. An equal proportion had sold maize when the household was

formed. Among those selling maize in the preceding year about 31% reported increases in maize sales. As Table 25 shows, with an exception of pre-SAP households, all others saw an increase in maize sales.

Table 25: *Distribution of Households reporting sales by food crop and time period (n=359).*

Food Crop type	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 -	Present	Outset	Present
Maize	35	29	26	39	32	33	32	32
				--- % ---			(310)	(310)
Cassava	33	27	24	34	21	33	26	31
							(261)	(270)
Sorghum	9	5	-	14	10	16	7	12
							(177)	(139)
Rice	31	-	9	9	6	7	14	6
							(59)	(55)

Source: *Afrint Mozambique survey, 2005*

Note: in parenthesis is the number of respondents

The trends in cassava sales show that 31% of the producers have sold cassava a year before the survey. However, only 26% had sold cassava at the reference period. Of those selling cassava in the preceding year about 29% reported increases in cassava sales. A relatively higher proportion of SAP and post-SAP households reported increases in cassava sales.

Among sorghum producers, only 12 % have sold sorghum in the most recent season. Of those selling sorghum, 24% saw increases in sorghum sales. Only 7% of the households that produced sorghum during the reference period had some sales. Finally, only 6 % of those that produced rice have sold it in the most recent season. Among those that produced during the reference period, some 20% had sold rice, but none reported increases in rice sales.

Overall there was an increase in the number of households reporting cassava and sorghum sales. This increase was particularly noticeable among SAP and post-SAP households. Despite this positive response, it may be the case these households have not reached the level of commercialization they had before SAP, which points to an ongoing commercialization process. Assuming an unclear pattern on maize commercialization process among SAP households, and the decline in rice marketing, the evidence seems to confirm our assertion that the crisis in cropping of more marketable food crops led households to resort to less commercial crops for cash in order to ensure household expenditures.

Despite the low market participation, a large proportion of households that participated indicated improvements in market outlets, particularly for maize, cassava and rice. As Table 26 shows over half of those selling maize, cassava, sorghum and rice reported improved market outlets in their areas. This is an indication that, though transaction cost are still high, efforts to rehabilitate access roads by the government, NGOs and the private sector resulted in improved market access.

Table 26: *Households reporting improved market outlet by crop and time period.*

Crops	Time when farm/household was formed			All Sellers (No of respondents)
	Pre-Sap (- 1986)	Sap (1987-1992)	Post-Sap (1993-)	
	--- % of those reporting improvement ---			
Maize	73	92	73	76 (98)
Cassava	74	79	76	75 (65)
Sorghum	60	50	55	56 (18)
Rice	70	100	100	77 (13)

Source: *Afrint Mozambique survey, 2005;*

Note: *In parenthesis is the number of respondents.*

However, farmers are still far away from the nearest market. Estimates from this study show that markets are often, on average, as far as 3 km for maize, whereas for cassava can be as far as 4 km where mostly private traders are the main buyers. At this distance, the alternative outlets are piecemeal local markets.

4.6.2 Crop profitability

The most common cash crops in Mozambique are cotton, tobacco, cashew nuts and sugarcane. Smallholder farmers within a concession system given by government authorities to private companies mostly grow cotton and tobacco. As Benfica et al (2005) indicated, often cotton and tobacco growers cultivate a relative large land area than non-growers implying a more diversified farming system. In effect, these researchers found that even among growers in those areas, tobacco farmers tend to cultivate a larger area than cotton grower do, an indication of relative high profitability of tobacco compared to that of cotton.¹⁸ However, it may

¹⁸ It is estimated that there are about 120 thousands tobacco growers, nationwide. These growers cultivate an average land area of 6.6 ha, 40% higher than non-growers of tobacco, and 69% higher than cotton growers. The area planted with tobacco is about 3 ha whereas 1.4 ha is the average cotton land area. To illustrate the relatively high profitability of tobacco, it is important to note that the mean cultivated area for maize in these zones is about 2.7 ha by tobacco and 1.5 ha by cotton growing farmers. In both areas tobacco and cotton are potential land competitors with food crops like maize.

also indicate the nature of intensification and potential that cotton possesses when compared to tobacco.

Insights from Afrint data indicate that both cotton and tobacco are not predominant cash crops in surveyed areas. The agro-ecology of these areas is not suited for these crops, and the small proportion of households growing and selling both tobacco and cotton reflects this.

Table 27: *Households reporting improved crop profitability by crop and time period (n=359).*

Crops	Time when farm/household was formed			All Sellers (%)
	Pre-Sap (- 1986)	Sap (1987-1992)	Post-Sap (1993-)	
	--- % of those reporting improvement ---			
Maize	23	19	19	21
Cassava	18	11	11	13
Sorghum	2	2	4	3
Rice	5	2	1	3

Source: Afrint Mozambique survey, 2005;

Note: In parenthesis is the number of respondents.

Table 27 above shows that there are few sellers reporting crop profitability in the study area. Of that reporting crop profitability, more households indicated maize as the most profitable among the food crops. With an exception of sorghum, there are more, though not statistically significant, pre- SAP households reporting crop profitability implying that they are more experienced with market signals than the households formed during and after the SAP are. In Table 27, those who sold it mentioned groundnut as the most profitable crop. About 65% of those selling reported that price for groundnuts have been attractive for the crop. Other food crops with relative profitability are beans, referred to by 18% of farmers who have sold them.

Table 28: *Percentage households that sell and report most profitable other food crop (n=68).*

Crops	% of respondents
Bananas	9.8
Beans	18.0
Groundnuts	64.8
Vegetables	4.1
Other	3.3
Total	100.0

Source: Afrint Mozambique survey, 2005

Table 29 shows that among those that grew and sold cash crops in the most recent season, 56% mentioned cashew nuts, and 29% sugarcane, as the most profitable cash crops. Cashew is an important cash crop nationwide though economically grows in certain provinces such as Nampula, Inhambane and Gaza. About a million of smallholder farmers grow cashew in holdings of an average of 60 trees (Mole, 2000).

Table 29: *Proportion of Households selling and reporting most profitable cash crop (n=68).*

Crops	% of respondents
Cotton	4.5
Sugar cane	29.4
Cashew nuts	55.9
Tobacco	4.4
Other	5.8
Total	100.0

Source: *Afrint Mozambique survey, 2005.*

In summary, despite the increase in the proportion of farmers selling and reporting increases in sales there seems that there is a shift towards less commercial food crops. Similar to other countries where farmers move onto other food crops, i.e. non-tradable like tomatoes, potatoes and green maize, in the study areas depending on the crop potential cassava and sorghum seems to have better market prospects than for traditional tradable food and non-food crops.

Below we present a summary of key differences from the gender perspective in agriculture as captured in the Afrint micro study, namely on patterns of crops grown, land access to land and type of activities male/female headed households are often engaged in.

4.7 GENDER PERSPECTIVE

As mentioned earlier, female-headed households accounted for about 21% of the study sample, with about 41% from the southern region, 32% from the northern region and 27% from the central region. Table 30 reflects gender representation across regions in the study area.

Table 30: *Proportion of female-headed households, by region in the study area.*

Region	Female headed households	Total village Households
North	27.9	5 839
Centre	10.2	1 543
South	75.0	3 039

Source: *Afrint Village level survey, 2005.*

The study found that about 81% of the female headed households engage in farming as the main occupation. Among these households 40% were from the North region and around 42% from the southern. About 13% did not work and the majority were from the central region (70%). Only few (about 6%) were working in non-farming activities, 60% of which were from the southern region, and none from the Northern region. Compared to male headed households, one notes that about 73% of the male headed households had farming as the main occupation. More than half of these households were from the North. As in the case of women headed households the proportion of non-working households is about the same (12%) while those engaged in non-farming activities was more than double with the majority (about 59%) residing in the central region.

In terms of crops grown, the pattern also favours men headed households. Table 31 shows the set of crops from both the reference period and the season before the survey. We found that with the exception of rice, in all other crop types, the proportion of women headed households cultivating such crops has slightly decreased a pattern that does not follow the tendency when all households are considered.

Cotton, tobacco, and cashew nuts are the very important cash crops in Mozambique and a big source of farming income. Table 31 shows that none of the female headed households produced either cotton and sesame or any other non-food crops in their last seasons. Among the crops produced by both, with the exception of cocoa the proportion of female headed households producing then is smaller than that of men headed households. We note that the study areas are not particularly suited for cotton cultivation.

Table 31: *Distribution of Female Headed Households by crop during the reference period and last season*

Crop type	Female Headed Households		All Households	
	Reference period	Last agricultural season	Reference period	Last agricultural season
	--- % ---			
Maize	21.4	21.2	89.2	87.7
Cassava	20.1	19.7	76.1	76.6
Sorghum	12.7	11.2	43.5	40.5
Rice	15.0	16.0	26.9	12.6
Other food crops and vegetables	23.9	22.6	69.3	75.4
Cash and non-food crops	11.6	9.4	23.9	26.6

Source: *Afrint Mozambique survey, 2005.*

We note that both men and women engage in the same type of activities, though men seem to have more opportunities than women do. We found that the proportion of women engaging revenue generating activities is lower than that of men.

Table 32: *Distribution of households by gender of the head of the household and crop grown.*

Crops	Gender of the Head of the Household		All respondentes
	Male	Female	
Cotton	1.9	-	1.4 (n=282)
Sugar cane	18.1	4.5	14.9 (n=282)
Cashew nuts	36.6	16.7	31.9 (n=282)
Tobacco	3.2	1.5	2.8 (n=283)
Sesame	4.6	-	3.5 (n=284)
Cocoa	1.8	3.0	2.1 (n=283)
Other	0.5	-	1.4 (n=282)

Source: *Afrint Mozambique survey, 2005.*

As Table 33 shows, the proportion of households selling food staples, and other crops, as well as non-food cash crops and animal related products is low. Although both men and women engage in all other than agricultural production activities, the proportion of women engaged is far lower and significant than that of their counterparts. Few exceptions are with respect to non-farm related activities.

Table 33: *Distribution of Female Headed Households by farm activity during last season*

Activity type	Among Female Headed Households	All Households
	--- % ---	
Sales of food staples	25.3	33.9 (n=395)
Sale of other food crops	25.6	32.0 (n=394)
Sales of non-food cash crops	10.1	18.2 (n=395)
Sales of animals or animal produce	2.5	8.1 (n=396)

Source: *Afrint Mozambique survey, 2005.*

While the pattern is repeated on non-farm employment and micro business activities (see Table 34, below), no women participation in large scale business activities was found. Alternatively, the proportion of women living on rent, interest and pensions were higher than that of men. The Ministry of Women and Social Action consider women and children as more vulnerable than the majority of men in general.

Table 34: *Distribution of Female Headed Households by non-farm activity during last season*

Income Activity type	Female Headed Households	All Households
	--- % ---	
Non-farm employment	11.3	12.4 (n=396)
Micro-business	30.9	35.5 (n=397)
Large-scale business	-	1.3 (n=396)
Rent, and interest	1.3	0.3 (n=396)
Pensions	12.5	6.1 (n=395)

Source: *Afrint Mozambique survey, 2005.*

As for land, access by both men and women is pre-determined by social organization structures. In the southern region, communities evolve around patrilineal relationships and the *régulo* (King) is the central figure in land access. Although in the Central and Northern regions such figure exist within matrilineal relationships, women access to land varies at the household level. Family ties determined access to land at the household level. Land can be allocated to a family member temporarily by the head of the households. Usually, the male descendant

inherits the best land. Women get only land use rights. While single these women get a plot for cultivation from their parents. In the Southern region such plot is to be returned to parents, after marriage as the woman moves to live with husband where land access is given by the husband's family. In most of the central and the entire northern region, where families are matrilineal, the men moves onto his wife's area where land access is given by his wife's family.

With respect to labour, the Afrint data also shows that only 11% of the female headed households could regularly hire labour for farming activities. The majority of these households were from the central and southern (around 44% each) regions. Among male headed households those able to hire regularly labour were more than double (around 24%) of that from women headed households. The ability to hire regularly labour for cropping activities depend on income prospects within the family. In the southern region female headed households result from loss of husband due illness or migration to South Africa. It may imply a source of remittance which provides for an ability to invest part of these resources on cropping activities. In the central and northern regions thought a loss of a husband may be constitute reason for female headship, it is clearly not the case of husband migration. In any of the cases, female headed households lack this important source of labour in the family that may constraint the choice of activities available to them.

Below a summary of constraints and opportunities are presented as prospects for agricultural intensification.

4.8 AGRICULTURAL INTENSIFICATION PROSPECTS

Mozambique agro-ecological diversity and differences in market accessibility makes agricultural intensification prospects diverse in nature and potential. As mentioned earlier, while the northern and central regions of Mozambique have higher potential for food and cash crop production, livestock is better suited for the dry climatic conditions in the country's southern region. As a result, the nature of intensification is specific to these conditions.

Likewise, due to this conditionality agricultural markets for both inputs and outputs follow the same pattern. As the market demand for food and staple crops increases driven by local government and donors' efforts to satisfy food security requirements, farmers seek to respond such demand by extensifying crop production in the northern and central regions.

Experiments by international NGOs in the north with production of Soya beans, sesame and sunflowers are examples of attempts at introducing intensification, but at a scale of subsistence with scarce surpluses for an impact on local marketing. An exception is the intensification by private companies with concessions schemes in cotton, and tobacco, and to some extent in cashew-tree treatment under the government program. Thus, the concessionaires' rights, and the government-led programs have been the main factors facilitating intensification.

Yet, there is long way to go. Use of modern inputs is limited to few areas and households, and consequently the adoption of new technologies is low. Data at the national level indicates that in 1995/6 only 4% of households used fertilisers, animal traction or small-scale irrigation schemes. From then up to 2003, the use of these technologies increased by 3% (TIA 1996, 2002, and 2003). During the same period, there was an increase in the number of households using drought resistant maize seed varieties, though only those in the lowest and highest income quintiles did. Market access has improved, as more households were able to access improved seeds through market channels. There are, however constraints and opportunities, as well.

4.8.1 Constraints

A number of factors constrain agricultural growth in Mozambique. The main concern to agricultural sector development has been low productivity that results from lack of use of modern inputs, improved technologies, and appropriate technical advice. The absence of such inputs in rural Mozambique is a consequence of the state and level of existing basic infrastructures, yet a priority and a necessary condition for economic growth and rural transformation. Rural connectivity for the sparse and dispersed population is critical to agricultural growth. High transaction costs resulting from this poor infrastructures constraint market operators and limits competition for better prices to rural producers. In such conditions, incentives to both intensification and extensification are non-existent. These are the main constraints to agricultural intensification in Mozambique's smallholder sector.

Below we present a reflection of such conditions from the household survey. Households were asked to indicate economic and household factors constraining their ability to intensify agricultural production.

4.8.1.1 Economic factors: structural adjustment introduces production risk as prices become unstable

The ranking of farmers responses (see Table 35) indicate that, among the economic factors, the constraints to agricultural intensification are: (a) low or fluctuating producer prices, (b) availability of high modern input and consequent high prices, and (c) high transport costs to market. Frequently, farmers associate these conditions to periods following the structural adjustment program, which they perceive them to have introduced risk to their agricultural activities as prices become unstable.

Table 35: Ranking of economic constraints to Agricultural Intensification by crop (n=359).

Type of Constraint	Corps			
	Maize	Cassava	Sorghum	Rice
--- Ordinal raking ---				
Low or fluctuating producer prices	1	1	1	1
High transport costs	2	2	5	5
High modern input prices	3	5	3	2
Modern inputs not available	5	4	2	3
Lack of credit facilities	4	3	4	4
% of household respondents	92	86	55	42

Source: Afrint Mozambique survey, 2005;

Note: Ranking is ordinal and varies from 1-4 as most important to least important constraint.

Low or fluctuating producers prices are the major constraint to crop intensification for all crops (maize, cassava, sorghum and rice). There were no significant differences between pre-sap and sap period proportion of farmers citing low or fluctuating producer prices as the most important constraint to agricultural intensification. However, there were significant differences between these and post-sap households. Of those raking low or fluctuating producer prices as the first constraint, more responses though not statistically significant were from post-sap households, which seem to confirm price instability after structural adjustment program. There have been complains among rural farming households about price instability after SAP and lack of government intervention in Mozambique. These complains result from past experiences of price setting and government intervention in crop marketing, a situation that changed since liberalization of agricultural markets.

Current high transaction costs in marketing due to high transport costs contribute to perceptions about price instability. High transport costs followed the same trend though differences across household types were not significant. A number of farmers also ranked high prices and availability of modern inputs among the major constraints. Fewer post-SAP farmers ranked it as such compared to pre-SAP farmer respondents. Thus, one of the major challenges to agricultural intensification is an investment in rural infrastructure and dissemination of price information. Investments in the development of rural road networks¹⁹ and price information may reduce transaction costs thereby improving rural marketing operation.

4.8.1.2 Household factors: an ageing smallholder farming sector, and dysfunctional rural input markets impose added challenges to agricultural intensification

In addition to economic factors, smallholders face household level constraints to agricultural intensification. Among these factors, interviewed households refer to (a) shortage of labour, particularly within the household because of migration of younger members either to other districts/provinces or abroad in search of better employment opportunities, (b) lack of capital to cope with high input prices for agricultural activities. With respect to the latter, the banking system in the country gears towards the requirements of industrial/commercial enterprises, and not to the agricultural sector, particularly the smallholder sector. The agriculture high risk and the need for long-term loans kept the banking sector away from the agricultural sector making further more difficult the uptake of modern inputs and new technologies. In addition, chronic illness in the family and insecure land tenure are other constraints perceived by farmers in parts of the rural Mozambique.

Previous research (Benfica et al. 2005; Mole 2000; and Strasberg 1998) in Mozambique has suggested that older farmers tend to possess more fixed assets than younger farmers do, but due to aging, they lack family labour. Unless they have sufficient income to hire, some of these assets may remain idle for long period without yielding the expected rate of return. Furthermore, in the absence of functional rural input markets, particularly for labour, these “little riches” may be further constrained because even with sufficient purchasing power they may not be able to find labour to hire.

Table 36 seems to confirm these findings. As demand for labour increases, real rural wages increase making labour even more expensive to hire. Furthermore,

¹⁹ Mozambique possesses the lowest rural road network density in the Southern Africa. It is currently

since most of the rural economy is still a bartered economy, a substantial part of labour payment is in kind. Under severe food insecurity and malnutrition, diversion of food from poor family tables towards labour payments makes the cost of labour even higher. As a result, some agricultural activities become costly, in some cases not undertaken resulting in overall low volume of agricultural produce.

Table 36: *Ranking of household constraints to Agricultural Intensification by crop (n=359).*

Type of Constraint	Crops			
	Maize	Cassava	Sorghum	Rice
	--- Ordinal raking ---			
Household labour shortage	1	1	1	1
Farm labour too expensive to hire	2	4	2	7
Lack of capital to land preparation	3	3	3	3
Chronic illness in the family	4	2	4	5
Lack of knowledge about yield improving techniques	5	5	5	2
Lack of capital to buy inputs	6	6	6	6
Lack of land to grow crops or insecure land tenure	7	7	7	4
% of household respondents	93	85	57	43

Source: *Afrint Mozambique survey, 2005;*

Note: *Ranking is ordinal and varies is 1-4 from most to least important constraint.*

As mentioned above, a further concern within the households is family chronic illness. An illness in the family enhances the shortage of household labour making even more difficult the hiring of outside labour. With chronic diseases in the family, household labour is devoted mostly to taking care of the ill. In addition, income/savings are drained to keep the ill alive. Time spent on these activities reduces considerably field effort, and money cannot be used to hire the required labour effort for field activities.

Although, the household questionnaires was not explicitly about HIV/AIDS, but chronic illness, informal interviews with village authorities and key informants suggested that HIV/AIDS was in the forefront of concerns about chronic illnesses in the household. Local efforts by government and NGOs working with local communities resulted in more awareness about the endemic disease, but significant impact of such efforts has yet to be seen.

4.8.2 Opportunities

The nature of opportunities derives from unexploited resource potential that Mozambique possesses. The country's vast and uncultivated land area is one of the untapped potential to increasing crop production. In fact, about 78% of Mozambique's land is forest. An estimate of 46% of it is cultivable, of which about 12% is currently cultivated (Issufo 2003; MADER 2003; and World Bank 2003). The majority of that land is under smallholder cultivation. Furthermore, slightly less than 50% of the 12 million hectares of good grazing land is currently used. Furthermore, with low crop yield there is scope for significant increases through use of modern and improved technologies.

As mentioned earlier, very few farmers use modern inputs and, in limited areas. National agricultural statistics indicate that an average of 4% of farmers use fertilizer, and about 7% use pesticides. Furthermore, the country irrigates less than 2% of its 3.3 million hectares of irrigable land. Because of low agricultural productivity, value-adding activities that could push the rural economy towards transformation are limited.

In sum, the untapped potential for agriculture to contribute to economic growth, food security and poverty reduction depend on changes in the institutional setting. There are current efforts in that direction. Government effort at designing the National Agricultural Investment Program (ProAgri, now at the onset of its second phase, provide such framework to creating an enabling environment under which key constraints can be lifted, and both public and private actors may intervene to exploit Mozambique's agricultural potential. If such framework does not come into implementation, it could turn into a major drawback for farmer's expectation of an improved environment for food security and poverty reduction.

4.8.3 Village Environment

This section summarizes the main insights from the village diagnosis. We review climatic conditions, farmer's perceptions and movement, marketing, transport and technologies, government and NGO/donor support activities as perceived by a range of rural stakeholders. These views obtained from focus groups discussions present factors that affect all the households inquired in the household survey.

Rainfall, land availability and suitability

Focus group members interviewed for the Afrint micro study reported below average rainfall conditions in about 73% of the villages. The majority (63%) of these villages were located in the central region, and none in the southern region. Drought conditions were observed in about 9% of the villages all of which in the south region. In the north, rainfall conditions were average to below average. A season before the most recent, the majority (91%) of the villages had observed average rainfall, with the reminder experiencing below average conditions. Two seasons back about 73% of the villages reported average levels of rainfall. However, in the southern region the conditions were often average to below average, whereas in the northern region rainfall levels were average to above average. The central region rainfall conditions remained at average levels. As mentioned elsewhere, the southern region is prone to bad weather conditions, particularly droughts making it less suitable for cropping activities.

Insights from the household survey suggested that there is not acute pressure on land.²⁰ Lack of land to grow crops or insecure land tenure ranked seventh among the most cited constraints to agricultural production. Land availability at the village level was not a major constraining factor to agriculture. Family members could get land from several sources. For instance, in 55% of the villages newly formed households would get mostly land not previously cultivated. In very few villages (9%), these households would have purchased land, and the reminder (36%) would have got it from family members. Reports of land purchases found only in the central region, and no family land allocation mentioned in the southern region.

In about 55% of the villages across regions, established households would increase farm size by clearing virgin land. In 36% of the villages, all of which from the central region, there were reports of land purchases from other households as a source for increasing farm size. Only 9% (a village in the southern region) reported renting/borrowing land for agricultural activities. In this village, a small proportion of smallholders held formal title or registration of their land. It is likely that only these households were able to rent out their land. Since the land law forbids land sales and rentals, this finding should be taken with caution.

²⁰ Local authorities in 64% of the villages suggested that land frontier is still open. However, 80% of the surveyed villages in the central region there were reports of the land frontier exhaustion with all the fields being permanently cultivated.

Table 37: *Land Availability, and Use Patterns, by region in the study area.*

Type of Use	Regions		
	Northern	Central	Southern
	--- % ---		
Cultivated land	34	30	-
Irrigated land	2	-	1
Fallow or pasture	8	34	-
Virgin land	40	3	5
Marginal land	8	11	4
Water bodies	5	9	1
Other uses	3	13	-

Source: *Afrint Village level survey, 2005.*

Note: There is no variation in area under cultivation, fallow and pasture, irrigation and other uses in the southern region; and that under irrigation is constant for the southern region.

Apparently, most of the surveyed villages have fertile and suitable land for cultivation. However, land fertility and suitability for cultivation is best in the Northern and Central regions. Survey data indicated that 82% of the villages are average to well endow in soils. Well-endowed soils were in 46% of the villages, all of which were located in Northern and Central regions. Across all regions, a large portion (in 73% of the villages) of these soils was on flat terrain or gentle slopes. In terms of potential, only about 18% of the villages had low agricultural potential, all of which were concentrated in one administrative post (Inchope) in the central region. The remainder of the villages had average to good agricultural potential, of which 55% were of average potential. The villages with good agricultural potential were in the administrative posts of Chinga, Siluvo and Chaimite in the northern, central, and southern regions, respectively.

Farmers and Farmer's Organizations

The country's largest agricultural farming is in the family sector, which produces the majority of the crops in smallholdings. Such cropping is mainly for subsistence with scarce surpluses. Cultivation is manual with little use of modern inputs. In addition, the family sector is involved in the northern and central regions in out growers' schemes mainly in tobacco and cotton concessions. The main implications for this is that the little use of modern inputs is circumscribed to out

growers schemes, which means that such inputs are used only on cash crops. Table 38 shows the dimension of the agricultural sector in Mozambique.

Table 38: *Farming households and land holdings in the agricultural sector in Mozambique*

Indicators	Holdings Farm Types			Total (#, ha)
	Small	Medium	Large	
% of farming households	99.6	0.33	0.07	3,064,715
% of total cultivated area	95.2	1.72	3.08	3,925,324
Land area per farming household (ha)	1.22	6.65	282	1.28

Source: Calculations from the author based on Bias, C., and Cynthia Donovan, 2003.

Now, agricultural intensification is crop and region specific. Furthermore, intensification occurs only on cash crops such as cotton and tobacco. In regions with low potential for cotton and tobacco production intensification the few food staples and vegetables that are cultivated farmers still do not use modern inputs or do in very limited amounts. However, in areas in the southern region intensification of input use has potential in other agricultural activities such as raising cattle and small ruminants. As the potential for cereals, tobacco and cotton in the southern region is low, and farmers hold a considerable size of livestock, though limited to cattle, intensification is possible with respect to livestock. Even in such context, there are a number of considerations to consider. Access to extension services by farmers is low as it is provision of such services by the farmers themselves.

Despite the fact that farmer organization movement is increasing, membership is still low and the capacity for these organizations to provide services to farmers themselves is limited. For instance, only 7% of the farmers interviewed in the study area are members of a local farmer organization in the agricultural sector, the majority of which are pre-SAP households (40%). These households are often located far away from public agricultural services. The average distance to an accessible extension agency/service is about 10.5 kms.²¹ Furthermore, 35% of the households interviewed reported having received an advice from an extension staff

²¹ Farming households formed in the pre-sap period tend to be located in far most distances to extension services (11.4 km) compared to Sap and post-Sap households, which are about 10 km away for such services. The difference between in distance to an extension agency/service between the last two household types is not significant.

at some point during the year before the interview. Among these households, more post-SAP households received extension services than pre- and sap households. The difference between the latter is not significant. The frequency by which households received extension services, also varied. Among those that received some extension services, 21% received it more regularly than others did and 78.4% rarely served.

Data from land access indicate that allocation of virgin land or pasture, inheritance, and land purchase are the most common access mechanisms. Allocation of virgin land or pasture is most common among post-SAP households, and inheritance among pre-SAP households. A very small proportion (5%) of the households indicated that had borrowed or rented land for cultivation.

Cultivated land followed three tenure statuses: (a) land owned individually by the farm household; (b) land under user rights allocated by the community, clan or government, and (c) land rented or borrowed from other individuals and families. The most common land tenure was the one in which land was individually owned by the farm household as reported by about 89.4% of all households interviewed. Among these were those holding user rights either allocated by community, clan or government, or rented or borrowed from other individuals or families. Of these 24.3% needed permission or had to consult landowners in order to cultivate or change land use of all or parts of their land.

As the village diagnostic indicated, clearing virgin land has been the most common mechanism to expand farm size. Clearing virgin land was referred to by 69% of the respondents, though buying more land and bringing fallow land into permanent cultivation were other possibilities for about 14% and 11% of the households, respectively. A small proportion of households indicated the possibility of turning grazing land into cultivation (about 1%) and renting or borrowing land (about 5%). Household heads indicated that their children expect to acquire land mostly through inheritance (31%), and allocation of non-cultivated land (29%), though they can purchase (19%) and get land under fallow from their respective families (18%). A small proportion (4%) of households mentioned borrowing and renting as land acquisition forms for the children.

Access to credit is also limited in the study area. The study found that only 2% of the farmers interviewed obtained some form of agricultural input credit. Seventy one percent of these households were from the post-SAP period. No SAP households were able to benefit from any input credit.

The analysis above suggests that there were no major changes in productivity, technology adoption and crop marketing over the pre- to post-SAP period. Although the smallholder sub-sector constitutes the country's largest agricultural farming economy, households cultivate in smallholdings producing the majority of the crops. Agriculture is mainly a subsistence activity with limited surpluses. Technology is manual with little use of modern inputs. Technology transfer mechanisms to smallholders are limited to out growers' schemes mainly in tobacco and cotton concessions in the north and central regions.

This study has documented the constraints and opportunities faced by smallholder farmers in the study areas. As in the country as a whole agricultural growth and intensification has been limited by lack of access to (a) markets for both inputs and outputs, (b) credit and its high cost, (c) improved technologies, but also by (d) rigidities in the access to and use of land, (d) natural disasters vulnerability (MADER, 2001a; Bias and Donovan, 2003). Our study shows that despite the fact that farmer organization movement is increasing, membership is still low and the capacity for these organizations to provide services to farmers themselves is limited. These farmer organizations though independent from government often depend for a long period on non-government organization that helped to create them. Despite efforts by the government to set a legal framework for their existence, many farmer organizations still, face a long process towards legalization. As a result, farmers have been facing difficulties to access to resources that require legal existence such as credit and engaging profitable activities to sustain their existence.

Cultivated land followed three tenure statuses: (a) land individually owned by the farm household; (b) land under user rights allocated by the community, clan or government, and (c) land rented or borrowed from other individuals and families. The most common land tenure was the one in which land was individually owned by the farm household.

Farmer' organizations were present only in villages in the north where such institutions have strong historic roots and NGOs such as CLUSA, CARE and World Vision have invested in social capital development. These organizations were all involved in the marketing of food crops, though only in half of the villages they were involved in the marketing of cash crop. Farmer's organizations were involved in neither provision of inputs nor of food storage. However, in half of the villages with farmer's organization, the members were involved in food value adding activities. In very few villages farmer's organization were involved in the provision of extension services.

Marketing Activities

Private of farmer organizations exclusively carried out marketing activities in the study area. Farmer group marketing was found only in the northern region. None of the village surveyed provided evidence of NGO/donor or government-supported output marketing. Villagers also indicated that neither fertilizer nor other agro-chemicals were available in their villages though seed was available in 30% of the villages in the northern and central regions.

In about 63% of the villages, local authorities were well aware of the input provision situation. They indicated that private operators could provide inputs in about 43% of the villages in the northern and central regions, and in 14% by the government all in the northern region. An equal proportion of villages benefited from an NGO or donor supported project in the northern region. In none of the regions farmer organizations were involved in input provision.

Input provision reflects the degree of presence of contract farming schemes. In both the north and the centre of Mozambique, concessions schemes have been often criticized for their monopoly in input provision. Traders have complained that input selling activities are not a profitable undertaking because of the monopoly held by concession companies in cotton and tobacco production. Given the limited use of such inputs in crop production, input sales are not an attractive business. For instance, contract farming or out grower's schemes were mentioned in 46% of the surveyed villages, none of which were from the southern region.

Government and NGO/donor supported agricultural services

During the focus group discussions, village authorities reported extension services provided to about 55% of the villages, of which in about 64% by the government, and NGO/donor supported projects. Farmer organization's extension network was present in about 9% of the villages. While NGO or donor, and government run extension services were present across all regions, association extension services existed only in the northern region surveyed villages. The private extension service network served only the southern region. The distribution of the extension service network as captured in this study follow to some extent the nature of the agro-ecology, and not necessarily its profitability, in which case private operators would have entered, as they are common in the Northern regions where most of more profitable crops are grown under concessions schemes.

Government price support or input subsidies directed at food crops served about 36% of the villages, of which 75% were in the northern region. Among the receiving villages, 75% received input subsidies, (67% of them in the northern region, and none in the centre) and 50% received credit subsidy (all of which in the northern region). Price or credit support is common in the northern region were out growers scheme operate on private concessions.

However, NGOs or donors also run a number of agricultural projects that provide inputs and credit. For instance, in 55% of the villages across the regions received some support from an NGO or donor run program. Among these villages, 33% received the support in the form of input subsidies, 66% in input provision, and 33% in the form of credit. These villages also received extension services from an NGO or donor supported project though only one village in the central region received conservation farming land management from these institutions. Despite high levels of state and NGO interventions in Mozambique than in other Afrint countries, technology adoption, commercialization between served and non-served villages is still limited. The Afrint macro study point to this issue more thoroughly. With respect to technology adoption coverage, content of extension messages, educational levels of targeted farmers and profitability of disseminated technologies are some of the factors affecting the level of agricultural dynamism in this regard in rural Mozambique. The recent restructuring of the Ministry of Agricultural, particularly its research and extension department seems to an effort at looking at these issues. As far as commercialization is concerned lack of a marketing policy and strategy that takes into account regional differences in agricultural potential and infrastructure development prospects prevents the development of integrated markets based on comparative advantages.

Transport and technology use

Public transport in rural Mozambique is mostly private. Government owned and run transport does not exist. Private operators exploit such opportunities with small buses, pick-up trucks or even tractors transporting goods and passengers. Regular public transport exists in about 73% of the villages across, though in the northern region 75% of the villages are not serviced by any regular public transport.

For the majority of the villages for the Afrint study, farmers contact with new technologies depends mostly on the presence of either NGO/donor supported projects or out grower schemes. The public extension service is limited in coverage. Afrint data shows that only in 36% of the villages farmers are involved in some kind

of out grower schemes. Seventy five percent of these farmers are in the central region. As expected, none of the farmers interviewed in the southern region were involved in any out grower's schemes.

The Afrint study examined the extent to which improved seeds, planting material, pesticides and irrigation were either introduced or disseminated in the study area. The evidence shows that open pollinated (OPV) maize seed varieties reached 36% of the surveyed villages. In about 75% of these villages, OPVs were introduced during 1994-6, whereas in the remaining villages only in 2000 were these varieties disseminated. In the northern region, however, neither OPV nor QPM were disseminated. Only maize hybrid seed seems to have been introduced in 45% of the villages surveyed. Hybrid maize seed reached the central region in 1992-4 whereas in the northern and southern regions such seeds were disseminated later in 1996 and 2005, respectively. Improved cassava seedlings were introduced in 18% of the villages, half of which in 1999 in the north and the remainder in 2002 in the south. Improved rice varieties reached the north in 1925, whereas lowland rice cultivation was first grown between 1981-2.

Pesticides were first introduced in the south in 2002 and in the north in 2003. In 18% of the villages, there is access to irrigation, 50% of which are in the north and the others in the south. The first irrigation infrastructures in the surveyed villages were first built in 2002 in the south and in 2004 in the north.

5 SUMMARY OF FINDINGS AND IMPLICATIONS

The analysis of agricultural dynamics in the Afrint study area suggested that agricultural intensification is crop and region specific. Intensification occurs only in cash crops such as cotton and tobacco. In areas with low potential for cotton and tobacco production, intensification does not occur in alternative crops such as food staples and vegetables. Farmers still do not use modern inputs or, where they do, this is very limited. However, in southern Mozambique, intensification of input use is likely to happen in other agricultural activities such as livestock, particularly more in cattle and less in small ruminants. In this region, farmers hold a considerable size of livestock that pasture in areas with low potential for cereals, cotton and tobacco production.

Households make a range of investments in capital goods. The most common capital investments in the study area include radios, bicycles, and tape recorders owned by 65% of the households whereas 44% and 27% of the households own bicycles and tape recorders, respectively. Both radios and bicycles play a crucial role in agricultural marketing in rural Mozambique. Radios are means for acquiring agricultural price information, and bicycles are means of transport for accessing input and output markets in areas with limited access due to lack of rural roads.

As the data suggested, the majority of the farmers reported that transport was an important cost to farming. Transport costs increased transaction costs to the because of poor links between production areas and consumption markets. Traders often blamed on lack of or bad rural road access, which made transport investments and maintenance costly for profitable marketing. Hired labour was costly to farmers, as well. Despite the low opportunity cost of labour within rural areas, high real wages were due to migration and an ageing farming community, which left villages without sufficient labour for agricultural activities. The third most significant costly item was machinery or implements for land preparation. Land preparation services by tractor or animal traction were in most parts of the study sites non-existent. The southern region was particularly in advantage because of its potential for animal traction, though the region has the least agricultural potential, particularly for cereals.

The use of chemical fertilizers and pesticides is limited to few farmers. Those using these inputs are limited to cotton and tobacco out growers' schemes in Northern Mozambique. In these areas, farmers often complain about high input prices charged by companies involved in the schemes. Indeed, about 20% of the

surveyed farmers indicated that chemical fertilizers and pesticides were a significant cost in farming activities. Furthermore, very few households reported that seeds were a costly input. This finding reflects the fact that the majority of smallholder farmers do not use purchased seed. Access to seed via the market has been through input trade fairs organized by the government with donor funds or via contract farming with private sector companies. The majority of the households in rural areas exchange seed from past harvest among themselves.

The main implication of these findings suggest that the lack of availability of modern inputs in rural areas, as well as limited market access prevent the vast majority of farmers from taking advantage of the potential that these inputs have to increase productivity. As a result, the likelihood for increased incomes to improve access to food and reduce poverty is low.

Furthermore, low purchasing power is an important reason for limited access and availability and use of modern inputs. Households derive income from a variety of sources. The Afrint micro study investigated all possible sources, and found that micro business activities are the major source of income for all household types. As other researchers found (Benfica et al. 1998; and 2005) the Afrint survey also found, that micro business activities include mainly trading and processing activities, particularly of food and beverages.

Poverty in rural Mozambique is a concern. An evaluation of household capital and assets suggests that about 46% of the households interviewed were very poor and another 43% as below average wealth. Over half of the households are normally unable to save a portion of their income for future needs. These findings do not diverge significantly from national statistics on poverty incidence. National poverty assessments (INE 1997; and 2003) shows that the overall poverty headcount index decreased from about 69% in 1996/7 to about 54% in 2002-3. Within the same period, rural poverty had declined 16%, about 37% more than the observed reduction in urban areas.

Nonetheless, the Afrint micro study suggests that there was some household response to liberalization. Such response varied across household types. There was an increase in the number of households cultivating maize and cassava, while that of sorghum and rice decreased. Often the number of pre-SAP households cultivating all crops decreased, while post-SAP households shifted away from more (maize and rice) to less (cassava) commercial food crops.

In the meantime, a large number of households reported changes in yields for the majority of crops. The main reasons for these changes have been either

conservation farming/improved tillage practices or access to new seed varieties. However, yields remain low and below both the national actual and potential levels. There seems that access to improved research and extension service could maximize the existing potential or at least to bring the current yield levels to the actual national levels in the study sites. Most of the surveyed villages have fertile and suitable land for cultivation. However, land fertility and suitability is best in the northern and central regions. Across all regions, a large portion of the soils was on flat terrain or gentle slopes. The majority of the soils had average to good agricultural potential, most of which could be classified as of average potential.

Insights from the analysis of land tenure suggested that there is not acute pressure on land.²² Land availability at the village level was as a major constraining factor to agriculture. Lack of land to grow crops or insecure land tenure was not a major constraint to agricultural production. Family members could get land not previously cultivated. In very few villages, households would have purchased land. Cultivated land follow three tenure statuses by order of relative importance: (a) land individually owned by the farm household; (b) land allocated by the community, clan or government under user rights, and (c) land rented or borrowed from other individuals and families. Among the households in categories (a) and (b), about 24% may require permission or to consult landowners in order to cultivate or change land use of all or parts of their land.

Clearing virgin land has been the most common mechanism to expand farm size. However, buying more land and bringing fallow land into permanent cultivation were other possibilities for number of the households. A small proportion of households could turn grazing land into cultivation and rent or borrow land.

The study found that there was no significant changes in the way households prepare land for crop cultivation. The majority of the households used hoe cultivation, and this did not changed for most of the crops. However, the number of households using hoe cultivation has relatively declined across household types. Oxen and tractor ploughing have been limited. Mechanization seems to be crop specific and limited to certain geographical areas. For instance, households used animal traction mostly for second season crops and cash crops.

²² Local authorities in 64% of the villages suggested that land frontier is still open. However, 80% of the surveyed villages in the central region there were reports of the land frontier exhaustion with all the fields being permanently cultivated.

The relative number of farmers using irrigation is low. There was a slight increase in the use of irrigation on maize, but its use on other food crops was very low. We did not observe any use of irrigation on cash crops. Increased public expenditures on irrigation infrastructures to tap on the potential that exist are likely to have a significant impact on intensification and productivity. We did not observe any use of irrigation on cash crops.

Government price support or input subsidies directed at food crops occurs in less than half of the villages surveyed. Over half of the villages served are located in the northern region. The most common support is through input subsidies, though credit subsidy is also used. Price or credit support is common in the northern region, particularly because of cash-crop cultivation under private out growers' scheme. NGOs or donors also run a number of agricultural projects in that provide inputs and credit. Slightly over half of the villages across regions have received support from an NGO or a donor run program. These organizations provide inputs directly to farmers, although they may also give input and credit subsidies to farmers. The provision of these is often jointly with extension services focusing technologies and improved agricultural practices such as conservation farming and land management.

Input provision by out grower's schemes, NGO and donor projects have been controversial in rural Mozambique. Private traders have complained that selling inputs in rural areas is not attractive because of the monopoly hold by concession companies in cotton and tobacco production, and direct provision through projects. Private actor or farmer organizations carried out marketing activities exclusively. Villagers indicated that neither fertilizer nor other agro-chemical was available, though seeds were available in some villages in the northern and central regions.

Despite the fact that farmer organization movement is increasing, membership is still low and the capacity for these organizations to provide services to themselves is limited. The data shows that only 7% of the farmers interviewed in the study area are members of a local farmers' organization. Public agricultural services are often as far as 11 km from the farmers' communities. Furthermore, where these services exist, a small proportion is actually reached. Among those receiving such services, the frequency varies and the majority of the farmers being rarely served. As with extension services, access to credit is also limited. The study found that only 2% of the farmers had obtained some form of agricultural input credit.

Evidence from this study suggests that there were no major changes in productivity, technology adoption, and crop marketing over the period of analysis.

Although the smallholder sub-sector constitutes the country's largest agricultural farming economy, households cultivate in smallholdings producing the majority of the crops. Agriculture is mainly a subsistence activity with limited surpluses. Technology is manual with little use of modern inputs. Technology transfer mechanisms to smallholders are limited to out growers' schemes mainly in tobacco and cotton concessions in the north and central regions.

This study has documented the constraints and opportunities to agricultural intensification faced by smallholder farmers in the study areas. As in the country as a whole agricultural growth and intensification has been limited by lack of access to (a) markets for both inputs and outputs, (b) credit and its high cost, (c) improved technologies, but also by (d) rigidities in the access to and use of land, (d) natural disasters vulnerability (MADER, 2001a; Bias and Donovan, 2003).

Our study shows that despite the fact that farmer organization movement is increasing, membership is still low and the capacity for these organizations to provide services to farmers themselves is limited. These farmer organizations, though independent from government, often depend for a long period on the non-government organizations that helped to create them. Despite efforts by the government to set a legal framework for their existence, many farmer organizations still face a long process towards legalization. The implication is that farmers have been facing difficulties to access to resources that require legal existence such as credit and engaging in profitable activities to sustain their existence.

Evidence also suggest that, for agricultural intensification, the successful development and dissemination of high yielding and disease-resistant seed varieties for a number of smallholder crops require linkages between applied research and extension as keys to agricultural development in Mozambique. Increased use of these modern inputs has a wide scope for promotion and potential for success. However, since smallholder farmers have limited ability to provide such technologies by themselves lack of adequate support limits their ability to increase yields, profits, and employment. The smallholder sector needs to access and adopt technical knowledge and cost-effective and modern agricultural technologies necessary for increasing income increase to reduce poverty.

The untapped potential for agriculture to contribute to economic growth, food security, and poverty reduction will be realized with a change in the institutional setting. Current, some efforts are underway in that direction. The government has designed its National Agricultural Investment Program (ProAgri), which is now

moving into its second phase. ProAgri provides such a framework to creating an enabling environment under which key constraints can be lifted, and both public and private actors may intervene to exploit Mozambique's agricultural potential. If such framework does not come into implementation, it could turn into a major drawback for farmer's expectation of an improved environment for food security and poverty reduction.

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ANNEXES

6.1 DISTRIBUTION OF HOUSEHOLDS BY USE OF MODERN INPUTS

Table 39: *Distribution of Households by time period and type of Sorghum seed used (n=117).*

Sorghum -type of seed	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 -	Present	Outset	Present
Traditional	100	97	100	100	100	100	100	99
Improved/HYV	-	3	-	-	-	-	-	1
Total	100	100	100	100	100	100	100	100

Source: *Afrint Mozambique survey, 2005*

Table 40: *Distribution of Households by time period and type of Rice seed used (n=35).*

Sorghum -type of seed	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 -	Present	Outset	Present
Traditional	100	100	100	100	100	100	100	100
Improved/HYV	-	-	-	-	-	-	-	-
Total	100	100	100	100	100	100	100	100

Source: *Afrint Mozambique survey, 2005*

6.2 PERCEPTIONS ABOUT CONSTRAINTS TO AGRICULTURAL INTENSIFICATION

Table 41: Perceptions about economic constraints to Agricultural Intensification by crop (n=359).

Type of Constraint	Crops			
	Maize	Cassava	Sorghum	Rice
	--- % of respondents ranking ---			
Low or fluctuating producer prices	33	34	43	24
High transport costs	14	13	2	5
High modern input prices	12	4	6	13
Modern inputs not available	5	6	6	7
Lack of credit facilities	7	7	6	6
No. of household responding	331	308	199	151

Source: Afrint Mozambique survey, 2005.

Table 42: Ranking of household constraints to Agricultural Intensification by crop (n=359).

Type of Constraint	Crops			
	Maize	Cassava	Sorghum	Rice
	--- % of respondents ranking ---			
Household labour shortage	31	33	31	29
Farm labour too expensive to hire	15	11	15	4
Lack of capital to land preparation	14	11	13	9
Chronic illness in the family	12	11	9	6
Lack of knowledge about yield improving techniques	10	9	7	12
Lack of capital to buy inputs	8	8	7	5
Lack of land to grow crops or insecure land tenure	3	1	2	8
% of household respondents	333	306	204	156

Source: Afrint Mozambique survey, 2005.

6.3 CROP YIELDS

Table 43: Yields by crop and time period when the household was formed.

Crops	Time when farm/household was formed			All respondents
	Pre-Sap	Sap	Post-Sap	
	--- tons/ha ---			
Maize	0.46	0.42	0.42	0.43 (0.38)
Cassava	0.94	1.2	0.84	0.94 (0.79)
Sorghum	0.25	0.27	0.21	0.24 (0.21)
Rice	0.30	0.52	0.34	0.36 (0.31)

Source: Afrint Mozambique survey, 2005;

Note: These are means only for those who had grown and harvest a given crop; and in parenthesis are 5% trimmed means.

Table 44: Yield Distribution by crop and Village in the Afrint Study, 2005

Villages	Crops			
	Maize	Cassava	Sorghum	Rice
	--- tons/ha ---			
Naminhalo	0.53 (0.49)	0.85 (0.78)	0.20 (0.17)	0.36 (0.36)
Nacololo	0.22 (0.20)	0.72 (0.68)	-	0.37 (0.35)
Nacuali	0.44 (0.40)	0.88 (0.87)	0.33 (0.31)	0.45 (0.40)
Namali	0.49 (0.48)	1.14 (1.0)	0.22 (0.22)	0.47 (0.41)
Bendegar	0.43 (0.38)	1.42 (1.0)	0.27 (0.21)	-
3 de Fevereiro	0.32 (0.31)	1.2 (0.72)	0.24 (0.23)	0.14 (0.14)
Bairro 1	0.49 (0.44)	1.0 (0.91)	0.20 (0.19)	0.07 (0.08)
Bairro 2	0.31 (0.29)	0.38 (0.37)	-	-
Bairro 4	0.67 (0.55)	0.97 (0.95)	-	-
Bairro 5	0.37 (0.35)	0.93 (0.88)	0.26 (0.25)	-
Bairro 8	0.39 (0.37)	0.65 (0.62)	0.18 (0.17)	0.12 (-)

Source: Afrint Mozambique survey, 2005.

6.4 AGRICULTURAL MANAGEMENT PRACTICES

Table 45: *Distribution of household using different crop management practices on Cassava by period.*

Management practices	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 -	Present	Outset	Present
				---- % ----				
Crop rotation No hhs.	29	28	29	20	16	17	23 (263)	21 (279)
Intercropping with nitrogen fixing crops No hhs.	70	73	66	72	71	69	70 (262)	71 (281)
Fallowing No hhs	30	25	29	13	16	12	23 (279)	17 (258)
Animal manure No hhs	-	1	-	-	3	-	1 (259)	<1 (279)
Conservation tillage or breaking the hard pan No hhs	2	-	-	-	4	2	3 (261)	1 (279)
Green manure or compost No hhs	18	16	24	30	14	19	17 (260)	20 (277)
Soil and water conservation No hhs	4	2	5	7	3	2	4 (311)	3 (318)

Source: *Afrint Mozambique survey, 2005*

Table 46: *Distribution of household using different crop management practices on Sorghum by period.*

Management practices	Time when farm/household was formed							
	Pre-SAP		SAP		Post-SAP		All respondents	
	-1986	Present	1987 - 1992	Present	1993 - Present	Outset	Present	
Crop rotation No hhs.	14	10	-	3	1	12	11 (147)	9 (151)
Intercropping with nitrogen fixing crops No hhs.	63	65	67	59	62	59	63 (147)	61 (152)
Fallowing No hhs	12	15	19	9	13	24	14 (144)	18 (152)
Animal manure No hhs	-	2	-	-	5	-	2 (144)	1 (152)
Conservation tillage or breaking the hard pan No hhs	4	-	-	-	5	1	3 (145)	1 (152)
Green manure or compost No hhs	22	34	22	44	19	27	21 (144)	33 (152)
Soil and water conservation No hhs	-	-	-	-	-	-	- (145)	- (151)

Source: *Afrint Mozambique survey, 2005*

6.5 HOUSEHOLD SOURCES OF INCOME

Table 47: Farmer's Income Structure by source (n=358).

Type of Source	Crops			
	Pre-SAP	SAP	Post-SAP	All respondents
	--- % of households reporting the source ---			
Micro business	35	46	35	37 (359)
Sales of food staples	25	35	40	34 (356)
Sales of other food crops	29	33	37	34 (355)
Sales of non-food cash crops	22	25	12	18 (357)
Off-farm income	9	14	16	13 (358)
Remittances	19	10	10	13 (357)
Others ²³	17	30	12	16 (358)

Source: Afrint Mozambique survey, 2005;

Note: Ranking is ordinal and varies from 1-7 as most important to least important source.

Table 48: Ranking of Agricultural Sources generating more farmer's income (n=191).

Type of Sales	Crops			
	Pre-SAP	SAP	Post-SAP	All respondents
	--- ordinal raking ---			
Food staples	1	2	1	1
Other food crops	3	1	2	2
Non-food cash crops	2	2	3	3
Sales of animals or animal produce	4	3	4	4

Source: Afrint Mozambique survey, 2005;

Note: Ranking is ordinal and varies from 1-4 as most important to least important source.

²³ On average it includes pensions (4%), rent, and interest (1%), large-scale business (1%), and animal sales (1%).