

HEALTH IMPLICATIONS OF COTTON AND TOBACCO  
CULTIVATION IN CENTRAL AND NORTHERN  
MOZAMBIQUE

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# **Health Implications of Cotton and Tobacco Cultivation in Central and Northern Mozambique**

A thesis submitted in partial fulfilment of the requirement for the degree of  
Master of Public Health

by

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## Declaration:

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Signature:.....

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### ***Dedication***

I dedicate this work to my wife Elise. I thank her for the endless support, encouragement and patience during the last year.

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## ***Definitions***

**Agricultural inputs:** Starting package for the production of crops (i.e. seeds, pesticides and fertilizers).

**Cash crop:** A crop produced for sale rather than for subsistence.

**Crop:** Cultivated plants or agricultural produce, such as grain, vegetables, or fruit, considered as a group.

**Extension services:** System of out-of-school education for farmers provided by contracting companies, and including subjects like agricultural practices, agricultural marketing, and health.

**Food crop:** A crop produced for subsistence of the household.

**Household food security:** Is year-round access to an adequate supply of nutritious and safe food to meet the nutritional needs of all household members (men and women, boys and girls).

**Smallholder or small-scale farmer:** A type of farmer whose agricultural activities have mainly 3 characteristics: **i)** Farm units are mainly managed by family labour, **ii)** The size of the cultivated land is relatively small, **iii)** The production system has few external inputs.

## **Abbreviations**

<b>CC</b>	Cash crops
<b>FC</b>	Food crops
<b>HH</b>	Household
<b>IAF</b>	Household consumption survey; From Portuguese: <i>Inquérito Nacional aos Agregados Familiares Sobre Orçamento Familiar</i>
<b>SH</b>	Smallholder
<b>TIA</b>	Agricultural household survey; From Portuguese: <i>Trabalho Inquérito Agrícola</i>
<b>WHO</b>	World Health Organization

## **Abstract**

*Background:* Cotton and tobacco are the main cash crops grown in Mozambique. Approximately 300,000 rural families are involved in their cultivation. Cash crops can increase the income of the farmer household, leading to better living conditions and to better access to food, education and healthcare. However, their production also implies numerous health risks.

*Main objective and methods:* This study is a literature review that describes the effects of the cultivation of cotton and tobacco over the health of smallholder farmers in Mozambique.

*Findings:* Health implications, related to the different categories of the proposed conceptual framework were found. Occupational health risks appeared as the main threats for the health of the farmers. Secondly, in spite of higher incomes and better availability of food, malnutrition and low utilization of health services tend to persist. Furthermore, children and women are disproportionately affected due to biological, socio-cultural and behavioural characteristics. Also, careless management of natural resources by cotton and tobacco farmers can damage the environment and indirectly affect their own health. Concerning HIV/AIDS, disparities in income and the presence of migrant labour are factors that could facilitate the spread this disease among smallholder communities growing cotton and tobacco. Finally, it seems that the burden of chronic diseases among farmers is low.

*Conclusions:* Cotton and tobacco can affect the health of farmers through different paths. These effects seem to affect disproportionately women and children, while also being capable to extend to the entire community. In spite of these problems, economic development can not and should not be stopped in Mozambique. On the contrary, it must be pursued. However, major efforts should be done to reduce the negative side effects associated to this process.

**Key words:** Africa, Mozambique, health, agriculture, cotton, tobacco, cash crops, food security, nutrition, environment, occupational health, child labour, gender, socio-economic development

**Word count:** 14,469 words

## **CHAPTER 1: Introduction**

As epidemiologist I have worked from 2006 until 2008 for a humanitarian organization in Mozambique. During my work I provided support to different projects located in urban and rural parts of the country regarding data management, monitoring and evaluation, and operational research. Although the main focus of my professional activities has always been centred on HIV/AIDS, the opportunity to travel across Mozambique allowed me to witness and be part of events that somehow characterize the hard day-to-day life of the average Mozambican. Among the memories that I collected as a "tourist", a particular one is that of small farmer families in the central part of the country working through the day in the tobacco fields. Although it started as a curiosity, my interest in the subject grew once I realized how much this cash crop affects the lives of the farmers and their families.

Cotton and tobacco are among the main cash crops (CC) grown in Mozambique. Their commercial value was introduced during the colonial times and since then they have provided extra income to farmers living in rural areas of the country. All cotton and at least half of the tobacco currently produced in Mozambique is grown in small farms operating under contract farming systems. Through this system, private or semi-private companies contract small-scale farmers to grow these particular crops in exchange of inputs (provided as credit), extension services and the promise of buying the production at the end of the season. Approximately 300,000 rural families are involved in the cultivation of cotton and tobacco in Mozambique. It has been described that cotton and tobacco cultivation can increase the income of the farmer household, hopefully improving their living conditions, and their access to better food, education and healthcare. On the other hand, by accepting to work under the contract farming system, farmers -willingly or not- assume all the health and financial risks associated to the production of the crop. The multi-faceted effects of this economic activity intrigued me to investigate more about the situation.

The main purpose of this thesis is to describe the **likely impact of cash crop cultivation** (cotton and/or tobacco) **on the health status of smallholder farmers** in Central and Northern Mozambique. The contents of this study are based on the results of an extensive literature review. So far, different studies have focused on particular aspects of relation between cotton and tobacco cultivation and farmer's health. However, no study has given yet a full overview of the possible health implications for farmers in Mozambique. This thesis aims to give a more comprehensive view of the situation by joining different data under a single conceptual framework.

The thesis is structured into 6 chapters as follows. **Chapter one** introduction, **Chapter two** background of the country, **Chapter three** brings up the relevance and objectives of the study, describes the methodology, and explains the conceptual framework, **Chapter four** presents the information retrieved through the literature review following the logic of the proposed conceptual framework, **Chapter five** includes the discussion of the findings, and **Chapter six** concludes and provides recommendations.

I expect that this document will be useful to: a) the Mozambican government, as regulator of the sector and as entity in charge of protecting the well-being of its people; b) the contracting companies, as business partners of the small-scale farmers and as organizations with social responsibility; c) farmer households, as main actors in this situation; and d) civil society organizations, involved in lobbying for the rights and interests of farmers in Mozambique.

## **CHAPTER 2: Background information**

### **2.1 General information**

#### **2.1.1 Geography**

Mozambique is located on the eastern side of Southern Africa. It is surrounded by Tanzania and Malawi to the North; Zambia, Zimbabwe and South Africa to the West; Swaziland to the South; and the Indian Ocean to the East.

Covering approximately 800,000 km<sup>2</sup> and with a coastline of 2,400 km, this country is privileged with natural resources and geographical diversity. The climate in Mozambique is tropical to subtropical and the rainy season goes from October until the end of March (FEWS NET Mozambique 2008). Although most of the country is suitable for agricultural activities, the central and northern regions have the best climatic and soil conditions.

The political division of the country includes 3 regions and 10 provinces: **Northern region:** Niassa, Cabo Delgado and Nampula in the Northern region; **Central region:** Zambezia, Tete, Manica and Sofala; and **Southern region:** Inhambane, Gaza and Maputo Province. See appendix 1 for a map of Mozambique.

#### **2.1.2 Demographic and socio-economic situation**

Mozambique has a population of 20.5 million inhabitants growing at 1.8% per year (INE 2009). High mortality and fertility rates have resulted in a relatively young population and in a short life expectancy. Almost half of the population (45%) is younger than 15 years old and only 3% older than 65. Life expectancy at birth in Mozambique is 44 years (UNDP 2007). Following global trends, Mozambique is going through a process of urbanization. However, still 65% of its people live outside the cities (UNDP 2007).

From the economic point of view, Mozambique is recognized as one of the most promising nations of the region. Since the late 90s, this country has experienced sustained economic growth due to a combination of macroeconomic reforms and political stability. Despite the progress achieved, most of the population still lives under the poverty line. With 74% of the population living with less than US\$2 per day (or 36% with less than US\$1) and a Gini coefficient of 47.3, it is clear that the economic boom so far has only reached a privileged minority (UNDP 2007).

Mozambique is ranked 172 out of 177 countries in the Human Development Index (UNDP 2007). Most of its population still depends on agricultural activities to survive.

Table 1. Distribution of the labour force in Mozambique - 2002/03.

<b>Type of labour</b>	<b>Percentage (%)</b>
Agriculture	81%
Services, commerce and finance	15%
Industrial sector	3%
Transport and communications	1%
<b>TOTAL</b>	<b>100%</b>

**Source:** (INE 2004)

### **2.1.3 Literacy rates, access to basic services, and living conditions**

Only 46% of Mozambican adults are able to read and write. This figure however, hides considerable difference between literacy rates in men (63%) and women (32%), and between urban (70%) and rural (34%) areas (UNDP 2007).

Availability and access to basic services (i.e. clean water, sanitation and electrical energy) are also low. Great differences exist while comparing urban and rural settings (INE 2004).

Table 2. Availability and access to basic services in Mozambique - 2002/03.

<b>Population</b>	<b>Urban</b>	<b>Rural</b>
With access to improved water source*	58%	27%
With access to sanitation**	73%	34%
Using electric energy	22%	<1%
With housing built with lasting materials***	39%	6%

**Source:** (INE 2004)

\***Improved water source:** Tapped water or protected well

\*\***Sanitation:** Sewage, septic tank or any type of latrine

\*\*\***Lasting materials:** Bricks or wood with zinc roof

### **2.1.4 Female workforce and child labour**

Most Mozambican women and children work in unregulated sectors like agriculture, domestic work and informal trading. Formal jobs are scarce and are mainly occupied by males. Child labour is regulated in Mozambique. However, and due to the informality that characterizes the jobs given to children, laws are difficult to apply. In theory, adolescents between 15 and 18 years are allowed to work but with certain restrictions, children between 12 and 15 years only in special circumstances. No child under 18 years is allowed to work in dangerous circumstances or in jobs that require high physical activity (Muianga 2005).

## 2.2 Health situation

### 2.2.1 The health sector

Health service provision is limited in Mozambique. Following more than one decade of civil war, the health sector was left with little infrastructure and a severe shortage of human resources. A major reform that came after the peace agreements (1992) has helped to improve the situation by building/refurbishing facilities, restructuring the national health system, and by improving service delivery. Unfortunately big differences still exist regarding availability, access and utilization of health services between urban and rural areas, and between rich and poor segments of society (Chao & Kostermans 2002; INE 2004).

Table 3. Availability, access and utilization of health services in Mozambique.

Indicator	n/ratio/%
<b>Availability</b>	
Inhabitants per facility of first level*	17,000
Inhabitants per facility of secondary level*	501,000
Medical doctors per 10,000 inhabitants*	0.26
Nurses per 10,000 inhabitants*	7.65
<b>Access and utilization</b>	
Urban population able to reach a health facility in less than 30 min **	68%
Rural population able to reach a health facility in less than 30 min **	21%
Urban population - <b>Births</b> attended by skilled health personnel**	81%
Rural population - <b>Births</b> attended by skilled health personnel**	34%
Highest wealth quintile - <b>Births</b> attended by skilled health personnel**	87%
Lowest wealth quintile - <b>Births</b> attended by skilled health personnel**	25%
Urban population - <b>Measles immunization</b> coverage in <1 years old**	91%
Rural population - <b>Measles immunization</b> coverage in <1 years old **	71%
Highest wealth quintile - <b>Measles immunization</b> coverage in <1 y.o.**	96%
Lowest wealth quintile - <b>Measles immunization</b> coverage in <1 y.o.**	61%

**Source:** (INE 2004; INS 2007; WHO 2008)

\*Information from 2007

\*\*Information from 2003

Three quarters (72.5%) of the national health expenditure are covered by the Mozambican government. The remaining quarter is covered by private funds (out of it, 40% out-of-pocket payment and 40% NGOs). The role of pre-paid and risk pooling plans (insurance systems) are almost negligible (<1%) (WHO 2009).

Although the public sector in Mozambique is heavily subsidized, user fees prevent poor subpopulations from using health services (Chao & Kostermans 2002).



### 2.2.2 Health indicators

In spite of the achievements of the Mozambican health services, the national health indicators are still among the worst of the region. Again, big differences exist between urban and rural areas.

Table 4. Health indicators from Mozambique - 2003.

Indicator	National	Urban	Rural
Total fertility (births per woman)	5.5	4.4	6.1
Infant mortality (per 1,000 live births)	124	95	135
Under-five mortality (per 1,000 live births)	178	143	192
Maternal mortality (per 100,000 live births)	410 - 520	-	-
Children stunted height/age (%)	41%	29.2%	45.7%
Children wasted weight/height (%)	4.0%	3.1%	4.3%
Women undernourished BMI <18.5 kg/m <sup>2</sup> (%)	8.6%	6.2%	10.0%
Women overweight BMI >=25 kg/m <sup>2</sup> (%)	14.1%	24.4%	8.1%

Source: (MEASURE DHS+/ORC Macro 2005; UNDP 2007)

Communicable, maternal, perinatal and nutritional conditions are responsible for most (70%) of the burden of disease in Mozambique. Non-communicable diseases account for just 24% of the burden while injuries are responsible for the remaining 6% (WHO 2004). The top 5 killer diseases in Mozambique are: HIV/AIDS (24.6% of deaths), respiratory infections (9.5%), perinatal conditions (9.0%), malaria (8.0%) and diarrhoeal diseases (6.7%) (WHO 2004).

Mozambique is one of the Sub-Saharan countries heavily affected by the HIV/AIDS epidemic. According to national data, 16% of adults are infected with HIV (MISAU 2008). Unfortunately, antiretroviral therapy only benefits one quarter (24%) of the population in need (UNAIDS/WHO 2008). See appendix 2 for map describing the provincial HIV/AIDS prevalence in Mozambique.

## **CHAPTER 3: Problem statement, study objectives, methodology, and conceptual framework**

### **3.1 Problem statement**

Cotton and tobacco are among the main cash crops grown in Mozambique (Broughton *et al* 2006). All cotton and at least half of the tobacco produced in the country is grown in small farms operating under contract farming systems (Benfica *et al* 2005; Broughton *et al* 2006). At national level, approximately 300,000 rural families are involved in the cultivation of these crops (MINAG 2007).

The Government of Mozambique considers commercial agriculture, as one of the pillars of rural development (Government of Mozambique 2006), and this view is shared by academics and international organizations (Lipton 2005; World Bank 2007).

It has been described that cotton and tobacco cultivation can increase the income of the farmer household (HH) (Walker *et al* 2004; Benfica *et al* 2005), hopefully improving their living conditions, and their access to better food, education and healthcare. However, the production of CC is not exempt from downsides. In order to produce yields of sufficient quality and quantity to be profitable, farmers growing CC are exposed to a wide range of situations that may threaten their health.

The main purpose of this study is to describe the direct and indirect implications that the cultivation of cotton and tobacco have on the health of smallholder (SH) farmers in Central and Northern Mozambique.

### **3.2 Study objectives**

#### **3.2.1 General objective:**

To describe the **likely impact of cash crop cultivation** (cotton and/or tobacco) **on the health status of smallholder farmers** in Central and Northern Mozambique

#### **3.2.2 Specific objectives:**

At the level of agricultural supply chain and policy & progress governance (according to the conceptual framework proposed)

- a.** To describe the **agricultural sector** (at smallholder level) involved in the production of cotton and tobacco in Central and Northern Mozambique. Including **producers, practices, outputs, and policies.**

At the level of health outcomes (according to the conceptual framework proposed)

- b.** To describe the **direct impact on health** that cotton and/or tobacco cultivation can have on the health status of smallholder farmers in Central and Northern Mozambique

At the level of health outcomes and intermediary processes (according to the conceptual framework proposed)

- c.** To describe **socio-economic, cultural and environmental factors** that indirectly can affect the health status of smallholder farmers cultivating cotton and/or tobacco in Central and Northern Mozambique
- d.** To propose **intervention points in order to diminish the health risks and enhance the health benefits** associated to the cultivation of cotton and/or tobacco in smallholder farmers in Central and Northern Mozambique

### **3.3 Methodology**

The present study is a literature review that includes data available from published and unpublished sources. The material used in the review was compiled using a phased search strategy. The results of this review are presented according subheadings that emerge from a proposed conceptual framework that is described below.

#### **3.3.1 Search strategy**

Electronic databases and public search engines were screened using a set of predefined keywords that were expanded with new descriptors after each screening round. No restrictions regarding language or date of publication were imposed. Public web pages of the government of Mozambique were also scanned. The lists of references in retrieved documents were screened, and a limited number of experts in the field of the study were contacted.

Once retrieved the material was classified according to subheadings available in the proposed conceptual framework. In case information about Mozambican farmers was lacking in specific categories, the range of the search was expanded in order to include studies performed in similar settings of neighbouring countries.

#### **3.3.2 Databases and search engines**

Pub Med, Scopus, WHOLIS, WHOSIS, WHO – Afro Library, Jstor, Google, Google Scholar.

#### **3.3.3 Keywords**

Africa, Mozambique, health, agriculture, cotton, tobacco, cash crops, food crops, food security, nutrition, environment, occupational health, child labour, gender, economic development, social development

### 3.3.4 Inclusion and exclusion criteria

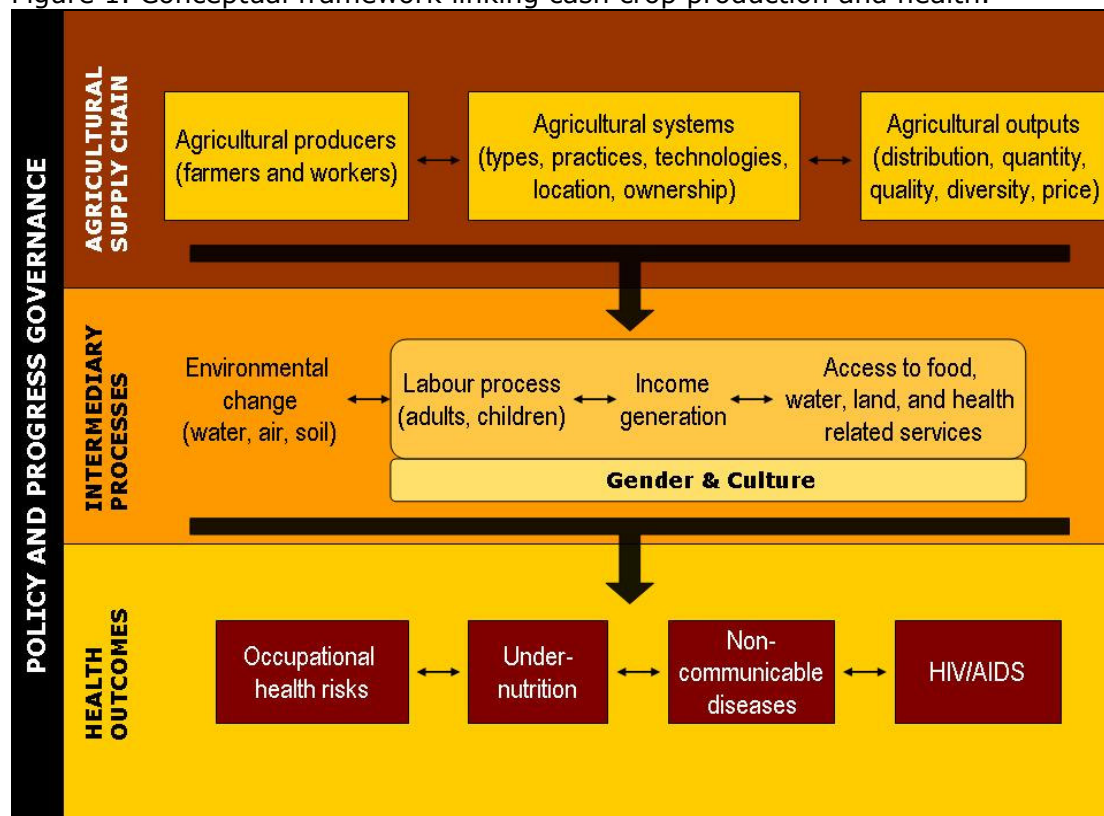
Inclusion criteria: a) all study designs, b) focus on data from Mozambique, if not available, relevant regional or worldwide data, c) focus on cotton and tobacco sector, if not available, relevant data from other cash crop sectors

Exclusion criteria: a) cotton and tobacco studies not including information about health impact

### 3.3.5 Conceptual framework

The conceptual framework used in this study is an adapted version from the one developed by Hawkes & Ruel (2006) to explain the links between agriculture and health. See appendix 3 for the original model of Hawkes & Ruel (2006).

Figure 1. Conceptual framework linking cash crop production and health.



Source: Adapted from (Hawkes & Ruel 2006)

In order to adapt the original model to the specific case of cotton and tobacco cultivation (and their impact on health), three major changes were done.

- a. The original bi-directional arrows connecting the horizontal layers ("Agricultural supply chains", "Intermediary process", "Health outcomes") were replaced by unidirectional ones pointing downwards. The change reflects the fact that this study only focuses on the effects of agricultural activities on the health of the farmers, and not the other way around.

- b.** A box in the layer “Intermediary process” was inserted indicating the crosscutting effect of “Gender & Culture” in aspects like the labour process, income generation and access to food, water, land and health related services.
- c.** Three boxes from the original layer “Health outcomes” were omitted due to their lack of relevance with the subject of the study. The first box left out, “Water-associated vector-borne diseases” refers to diseases like malaria and schistosomiasis. Due to the nature of their transmission, these diseases tend to occur more frequently in settings where water exists in large quantities (i.e. irrigation systems used for large-scale farming). However, these big irrigation systems are uncommon among SH farmers in Mozambique; therefore the impact of malaria or schistosomiasis among this specific population is assumed to be similar to the one of the general population. The second box omitted is “Food borne illnesses” and refers to diseases that occur once food products contaminated with toxins are consumed by the general population. Neither cotton nor tobacco are food products, therefore it is assumed that their role as vectors of food borne illnesses is negligible. The last box omitted is “Livestock-related illnesses” and refers to diseases like brucellosis that are more common among humans that are in close contact with animals, which is not applicable in this case.

### ***3.3.6 Limitations of the study***

One of the main limitations of this study lies on the fact that it uses secondary data to describe the health impact of cotton and/or tobacco cultivation in the health of Mozambican farmers. By using secondary data the study could be prone to bias due to different reasons. First, if the search strategy was not extensive enough, relevant information may not have been retrieved tending to skew the vision of reality presented in this review. Second, in case there was lack of information about the health impact of cotton and/or tobacco cultivation in the target population, studies from similar populations/settings were included. Although this substitution is not expected to create major bias, its effects cannot be denied. Finally, little information was found about the social responsibility role of national and multinational companies contracting SH cotton and/or tobacco farmers in Mozambique. It is not strange that big companies count with programs that somehow help the local communities where they operate (i.e. building schools, assisting the public health system, etc). The lack of this particular information can somehow reduce the weight of the positive effects of cash crop cultivation on the health of Mozambican farmers and bias the results.

## CHAPTER 4: Study results

### 4.1 The cotton and tobacco sector

#### 4.1.1 Producers and labour

All cotton and at least half of the tobacco produced in Mozambique is grown by SH farmers (Benfica *et al* 2005; Broughton *et al* 2006). In 2007, around 300,000 farmer families were involved in cotton and tobacco cultivation. This was equivalent to 7.7% of all farmer HHs in the country (MINAG 2007). Due to better geographical conditions, these crops are mainly grown in the Central and Northern part of the country. However, the different climate requirements of each crop avoid major overlaps.

Table 5. Smallholders growing cotton and tobacco in Mozambique - 2007.

		Smallholders cultivating cotton	Smallholders cultivating tobacco
North	Niassa	4,484 (2.3%)	30,789 (14.5%)
	Cabo Delgado	57,254 (14.0%)	3,681 (0.9%)
	Nampula	34,598 (4.6%)	5,265 (0.7%)
Central	Zambezia	20,939 (2.6%)	20,133 (2.5%)
	Tete	39,048 (11.7%)	29,036 (8.7%)
	Manica	13,166 (4.8%)	3,292 (1.2%)
	Sofala	15,362 (7.9%)	1,361 (0.7%)
South	Inhambane	3,173 (0.1%)	635 (0.2%)
	Gaza	0 (0.0%)	0 (0.0%)
	Maputo	0 (0.0%)	0 (0.0%)
<b>NATIONAL</b>		<b>184,572 (5.1%)</b>	<b>94,096 (2.6%)</b>

Source: (MINAG 2007)

The comparison of HHs involved and not involved in cotton and tobacco cultivation shows that: a) grower HHs tend to be slightly larger than non-grower ones, b) less female headed HHs are seen among growers, c) the age composition within the HHs is similar among both groups, d) compared to non-growers, HH heads in tobacco settings tend to be more educated, while in cotton settings it is the opposite, e) school enrolment of children seems to be better among non-grower HHs (Benfica *et al* 2005).

Table 6. Characteristics of households involved and not in cotton and tobacco cultivation in the Zambezi Valley, Tete, Mozambique – 2004.

	Cotton areas		Tobacco areas	
	Growers	Non-growers	Growers	Non-growers
Household size (n people)	5.9	5.6	6.0	5.6
Female headed (% households)	5.4%	9.4%	4.2%	15.6%
<b>Age structure (% people)</b>				
<= 9 years	30.6%	31.3%	30.7%	26.8%
10-19 years	23.4%	21.3%	29.1%	27.3%
20-29 years	10.6%	23.8%	17.3%	19.7%
30-39 years	14.3%	9.5%	10.7%	13.2%
40-49 years	10.1%	8.3%	7.4%	9.5%
50-59 years	7.5%	2.0%	2.8%	1.9%
>=60 years	3.5%	2.2%	1.8%	1.4%
<b>Education</b>				
HH head with >5 <sup>th</sup> grade (% of HH)	11.1%	25.0%	28.5%	25.0%
HH members with >5 <sup>th</sup> grade (% of adults in HH)	14.3%	17.7%	18.7%	25.1%
<b>School attendance</b>				
Children in school (%)	64.2%	74.7%	59.5%	69.4%
Missed school (%)	45.7%	37.8%	40.0%	26.9%

**Source:** Adapted from (Benfica *et al* 2005)

Three types of labour predominate within SH farms: **a) Family labour**, referring to the work done by members of the HH that owns the land, **b) Temporary hired labour**, referring to the work done by paid workers hired for a specific and usually short task, and **c) Permanent labour**, referring to the labour done by paid workers fully dedicated to the cotton or tobacco fields.

Most of the work done in SH farms is family labour. The role of temporary and permanent workers is secondary and varies according to the type of crop. Women are highly involved in the farming activities except as permanent labour. The role of children in farming activities is not clear as it varies from report to report (Benfica *et al* 2005; Muianga 2005; ECLT 2006; MINAG 2009). This variations could be in relation with the legal implications that child labour have in Mozambique.

Table 7. Type and composition of labour in smallholder farms in the Zambezi Valley, Tete, Mozambique - 2004.

	Cotton farms			Tobacco farms		
	Family labour	Temporary hired labour	Permanent labour	Family labour	Temporary hired labour	Permanent labour
<b>Distribution of labour</b>	77%	21%	2%	62%	9%	29%
<b>Composition by type of labour</b>						
Children	2.9%	0.2%	0%	1.6%	0.2%	0.1%
Women	41.8%	43.8%	25.0%	36.8%	38.7%	6.6%
Men	55.3%	55.9%	75.0%	61.6%	61.1%	93.3%

**Source:** Adapted from (Benfica *et al* 2005)

Regarding the place of origin of workers, individuals hired as permanent workers in cotton fields usually come from nearby areas (i.e. same village or district). For tobacco workers the situation is different as it is common to see individuals coming from other districts, provinces or even countries. Benfica *et al* (2005) reported that up to 52% of tobacco farms hired permanent workers coming abroad. The main origin of foreign labour was Malawi, as 44% of farms had employees coming from that country.

If it happens, locally hired labour tends to be composed by subsistence farmers coming from nearby areas. Locally hired labour is mainly seen during the months where food reserves of subsistence farmers start getting empty (from October until December) (Peters & Herrera 1987; FEWS NET Mozambique 2008). By hiring labour, SH farmers can also transfer some of the health risks associated with cotton and tobacco cultivation to their workers and their families.

In cotton farms, the members of the HH perform most of the hard physical labour and pesticide application. Temporary hired labour is left for specific activities like weeding or harvesting. On the other hand in tobacco farms, hard physical labour is shared between the HH members and permanent workers, while pesticide application is mainly done by the latter (Benfica *et al* 2005). Disparities in the availability of money and in the amount of work may be behind the differences observed in the division of labour between cotton and tobacco farms.

Table 8. Division of labour within smallholder farms growing cotton and tobacco in the Zambezi Valley, Tete, Mozambique - 2004.

	Cotton farms			Tobacco farms		
	Family labour	Temporary hired labour	Permanent labour	Family labour	Temporary hired labour	Permanent labour
<b>Involvement with</b>						
Physical labour	High	Medium*	Low	High	Medium**	High***
Applying pesticides	High	Low	Low	Medium	Low	High

**Source:** Adapted from (Benfica *et al* 2005)

\* Mainly in weeding and harvesting

\*\* Mainly in land clearing

\*\*\* Except from land clearing

#### **4.1.2 Farming practices and technologies**

The low-technology practices utilized for cotton and tobacco cultivation in Mozambique make these activities highly dependent on human labour. SHs growing cotton and tobacco hardly use animal or mechanical traction to plough the land. Seeding, weeding, harvesting and other process related activities are done manually (Benfica *et al* 2005).



The use of pesticides in Mozambique is mainly limited to the cultivation of CC. Nationwide, only 3% of SH farmers use pesticides on their fields (MINAG 2009). This is in great contrast with the almost 100% of cotton and tobacco farms relying on these chemical inputs to improve the quality and quantity of their yields. Surprisingly, food crops (FC) grown by the same SHs producing cotton or tobacco are not treated with pesticides. The most common pesticides used in cotton and tobacco cultivation in Mozambique are: Pyrethroids (i.e. Cypermethrin<sup>®</sup>), Organophosphates (i.e. Acephate<sup>®</sup>), Lambda-cyhalothrins (i.e. Karate<sup>®</sup>), Carbamates and copper (Benfica *et al* 2005). Apart from copper (used as fungicide), all chemicals mentioned earlier are used for its insecticide properties. According to the WHO pesticide classification, these substances are either of moderate or high hazard (WHO 2005). Fertilizers are mainly used to improve the yields of tobacco fields (Benfica *et al* 2005).

Table 9. Use of non-human traction and chemical inputs among smallholder farmers in the Zambezi Valley, Tete, Mozambique - 2004.

	<b>Cotton farms</b>	<b>Tobacco farms</b>
<b>Proportion using (%)</b>		
Animal traction	5.7%	7.7%
Mechanical traction	1.2%	0%
Pesticides	95.0%	97.4%
Fertilizers	0%	100%

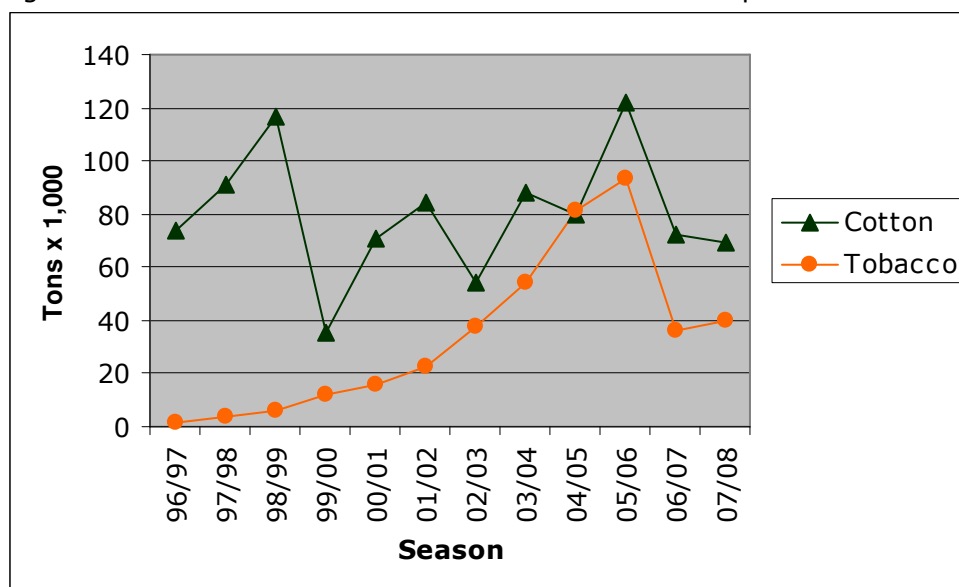
**Source:** (Benfica *et al* 2005)

Most –if not all- inputs (i.e. seeds, pesticides, fertilizers, etc) used by SHs each season come from contracting companies (explanation of contracting company under the subtitle “Agricultural policies”). This dependence reflects the SH’s lack of starting funds and the need for an independent network of dealers for non-chemical and chemical inputs in the country (Benfica *et al* 2005).

### 4.1.3 Outputs and income

The national production of cotton has seen many ups and downs in Mozambique. Tobacco production, on the other hand has boomed in the last decade. Adverse climatic factors were responsible for a major downfall in production of both crops in the season 2006/07 (IAM 2009).

Figure 2. Production of cotton and tobacco in Mozambique: 1996 – 2008.



Source: (Benfica *et al* 2005 ; IAM 2009 ; MINAG 2009)

Income resulting from cotton and tobacco cultivation varies widely among SHs. The range of this variation is in fact so wide that it goes from net losses to considerable gains, depending mainly on the yield obtained at the end of the season. Greater differences in financial outcomes are seen among tobacco growers than among cotton ones. Although more profitable CC are available in Mozambique, SHs tend to keep choosing cotton and tobacco. This preference is mainly due to a general perception that these crops have secure markets in the country (Broughton *et al* 2006).

Table 10. Return per hectare cultivated with cash crops in Mozambique - 2004.

Type of crop	Return per hectare cultivated (US\$)
Cotton	-23 to 130
Tobacco	-78 to 521
Groundnuts	200
Paprika	215
Sesame seeds	161

Source: ((Benfica *et al* 2005 ; Broughton *et al* 2006)

On average, HH income per capita for cotton growers in 2004 was US\$ 128, while for tobacco growers it was US\$ 223. On both cases, the economic benefit was between 8% and 12% larger than the one seen in neighbouring farmers not involved in the cultivation of these crops (Benfica *et al* 2005).

#### **4.1.4 Policies and commercial agreements**

The production and trade of cotton and tobacco in Mozambique is organized through a concession system. Under this scheme, private or semi-private companies receive exclusive buying rights (monopoly) for a specific product in a defined geographical area. This means that SHs growing cotton or tobacco are obliged to sell their crops to a company designated by the government (Broughton *et al* 2006).

At a lower level, SHs and companies work together under a contract farming system. This is, companies contract small-scale farmers to grow cotton or tobacco in exchange of inputs (i.e. seeds, fertilizers, pesticides, etc), extension services and the promise of buying the production at the end of the season. The inputs are provided as a form of credit that is usually paid back once the farmer sells the harvest to the company. Thus, the farmer gets in return an amount of money that equals the total price of the crop produced minus the credit received from the company at the beginning of the season. Additionally, contracting companies are expected to give technical assistance to the farmers. This support is not only intended to improve the yields of the CC but also to prevent situations where food insecurity and/or environmental damage can affect the SH HH (Broughton *et al* 2006).

Chemical inputs like fertilizers and pesticides are partially controlled in Mozambique. Contracting companies are obliged to import their supplies through a network of licensed agencies. However, little or no control exists regarding the amount of chemicals distributed to the farmers (Benfica *et al* 2005; Broughton *et al* 2006). Therefore, there is hardly any information available about the amount of inputs provided to the farmers or about the quality and quantity of technical support given (Broughton *et al* 2006).

It is important to realize that through the contract farming system most – if not all- economic and health risks associated to the production of cotton and tobacco are transferred from the contracting companies to the farmers. In theory, this misbalance should be corrected with interventions done by the social responsibility components of the companies.

Finally, the negotiations for the minimum price that companies utilize while buying cotton and tobacco from the producers differs according to the crop. In the case of cotton, the government has an active role by monitoring the negotiations and publishing the official prices.

Unfortunately, due to a lack of information of the market and to a limited negotiating power, SH farmers have little influence on the final price of cotton. This could be one of the reasons why the Mozambican cotton is among the cheapest of the region (Broughton *et al* 2006). In the case of tobacco, the government has no active role in the negotiations or establishment of the final price. In both cases the minimum price for the raw product is set well in advance of the harvest.

See appendix 4 for a list with the main companies working with concessions of cotton and tobacco in Mozambique.

## 4.2 Direct impact on health

### 4.2.1 Occupational health risks

#### 4.2.1.1 Exposure to pesticides

Pesticides entering the human body are harmful and can lead to death. The effects and complications seen with pesticide intoxication vary depending on the type of pesticide, quantity absorbed and duration of exposure. While some of the effects tend to disappear in a short time, others can remain as permanent handicaps for the individual (WHO/UNEP 2006). Non-organic effects of pesticides also include psychological disturbances that in association with other socio-economic factors (i.e. poverty) can lead to increased suicides rates (Riza *et al* [no date]).

Table 11. Complications due to exposure with commonly used pesticides.

<b>Acute effects</b>	<b>Neurotoxicity:</b> Including blurred vision, dizziness, headache, limb weakness or numbness, salivation, seizures, tremor
	<b>Gastro-intestinal toxicity:</b> Including nausea, vomiting, abdominal pain, diarrhoea
	<b>Skin and eye toxicity:</b> Including skin rash and eye irritation
	<b>Respiratory toxicity:</b> Including coughing, sneezing, and difficult in breathing
<b>Long-term effects</b>	<b>Development of cancer:</b> Including leukaemia, lymphoma, brain, testicle and colon cancers, and soft-tissue sarcoma
	<b>Reproductive toxicity:</b> Including changes in the capacity to reproduce (fertility) and alterations in the growth and development of unborn children
	<b>Endocrine disruption:</b> Affecting the normal balance and function of hormones and glands in the body (i.e. thyroid and estrogenic systems)
	<b>Neurotoxicity:</b> Including changes in the function of neurotransmitters and by killing cells of the nervous system (neurons)
	<b>Immune toxicity:</b> Resulting in a variety of outcomes ranging from immunosuppression to autoimmune responses (i.e. allergy, asthma, rheumatoid arthritis, etc)

Source: (WHO/UNEP 2006)

Although poisonings are reportable events within the Mozambican national health information system, little is known about the occurrence of these events. During the literature review, no studies or reports were found about acute or chronic pesticide intoxication in Mozambican farmers. Despite the lack of information, and based on results coming out from studies of the same region, we know that acute poisoning is not a rare event among farmers.

A study performed by Ohayo-Mitoko (1997) in subgroups of farmers in Kenya (including cotton and tobacco growers) reported a prevalence of symptoms associated to pesticide exposure of 40% (Ohayo-Mitoko 1997). Another study among Zimbabwean cotton farmers also showed that symptoms associated with acute pesticide poisoning are not uncommon. Sixty-one percent (61%) of farmers complained of skin rash, 32% of eye irritation, 15% of dizziness and 10% of gastro-intestinal complaints (Maumbe & Swinton 2003).

The adverse effects of pesticides are not only limited to the workers on the fields. Due to the multiple ways pesticides can be transported through the environment (See figure 3), relatives of farmers and other people living in the surroundings of the farms are also at risk. A study performed in Iowa (USA), showed that traces of pesticides could be easily found in the houses of farmers and in biological samples of their relatives. This happened despite the fact that people were educated, protective gear was readily available (i.e. from gloves and boots to spraying tractors with closed cabins) and that no pesticides were stored in the houses (Curwin 2006).

Figure 3. Sources of exposure of pesticides.

<p><b><u>Inhalation</u></b></p> <ul style="list-style-type: none"> <li>• Spray drift</li> <li>• Dust suspension</li> </ul>	<p><b>INDIVIDUAL AT RISK</b></p>	<p><b><u>Dermal</u></b></p> <ul style="list-style-type: none"> <li>• Direct contact</li> <li>• Soil/Dust</li> <li>• Contaminated surfaces</li> </ul>
<p><b><u>Direct ingestion</u></b></p> <ul style="list-style-type: none"> <li>• Contaminated food</li> </ul>		<p><b><u>Indirect ingestion (hand-mouth)</u></b></p> <ul style="list-style-type: none"> <li>• Soil/Dust</li> <li>• Contaminated surfaces</li> </ul>

**Source:** Adapted from (Curwin 2006)

A proxy for the impact on health of farmers due to pesticide intoxication can be the costs of healthcare due to this problem. Farmers experiencing acute intoxication with pesticides use an important part of their resources in order to pay for healthcare. According to Maumbe & Swinton (2003), ill cotton farmers in Zimbabwe used the equivalent of 3 to 5 days of salary to pay for health costs due to pesticide intoxication. In addition, farmers also required 2 to 4 days away from the fields in order to recover from the illness. Knowing that pesticide intoxication is a relatively frequent event, these high costs do not only harm the HH economy but can

prevent farmers from using health services. This is reflected by the fact that only 3% to 7% of the cotton farmers in Zimbabwe (Maumbe & Swinton 2003) and 25% of the farmers in Kenya (Ohayo-Mitoko 1997) seek care once they realized they were ill.

Although the above shows that in these cases the economic burden for the family is high, the calculations are not complete. Maumbe & Swinton (2003) did not include in the equation a) health costs of other members of the HH affected by pesticides, b) costs of traditional medicines used to treat complaints, c) economic opportunities lost while someone from the HH stayed at home taking care of the sick farmer, and c) costs associated with chronic diseases that may appear in the future. By including these factors in the equation it is likely that the health costs would increase even more.

In general, most of the literature available worldwide about pesticide intoxication refers to acute events. Little exists, especially from Africa, about long-term complications of pesticide exposure.

Awareness of the health effects of pesticide exposure, protective gear (i.e. gloves, boots, aprons, etc) and general safety measures (i.e. hand washing, changing and washing clothes, etc) are means that help to reduce the risk of pesticide intoxication. Unfortunately, Mozambican farmers are not fully benefiting from this reduction of risk. A study performed in cotton SHs from Nampula (Northern Mozambique) showed that although farmers were knowledgeable about the use of protective gear during spraying, their understanding about the health problems associated with pesticide exposure was very low. This was specially the case among young farmers and in individuals who received information/training in a language different from the local one (Jones *et al* 2002). This limited understanding about the dangers of pesticides can lead to dangerous situations like the ones described by Rother (2000) in South African cotton farmers. In this study old pesticide containers were reused to store food and water, farmers ate weeds and other vegetables directly from pesticide treated fields, pesticides were stored in "safe places" next to food products, and people did not manage to identify dangerous situations apart from the ones specifically described in the product package.

The study of Jones *et al* (2002) from Nampula also suggests that farmers may opt for practices that can be harmful for their health (i.e. decide not to buy protective gear for spraying) in exchange of higher economic benefits for the HH. This could correlate with the findings of other studies, compared in the table below, where only employees of big-scale commercial farms would seem to use regularly protective gear.

Table 12. Comparison of protective gear use in different agricultural settings from Kenya and South Africa.

<b>Study</b>	<b>Ohayo-Mitoko (1997)</b>			<b>Naidoo et al (unpublished)</b>	
Country	Kenya			South Africa	
Population	Workers of commercial farms	Small subsistence farmers	Small subsistence farmers	Small subsistence farmers	Small subsistence farmers
Labour type	Hired	Independent	Independent	Independent	Independent
Pop. size (n)	106	24	30	116	230
Product	Flowers	Subsistence + cotton	Subsistence + tobacco	Subsistence + cotton	Subsistence + cotton
<b>Proportion using protective gear while handling pesticides (%)</b>					
Boots	95.3%	7.1%	0%	68.1%	33.9%
Gloves	84.9%	0%	0%	19.8%	20.0%
Coat/Overall	84.8%	7.1%	0%	29.3%	27.4%
Mask	49.1%	0%	0%	15.5%	11.7%
Eye goggles	-	-	-	3.4%	6.9%

**Source:** Adapted from (Ohayo-Mitoko 1997; Naidoo [unpublished])

Although no information was found about utilization rates of protective gear among Mozambican SHs, the table also shows that in other countries of the region they are generally low. Moreover, Maumbe & Swinton (2003) compared the use of protective gear among SH cotton farmers in two different districts of Zimbabwe. The proportion of farmers per district spraying without any protective gear was 4% and 34%. Unfortunately, no detailed information is given about the farmers who used some type of protection. The difference seen between both districts was attributed to the presence of a farming school operating in the district with the best practices.

#### **4.2.1.2 Green tobacco syndrome**

This term refers to an acute nicotine intoxication that can affect tobacco farmers. Nausea, vomiting, dizziness and headaches are characteristic of this illness. The intoxication occurs when nicotine present in wet tobacco leaves is absorbed by the skin of the farmer during direct contact. Although the disease is not lethal, the symptoms can be severe and persistent (McBride et al 1998; Riza et al [no date]).

Table 13. Main characteristics of green tobacco syndrome.

	<b>Description</b>
<b>Cause</b>	Acute nicotine intoxication due to contact between exposed skin and wet tobacco leaves
<b>Signs and symptoms</b>	Nausea, vomiting, dizziness, headache, weakness, abdominal cramps, shortness of breath, pallor, diarrhoea, chills, fluctuation of blood pressure and hearth rate, increased salivation and perspiration
<b>Natural history</b>	Latency 3 to 17 hours; self limiting in 12 to 72 hours
<b>Treatment</b>	Rest, rehydration and symptomatic treatment
<b>Prevention</b>	Water resistant gear (i.e. gloves, clothes, boots, etc)

**Source:** (Riza et al [no date])

It is estimated that during a normal day of work a farmer can absorb as much as 9mg of nicotine (equivalent to 6 cigarettes). Absorption is facilitated when leaves are in contact with thin skin (i.e. skin of the arm pit during harvest of leaves) or if skin lesions or rash (reported by up to 45% of tobacco workers) (Ueda *et al* 1987) are present in the exposed area.

Children are particularly vulnerable to this problem due to their thinner skin and their low tolerance to nicotine (McKnight & Spiller 2005). Pregnant women form another susceptible group, as periodic exposure to nicotine is known to affect the normal development of the foetus (i.e. lungs, cardiovascular system, etc) and is associated to spontaneous abortion and low weight at birth (HCN 2004).

Little is known about this illness in African settings. During the literature review, no studies were found about green tobacco syndrome in Mozambique. However, the available literature (mainly from the USA and Asian countries) reports that between 9% and 89% of tobacco farmers are affected each season (Parikh *et al* 2005; Schmitt *et al* 2007). A study from Vietnam comparing farmers growing and not growing tobacco, showed significant differences in the number and type of health problems experienced by each group. Tobacco growers were 3.5 times more likely to present health complaints than non-growers (95% CI: 1.5;8.0). According to the authors, these self-reported problems were mainly due to green tobacco syndrome, although intoxication with pesticides and hard physical labour may also played a role (Hoang Van Minh *et al* 2009).



Table 14. Health complaints experienced by growers and non-growers of tobacco in Vietnam.

<b>Signs &amp; symptoms</b>	<b>Tobacco growers</b>	<b>Non-growers</b>	<b>P value</b>
<b>Tiredness/Weakness</b>	90%	77%	<0.001
<b>Nausea</b>	29%	19%	<0.001
<b>Vomiting</b>	11%	13%	*
<b>Dizziness</b>	59%	63%	*
<b>Headache</b>	78%	73%	*
<b>Abdominal pain</b>	28%	34%	<0.05
<b>Insomnia</b>	56%	50%	*
<b>Difficult in breathing</b>	24%	21%	*
<b>Increased perspiration</b>	67%	28%	<0.001
<b>Chills</b>	21%	12%	<0.001
<b>Increased heart rate</b>	27%	20%	<0.05
<b>Pallor</b>	17%	13%	*
<b>Increased salivation</b>	12%	8%	<0.05
<b>General pain</b>	86%	80%	<0.05
<b>Lack of appetite</b>	48%	33%	<0.001
<b>Skin rash/Itching</b>	23%	14%	<0.001

Source: (Hoang Van Minh *et al* 2009)

\*P value > 0.05

Despite the lack of information from Mozambique, it is plausible to assume that green tobacco syndrome exists in the country, specially if the utilization rates of protective gear (i.e. gloves, overalls) among Mozambican farmers are as low as in other African settings (Ohayo-Mitoko 1997; Tørres 2000; Naidoo [unpublished]).

#### **4.2.1.3 Respiratory illness due to tobacco curing**

Also called “tobacco worker’s lung” this is an inflammatory condition that affects the lungs of the people involved in the process of curing (drying) tobacco. It resembles a chronic obstructive pulmonary disease (COPD) and it presents acutely with fever, chills, muscular pain and headache. If the exposure with dust, smoke and fumes persists, continuous cough, fatigue and weight loss may appear indicating the presence of irreversible damage of the lungs (fibrosis).

This occupational health problem is probably also present in Mozambique, as SHs are responsible for the curing of tobacco. Because this activity is done at HH level, not only men are at risk of the “tobacco worker’s lung”. A study from Mozambique reported that children participate actively in the curing process while another one from Malawi reported that women and children are the ones in charge of keeping the fires of the curing structures alive (ECLT 2006; Otañez 2008). If this is the case, children and women chronically exposed to dust, smoke and fumes from curing activities are also likely to develop lung problems. Once at this point, children may present impaired development, while adults will have to cope with a diminished capacity to perform physical activities. In all groups chances for respiratory infections will increase.

#### 4.2.1.4 Musculoskeletal pain

Muscular pain is a common complaint observed in the general population worldwide. However, individuals performing intensive labour (i.e. agricultural workers) tend to suffer more from it (Holmberg *et al* 2003; Naidoo *et al* 2009).

The physical risk factors associated with these types of complaints include a wide spectrum of activities that range from complete inactivity to intense exercise. Cotton and tobacco cultivation requires movements and positions that place the farmer at higher risk of acquiring muscular pain.

Table 15. Risk factors for muscular pain in cotton and tobacco farmers.

	<b>Cotton cultivation</b>	<b>Tobacco cultivation</b>
<b>Carrying heavy loads</b>	Pesticide application, harvesting, bailing	Pesticide and fertilizer application, harvesting, wood for curing, bailing
<b>Driving heavy vehicles</b>	Tractor	Tractor
<b>Long periods of work in sedentary positions</b>	-	Stringing*, sorting, curing
<b>Operating vibrating tools</b>	-	-
<b>Repetitive movements</b>	Seeding, weeding	Seeding, weeding, stringing*, sorting
<b>Working with hands above shoulder level</b>	Harvesting	-
<b>Working with hands below knee level**</b>	Preparing land, seeding, weeding	Preparing land, seeding, weeding, suckering***, harvesting

**Source:** Risk factors adapted from (Burdorf & Sorock 1997; Cote 2008; Naidoo *et al* 2009)

\*Stringing refers to the process of tying together tobacco leaves before curing

\*\*Includes bent, squatting, kneeling

\*\*\* Suckering refers to the process of cutting the flower of the plant to promote growth of the leaves

No studies reporting musculoskeletal pain among Mozambican cotton or tobacco farmers were found. However, a study comparing complaints among female cotton growers from two different agricultural settings (irrigated vs. dry lands) in South Africa was retrieved. Sixty-seven percent (67%) of the women reported pain in either the upper extremities, lower extremities or in the back, while 28% presented problems in all three areas. Approximately half of the women (42.8% to 48.3%) reported pain lasting more than 3 months. The main factors associated with chronic pain were: age >40 years, carrying heavy loads, working with hands above shoulder level, and frequently squatting and kneeling. These findings correlated with others reports coming from developing countries (Naidoo *et al* 2009).

Most of the women included in the South African study were involved in cotton cultivation. However, their easier access to animal and mechanic traction for ploughing the land (40% to 68% doing manual ploughing in

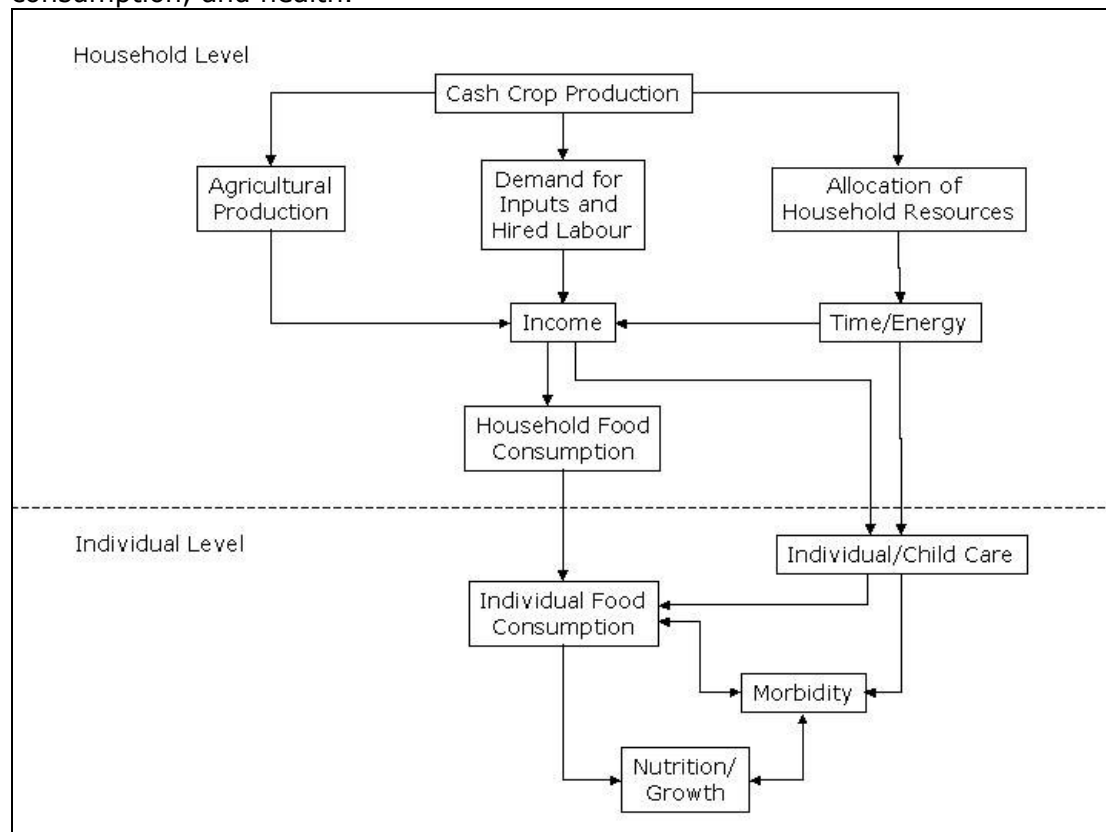
South Africa vs. 92% to 93% in Mozambique) can make us believe that their working conditions were somehow better than the ones of Mozambican farmers. Therefore, it is possible to think that the prevalence of muscular pain among Mozambican farmers could be higher than the findings reported in this study.

### 4.3 Indirect impact on health (socio-economic, cultural and environmental factors)

#### 4.3.1 Undernutrition and food security

Cultivation of CC can affect the nutritional status and food availability of farmer families through a variety of paths, as graphically shown below. Variations in the income of the HH can bring better/worse access to food products sold in markets. Changes in the amount of land assigned for food production (and not yet used for CC) result in increase/decrease of the food reserves available for the family. Individuals working for longer periods in the fields can have less time available for themselves and for caring and feeding children. Longer hours at work (compared to the ones required for FC) can increase the energy requirements of farmers and their families (Kennedy *et al* 1992).

Figure 4. Relationship between commercial agriculture and production, income, consumption, and health.



Source: Adapted from (Kennedy *et al* 1992)

Food availability is not a simple issue for farmers in Central and Northern Mozambique. Even if year after year these regions produce a surplus of food products, paradoxically food insecurity is not uncommon among farmer HHs. The Agricultural HH Survey (TIA) of 2007 shows that almost one third (27%) of SH farmers in Mozambique passed through periods of hunger within 12 months before the survey (MINAG 2007). This seems like an apparent improvement in comparison to the 38% of HHs who suffered from food scarcity in 2005 (MINAG 2005b). Accordingly, other national surveys report that 46% of children from rural areas present signs of chronic malnourishment (stunted) while 10% of adult women have a body mass index (BMI) below 18.5kg/m<sup>2</sup> (MEASURE DHS+/ORC Macro 2005). It is unclear however, to which extent these results reflect poor availability of food, HIV/AIDS infections or a combination of both. Reasons behind the problem of food insecurity could include: **a) insufficient yields** as a consequence of low-tech farming practices, small farm sizes, and adverse climatic factors (i.e. rain patterns), **b) larger family sizes**, spreading the little available resources among more people, **c) high food prices**, impeding them to buy food items in case of need, and **d) generalized poverty**, forcing people to sell crops in order to cover other needs (i.e. health, education), and deterring the improvement of their farming techniques (Peters & Herrera 1987; Van den Broek 2007; Boughton & Donovan 2008).

Due to the normal characteristics of agricultural cycle and to limited yields, the amount of food available for farmer families in Mozambique is not constant across the year. While food requirements may be covered immediately after harvest, hunger tends to reappear once food stocks get empty. Interestingly, some micronutrients required for the normal function of the body would seem to be permanently in deficit. This was described by Rose & Tschirley (2000) as cited by Bias & Donovan (2003).

Table 16. Frequency of low nutrient intakes in Nampula and Cabo Delgado (Northern Mozambique) by season.

Nutrient	Percent of individuals with low intake (<75% of daily recommended amount)			
	All seasons	Harvest season	Post-harvest season	Hungry season
Calories	41%	40%	25%	58%
Proteins	24%	10%	8%	55%
Vitamin A	91%	93%	98%	82%
Iron	38%	39%	20%	54%

Source: (Rose & Tschirley 2000) as cited by (Bias & Donovan 2003)

In theory, CC should allow SHs to escape this state of almost constant hunger. Cotton and tobacco farmers in Mozambique and Malawi for example, grow FC in parallel with CC. This practice allows them to cover most of the food requirements of their HH (up to 80%) while the financial income serves as protection layer against situations of food insecurity. Occasional surpluses of food serve also as "in kind" payment for hired labour, services and other products. Extra income allows them to

purchase more expensive food products (i.e. meat, fruit, fish, drinks) covering potential micronutrient deficiencies (Peters & Herrera 1987; MAP/MSU Research Team 1997; Benfica *et al* 2005). Small holders growing cotton or tobacco in Mozambique also benefit from hybrid maize and fertilizer for 0.5 hectare, and extension services provided by some contracting companies. And finally, it has been reported that maize yields of Mozambican cotton and tobacco growers tend to be larger than the one of non-growers. This maybe due to the rotation of crops and the use of fertilizers in the soil (MAP/MSU Research Team 1997; Benfica *et al* 2005; IAM 2007).

In spite of the aspects explained, no clear consensus exists about the net effect of cash crop cultivation over the nutritional status and food security of farmers. Behind this lack of agreement lie the complex interactions that link cash crop cultivation and nutrition/food security. Studies from Kenya and Malawi present the stories of tobacco farmers not having enough time to grow their own food, having economic losses after each season and suffering from high malnutrition rates mean while tobacco production remains stable (Campaign for Tobacco-Free Kids 2001; Otañez 2008). On the other hand, an analysis of 6 studies performed in farmers from different developing countries show that cash crop cultivation does increase the income and availability of calories (food) of the HHs. However, no improvements in the health (as reduction of morbidity) or nutritional status of its members could be found when comparing the results with individuals not growing CC (Kennedy *et al* 1992).

Results from different studies would seem to indicate that the nutritional status of children from HHs growing CC not does necessarily change in spite of a greater availability of food and calories. It would seem that internal and external factors other than the direct effects of cash crop cultivation alone are among the main forces affecting the nutritional status of farmer HHs.

In Mozambique, the main factors affecting the nutritional status of children under 1 year old coming from rural areas seem to be a mix of biological factors (i.e. age, sex) and the level of education and knowledge of healthcare of the mother. Once these children grow, a shift occurs and environmental hygiene and food safety become more important factors (Garret & Ruel 1999; Van den Broek 2007). These results correspond to the ones found in another study from Malawi. In this study, children coming from HHs growing tobacco did not manage to improve their nutritional status despite a higher availability of calories. The author suggested that the high prevalence of diseases like malaria, respiratory infections, and diarrhoeal diseases acted as a barrier preventing their nutritional recovery (Peters & Herrera 1987; Van den Broek 2007).

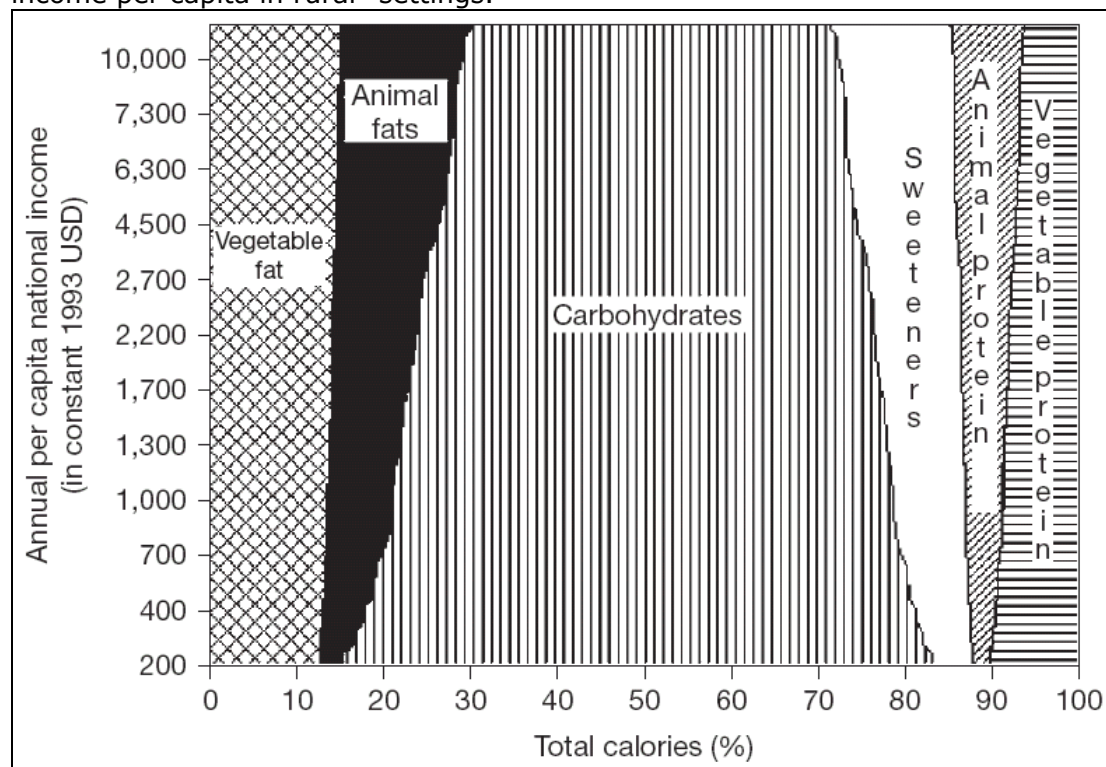
### **4.3.2 Non-communicable or chronic diseases**

In developing countries, infectious, maternal and perinatal conditions are still responsible for most of the burden of disease (WHO 2004). However, the impact of chronic diseases in these countries is growing at an accelerated pace. While in 2002, 46% of deaths in developing countries were due to chronic diseases, recent estimates calculate that this proportion could reach 59% by the year 2030 (Stuckler 2008). Several factors, including aging populations, shifts in patterns of disease and variations on people's behaviour are behind this transformation.

Ahead in the list of chronic diseases responsible for the highest morbidity and mortality in the world are cardiovascular disease, cancer, respiratory diseases and diabetes (WHO 2004). All these diseases have in common a small set of risk factors (i.e. consumption of tobacco and alcohol, unhealthy diets, and sedentary life) that precede conditions like high cholesterol levels, high blood pressure and obesity, and that are associated with the development of chronic diseases. These risk factors tend to increase, among others, in poor populations experiencing the early phases of economic development (Du et al 2002; Stuckler 2008; Popkin 2009). Which in this case would be applicable to SH farmers commercialising CC.

Farmers benefiting from higher incomes have in theory a broader access to products in the market. If well spent, the extra resources can allow people to reach products and services that will lead them to a better and healthier life. However, this is not always the case. Extra incomes can also be -and are- used to purchase unhealthy items, like processed foods, sodas and cigarettes, as shown by the graphic below. The decision to do so, is not always an informed and conscious one as people from rural areas tend to be highly susceptible to marketing campaigns that associate unhealthy products to social status and prestige (Stuckler 2008). Additionally, changes in income can also open the possibility to reduce the amount of physical activity performed by farmers, as wealthier HHs could opt to hire labour and decide to invest in animal or mechanical traction to plough the fields.

Figure 5. Relationship between the proportion of energy from different food sources and income per capita in rural\* settings.



Source: (Popkin 2009)

\*Rural setting was defined as 75% of the population living outside urban areas

In addition to unhealthy diets and lack of physical labour, tobacco farmers could also be at increased risk of starting to use products containing tobacco. The higher risk does not only come as a consequence of easier access to raw material (tobacco leaves) but is also linked to the fact that smoking cigarettes is believed to rise the tolerance to nicotine and therefore to reduce the effects of green tobacco syndrome (McBride et al 1998; Arcury & Quandt 2006). If this is the case, farmers will be encouraged to start smoking in order to prevent discomfort and sickness while working in tobacco fields.

No information was found about the long-term effects seen in individuals exposed chronically to nicotine through the skin. Therefore it is uncertain, if chronic levels of nicotine in blood have any effect in smoking patterns of tobacco workers.

Most of the rural population in Mozambique, including some SHs growing cotton and tobacco, do not count with enough economic resources to be able to choose for unhealthy options. Therefore, HHs are mainly limited to consume food products grown by them (i.e. maize, groundnuts, manioc) and to do high amounts of physical activity while working the land. This suggests that the risk of developing chronic diseases linked to unhealthy diets and low exercise levels in rural Mozambique is still low.

No studies were found about risk factors, prevalence or incidence of chronic diseases in SHs growing cotton and tobacco in Mozambique. A study in SH tobacco farmers from Malawi reported that extra incomes coming from the commercialisation of CC were used to buy more nutritious food (i.e. meat, fish, fruits) but also to buy more drinks. In addition, HHs with better incomes reduced their consumption of grains, vegetables and roots (Peters & Herrera 1987).

Concerning the use of tobacco, a different study in HHs growing this crop in Malawi reported that at least 28% of the farmers interviewed stated to use tobacco products regularly (Tørres 2000). This would seem to be above the national prevalence of smoking in Malawian adults (> 18 years) reported by WHO (prevalence in men: 20.5%, 95%CI 18.2 to 22.9; women: 4.8%, 95%CI 3.5 to 6.0) (WHO 2003).

### **4.3.3 HIV/AIDS**

Complex socio-economic forces lie behind the spread of HIV/AIDS. Among those are the dynamics of wealth and poverty. Regardless of considerable amounts of research, no clear-cut answers exist about the net effects of wealth and poverty over the risk for HIV infection (Gillespie *et al* 2007). Wealthier populations seem to be at higher risk of acquiring HIV due to their increased mobility and higher chances for having multiple sexual partners. This could happen in spite of the theoretical protection that education and a better access to reproductive health services can provide them. On the other hand, the financial constraints that affect poor populations could force them into risky sexual behaviours (i.e. commercial sex work) (Wojcicki 2005; Mishraa *et al* 2007).

In settings where poverty is the norm, even small disparities in wealth can result in uneven distribution of power. According to Mosoba (2003), as cited by Arcury & Quandt (2006), HIV/AIDS prevalence rates rose in areas from Kenya where tobacco production was introduced. This increase was attributed among others, to sexual exploitation by farmers of landless women in search for means to survive. A similar situation was reported in Zambia by Byron *et al* (2006), where money from sugarcane farmers attracted local women to engage in sex. No studies were found about the influence of HH income on HIV infection in cotton and tobacco farmers in Mozambique. Therefore, it is unclear how these dynamics affect the risk of cash crop farmers in this country.

Mobile populations (migrants) are not only vulnerable to HIV infection but can also act as bridges by transporting the virus from high to low prevalence areas (Brockerhoff & Biddlecom 1999; Lurie 2006; Mmbaga *et al* 2008; Saggurtia 2008). Their particular vulnerability is associated to behavioural changes related to social disruption produced by different factors. Among them, the separation with their families, the loss of social control, and the exposure to new socio-cultural norms or to harsh



conditions (i.e. economic insecurity, exploitation) (Gillespie *et al* 2007; Mmbaga *et al* 2008).

A study in rural population from Zimbabwe showed that foreign agricultural workers had at least double the risk (OR 2.06; 95%CI 1.28-3.3;  $p=0.003$ ) of contracting HIV/AIDS than workers born locally. The risk of migrants was even higher for the ones who moved without their spouses and for the ones migrating later in life (>25 years old) (Cofee *et al* 2005).

Migrant populations are mainly found as permanent workers in tobacco farms from Mozambique. However, no studies were found reporting the risk behaviours or the prevalence of HIV/AIDS within this population.

#### **4.3.4 Environmental change**

The management of land, water and other natural resources is crucial for Mozambican SHs. With careful administration of their environment farmers can secure an almost endless supply of food, water, shelter and fuel. Careless management, on the other hand, can result in harsh conditions to live in.

The use of pesticides and fertilizers usually lead to bigger and better yields. However, their overuse can also bring problems. Excess of these chemicals tends to spill out of the fields contaminating the land and water sources, affecting not only humans but also all living creatures around. Residues of nitrogen-based fertilizers are among the most common contaminants of water sources worldwide. If drunk, polluted water can lead to nitrate poisoning (Hawkes & Ruel 2006a). Regarding pesticides, only a minimal fraction (0.1%) of the total volume applied worldwide reaches pests. The great majority remains in the environment affecting other creatures until degraded (Hawkes & Ruel 2006b).

Soil depletion is also a concern for SHs in Mozambique. Without proper care, intensified agriculture can drain nutrients from the soil leaving it arid and resulting in smaller harvests of food and non-food products. A particular nutrient-demanding crop is tobacco. In order to obtain leaves bigger in size and with greater contents of nicotine, farmers stimulate root and leave growth by removing the suckers (flowers). This leads to increased absorption of nitrogen, phosphorus and potassium from the ground (Campaign for Tobacco-Free Kids 2001). Fertilizers and crop rotation systems can be used to prevent soil depletion. However, farmers not willing/able to use these practices end spoiling the land and are forced to move constantly while searching for new fertile fields (Geist *et al* 2009).

Deforestation is another environmental problem that can affect the health of farmer communities. Woodlands and forests not only protect the land from erosion and desertification (Geist *et al* 2009) but also provide rural

families with fuel for cooking and heating, and with building materials for shelter. With less wood available, women and children are obliged to cover larger areas in order to collect some fuel (Otañez 2008). This not only increases the workload but also can turn women and children more vulnerable to the natural elements and to sexual violence.

Tobacco production is closely associated with deforestation as high amounts of dry wood are required to build and heat the barns for curing (drying) the leaves. It has been calculated that 20 Kg of dry wood are needed to cure 1 Kg of tobacco.(Heiler 2003) This translates into 140,000 hectares of woodlands being cleared every year in Southern Africa for drying the leaves (Campaign for Tobacco-Free Kids 2001). The situation in Mozambique is not better and it would seem that not only tobacco farmers but also cotton farmers are responsible for deforestation in their areas.

Table 17. Number of trees cut and planted by smallholders in the Zambezi Valley, Tete, Mozambique – 2003/2004.

	Cotton areas		Tobacco areas	
	Growers	Non-growers	Growers	Non-growers
Trees cut for land expansion (mean number per household)	313.8	40.1	425.3	118.5
Trees cut for other reasons (mean number per household)	78.4	138.0	174.6	57.7
Trees planted (mean number per household)	1.9	2.1	57.7	41.9

**Source:** Adapted from (Benfica *et al* 2005)

#### **4.3.5 Labour process: Child labour**

Agriculture is the most common economic occupation for children all over the world. Children start in this activity while being very young, some even at 5 or 6 years old (Gastal Fassa 2003; Riza *et al* [no date]). This should not be surprising, as children from developing countries have always been involved in HH and in agricultural activities. These practices, in limited amounts, are believed to be beneficial as they provide children with survival skills for the future while serving as an introduction to their role in the adult world (Tørres 2000; ECLT 2006). However, once adult activities take over the lives of children to the point of deterring their health, normal development, education, and in general their rights as human beings, problems appear.

Great discrepancies exist while comparing reports of child labour in cotton and tobacco farms in Mozambique. Some studies like the one of Benfica *et al* (2005) in cotton and tobacco farms from Tete province show that child labour accounts for less than 3% of all the work done in the fields. On the other hand, other studies like the one performed in tobacco farms from Tete and Niassa provinces report that on average 68% of children 6 to 14 years and 90% of the ones 15 to 17 years old do help with the crops (ECLT 2006). This lack of consistency can be associated to the legal implications of child labour in Mozambique (Muianga 2005). However, it is

likely that the proportion of children involved in agricultural work is in reality very high. According to the preliminary results of the national agricultural HH survey of 2008, 84% of individuals older than 10 years old in rural HHs of Mozambique are involved with agriculture (MINAG 2009). It is important to keep in mind that almost half of the population of Mozambique (45%) is younger than 15 years old (UNDP 2007).

Most of the times children start working in cotton and tobacco farms due to economic necessity. According to the study in tobacco HHs from Tete and Niassa, 39% of parents decided to put their children to work because they needed to increase the labour force in the fields. A smaller group (23%) replied that they wanted their children to learn from the experience. In general, few of the parents and children interviewed were aware of the health risks associated to tobacco cultivation (ECLT 2006). Cotton and tobacco cultivation require larger amounts of labour than regular FC (Benfica *et al* 2005). The extra work is necessary to secure the quality and quantity of the harvest and therefore the income at the end of the season. If it happens that the HH does not have financial means to hire labour, children are a readily available –and free– source of human power. Additionally, children can also increase the work force in the fields indirectly. Children substituting their parents in the day-to-day activities of the house (i.e. fetching water and firewood, caring for smaller children, etc), allow adults to spend more time in the fields.

Children working in tobacco farms in Mozambique and Malawi perform more or less the same jobs as adult workers. This situation places them facing health risks that are equal or higher than the ones of their adult counterparts. While the amount of responsibilities and tasks in the production of tobacco increase with age, little difference exists between boy and girls. Additionally to the work in the fields, children (and specially girls) are also expected to help at home. Therefore, it is not surprising that 46% of children in Malawi reported pain or tiredness during or after their work (Tørres 2000; ECLT 2006). No information was available about health problems in children working in cotton or tobacco farms in Mozambique.

Table 18. Children's involvement in household activities and tobacco production, Malawi – 1999.

Activities	5 to 9 years		10 to 14 years		15 to 18 years	
	M	F	M	F	M	F
<b>Tobacco related</b>						
Clearing fields and ridging	9.7%	10.4%	35.3%	31.0%	38.9%	36.0%
Making nursery beds	0.7%	0.8%	6.2%	4.4%	14.5%	6.9%
Watering seedlings	2.0%	2.3%	12.1%	8.7%	19.6%	10.2%
Building/renovating barns/sheds	0.7%	0.3%	3.5%	1.9%	6.5%	2.9%
<b>Household related</b>						
Fetching water	3.2%	14.5%	8.1%	27.2%	8.4%	28.7%
Fetching firewood/charcoal	3.0%	11.5%	8.7%	27.0%	6.2%	26.5%
Household cores (i.e. child care)	11.5%	24.9%	16.2%	37.4%	9.8%	42.9%
Building dwelling unit	1.2%	0.7%	1.9%	2.3%	2.9%	2.2%

Source: (Tørres 2000)

Circumstances that pose a direct threat for the health of children and adults during cotton and tobacco cultivation are similar. However, still in similar conditions children may be at higher risk due to factors related to their physical development, body size, younger age, behaviour and education.

Table 19. Factors modifying the health risk of children working in agricultural activities.

<b>Factors</b>	<b>Risks</b>
Physical development	Chemicals can affect the normal development of the brain and body
	Hard physical labour can affect growth
Smaller body size	Lower body weights can lead to poisoning with smaller amounts of chemicals
	Smaller bodies can lead to more frequent cases of heat stroke
	Proportionally larger and thinner body surfaces (skin) can lead to easier absorption of chemicals
	Hard physical labour can result in body injuries
	Protective gear not always suitable or available for small body sizes
Younger age	More years of exposure to chemicals and hard labour can lead to higher risks to develop chronic problems
Behaviour	Hand-mouth behaviour and playfulness can lead to more frequent cases of poisoning
	Playfulness can lead to more frequent accidents and injuries
Education and experience	Low education and lack of experience can prevent children from grasping the dangers of chemicals and farming equipment
	Low education can prevent children from reading warnings and instructions appearing in packages of chemicals and equipment

**Source:** Adapted from (Rother 2000; Tørres 2000; Gastal Fassa 2003; Arcury & Quandt 2006)

Child labour in cotton and tobacco cultivation can also affect indirectly the health and future possibilities of children by reducing their chances of getting education. Benfica *et al* (2005) reported lower rates of school enrolment and higher of school absenteeism among children coming from HHs growing cotton and tobacco in comparison with children coming from non-grower HHs. This results are in agreement with other reports from Mozambique and Malawi showing low school enrolment rates in children coming from tobacco grower families (Tørres 2000 ;ECLT 2006). The main factors retaining children in the tobacco fields and preventing them to go to school were: a) low or non use of hired labour, b) distance from home to school of 1.5 km or more, and c) no gain or economical loss for the HH resulting from tobacco cultivation (ECLT 2006).

#### **4.3.6 Income generation and use of health related services**

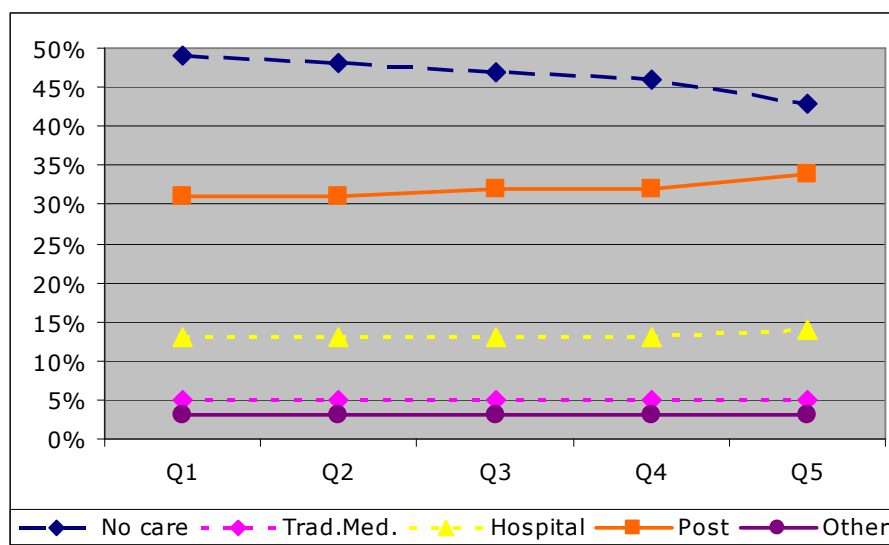
Access to food, water and land are without doubt factors that can influence the health status of people. However, the main focus of this section will be centred on the relationship between HH income and its effect on the use of health related services. This topic was given priority over the others due to its direct implications on health, and because it is

the only subject that has not been commented or discussed anywhere else in this document.

In order to benefit people, health services need to be available, acceptable and affordable (Gilson & Schneider 2007). Whereas, the first factor depends mainly on public and private provision, and the second one on socio-cultural factors, the last one is largely dependent on the availability of resources within the HH. Affordability is a wide term that refers not only to direct costs (i.e. user fees, cost of medication, etc) but also to indirect ones (i.e. opportunity costs, transport costs, etc). Following this logic, farmers benefiting from larger incomes out of cash crop cultivation should in theory have easier access to health services, as they are in a better position to cover direct and indirect costs associated to health care. However, we must keep in mind that not all cotton and tobacco farmers are privileged with this benefit. Income from cotton and tobacco varies widely, and while on average Mozambican cotton and tobacco farmers earn more (8% to 12%) than subsistence farmers, there seem to be always a group that ends each season with net losses (Benfica *et al* 2005). This observation is supported by a study from Malawi where 40% of farmers reported no income coming from tobacco sales, and of those 20% reported losses (Peters & Herrera 1987).

At this point it would be relevant to know how farmers with higher income make use of health services. Is there a direct correlation between HH income and use of health services? Lindelow (2003) analysed information about general population coming from national surveys. According to his model, HH income is not the main factor determining the use of health services in Mozambique. Level of education and physical availability of services seemed to have a bigger role while predicting the use of services.

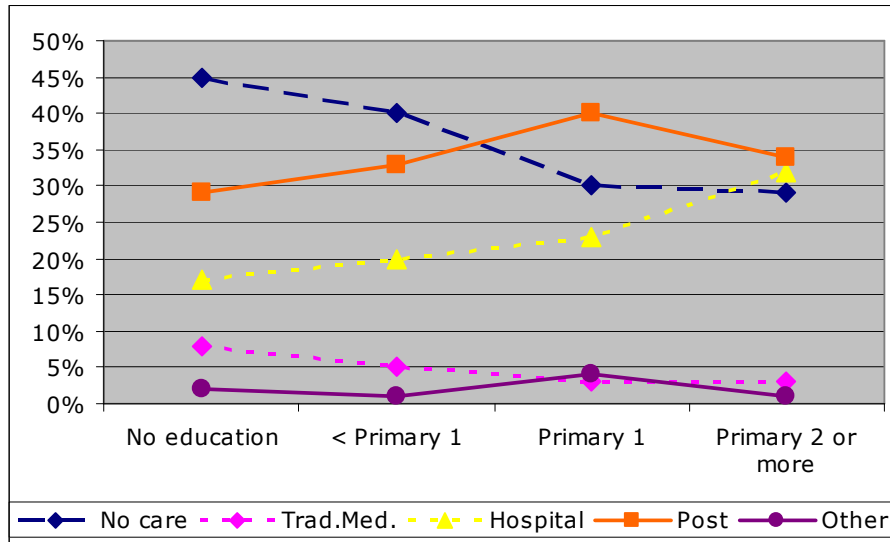
Figure 6. Impact of household income\* (**in quintiles**) on the probability of health service use.



Source: (Lindelow 2003)

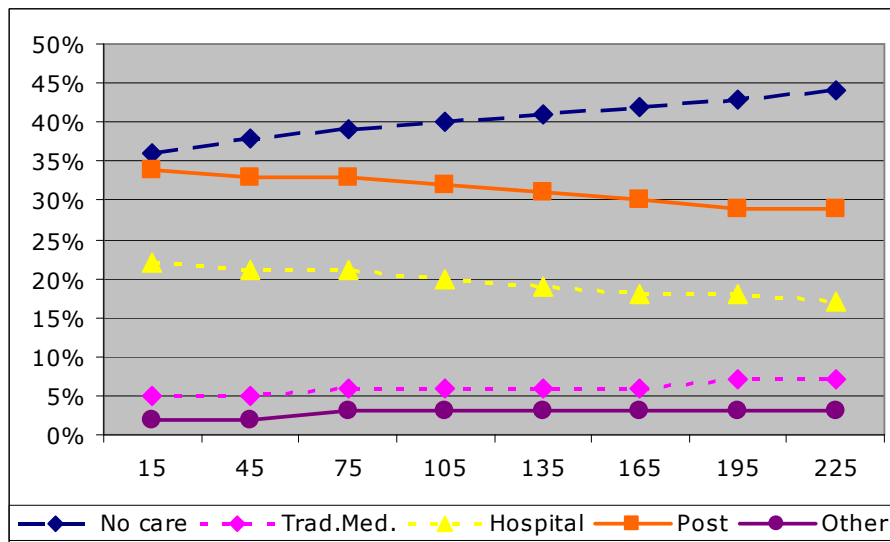
\*Household expenditure was used in the model as a proxy for income

Figure 7. Impact of education level on the probability of health service use.



Source: (Lindelov 2003)

Figure 8. Impact of travel time (in minutes) from house to health facility on the probability of health service use.



Source: (Lindelov 2003)

### 4.3.7 Gender

Gender behaves as a magnifying lens altering the effects of cash crop production on the health of men and women involved with their cultivation. This distortion is not only present in one but in many of the dimensions linking the health of farmers and their agricultural activities.

As has already been described, exposure to pesticides can have severe effects on the health of farmers and their families. Although the negative effects do not spare any of the sexes, women tend to be more vulnerable at certain periods of their life. Due to rapid physiological changes seen during pregnancy, women are more sensitive to toxins. For the unborn babies, external substances can alter their normal development, resulting

in miscarriages, premature births, or in children with birth defects or with low weight at birth. Finally, pesticides can also affect children in later phases as they can pass from mother to child during breastfeeding (WHO 2006).

Apart from biological susceptibilities, contextual factors like the level of education, social norms and gender roles can also collaborate to increase the risk of women. Studies in tobacco producers from Malawi and cotton farmers from India showed that low literacy rates can prevent women from reading labels with instructions in pesticide containers, resulting in increased risks of poisoning (Tørres 2000; Mancini 2005). A study in Malaysian tobacco farmers showed that female workers were in clear disadvantage compared to men concerning the use of protective gear and safe working practices during pesticide application. This difference however, was not directly associated to the lower education of women but to their personal preferences and to local socio-cultural norms (Rusli et al 2001).

Outside the fields, different behaviour related to specific gender roles can also modify the risk of intoxication. Women washing clothes damped in chemicals or recycling old pesticide containers for domestic use are at higher risk of poisoning. Men on the other hand, could be in a better position, because they are the ones that have direct contact with the suppliers (while buying pesticides) and thus have direct access to information. Males could use this information to follow safer working practices or to react faster in case of poisoning (London & Bailie 2001; Mancini 2005).

The different workloads that men and women have can lead to unequal occurrence of musculoskeletal problems between genders. A qualitative study performed in cotton farmers from Nampula (Mozambique) showed that with the exception of land clearing (done mainly by men), males and females perform the same activities in the field. Despite this apparent equilibrium, women had most of the times a higher workload, as they were also expected to do the daily HH activities (Pitcher 102). Reports on tobacco farmers from Malawi confirm this and show considerable differences between the workload of males and females. In some cases women performed twice the work of men (Kamkondo & Wellard 1994). A different study from Malawi reports that women coming from tobacco-growing HHs work on average for 12.2 hours per day (3.8 hours in cash crop fields, 2.5 hours in food crop fields, and 5.9 hours in HH activities) (Tørres 2000).

On a different dimension, the capacity to decide how to use and invest HH resources can also impact the health of individuals and their families. It is believed that women, in contrast with men, tend to use their assets mostly on things that improve the nutrition, health and education status of the HH (IFPRI 2000; Voegele 2009). Therefore in circumstances where

women have little or no control over the HH resources these benefits could be lost. In a study on SHs growing cotton in Nampula, Pitcher (1996) found that most couples shared the responsibilities of keeping, managing and spending money. According to the author, this balance between genders was mainly possible due to the privileged position of women in matrilineal societies (characteristic of central and northern Mozambique), and also to the fact that women assumed an important part of the work on the fields. Similar results were found in Malawi among HHs growing tobacco and living within matrilineal societies (Peters & Herrera 1987). One of the main privileges that matrilineal societies offer to women is land ownership. Land does not only mean economic and food security for women but also place them in better position to negotiate with men (Gawaya 2008). A more recent study done by Benfica *et al* (2005) shows that only a minority of HHs growing cotton and tobacco in Tete province obtained land through inheritance. Although this result can't be interpreted as a change in cultural patterns in Mozambique, it can suggest that part of the negotiating power of women in this particular setting could be disappearing. Due to the limited scale of the study performed by Pitcher (1996) the results shown in her study may not represent the reality of all HHs involved in cash crop cultivation in central and northern Mozambique. No more studies were found about distribution of income within the HHs of cotton and tobacco growers in Mozambique.

Table 20. Type of access to land among cotton and tobacco growers in the Zambezi Valley, Tete, Mozambique – 2004.

<b>% of smallholders that obtained land through</b>	<b>Cotton growers</b>	<b>Tobacco growers</b>
Traditional authorities	15.8%	31.6%
Formal authorities	1.2%	2.3%
Occupied	74.8%	44.1%
Inherited	6.4%	13.6%
Other	18.2%	22.6%

**Source:** Adapted from (Benfica *et al* 2005)

HHs headed by women have fewer chances to benefit from increased incomes coming from CC. In the Zambezi Valley (Tete province), female-headed HHs are rarely involved in cotton and tobacco cultivation (Benfica *et al* 2005). A different study on tobacco farms from Mozambique showed that profits of female-headed HHs are on average US\$ 400 below the ones obtained by male-headed ones (Benfica 2006). These findings are coincide with results coming from similar study done in Malawi (Peters & Herrera 1987). Low education, poor access to market information, and a lower position in society due to cultural and social factors, can act as handicaps for women deciding to start commercial farming activities (MINAG 2005a; Gawaya 2008). These factors can limit the capacity of women to: a) negotiate crop prices and conditions with the contract companies, b) access credits and loans, and c) use and profit from technology and newer farming practices.



## **CHAPTER 5: Discussion**

This study has described the agricultural sector involved in the production of cotton and tobacco in central and northern Mozambique, and the direct and indirect implications of these two CC on the health of SH farmers. The findings of this study have been presented according to a conceptual framework that shows the different links between cash crop production and health.

Approximately 300,000 SH families grow cotton and tobacco in Mozambique using agricultural practices that are highly dependant on human labour. Most of the work is done by the members of the HH. Contracting companies, holding monopoly rights over the commercialisation of cotton and tobacco, hire SHs to grow these crops. In exchange the companies provide credits in the form of inputs (i.e. seeds, pesticides, fertilizers) and technical support. At the end of the season, farmers are expected to sell their harvest to the company (at a pre-agreed price) and to receive in exchange money equivalent to the value of the harvest minus the amount of the credit received. The income of cotton and tobacco growers is on average superior to the one of non-growers. However, some growers do suffer from net losses at the end of the season. These net losses reflect some of the risks that are transferred from the companies to the farmers within the context of the contract farming systems. The other risks shifted by system from companies to the farmers are: a) the occupational health risks and b) the environmental impact associated to cotton and tobacco cultivation.

Pesticide intoxication, green tobacco syndrome, respiratory illness due to tobacco curing, and musculoskeletal pain are the main occupational health risks affecting SH farmers growing cotton and tobacco. The impact on health of these problems is not only limited to workers on the fields but is also to individuals not involved in agricultural activities (i.e. pesticides brought home). Agricultural practices highly dependent on human labour, low utilization of protective gear, low awareness about occupational health risks, and low literacy rates among workers are characteristics of the cash crop sector in Mozambique that place farmers in vulnerable position.

In spite of higher incomes and in some cases of better food yields, malnutrition seems to be a common problem among children from SH farmers growing cotton and tobacco. No consensus exists about the subject. However it appears that diets richer in calories and nutrients are not enough to improve the nutritional status of children of cash crop farmers. More important factors for a good nutritional status are the type of care provided by the mother (resulting from her level of education) and the frequency and severity of infections (i.e. diarrhoea, malaria, etc) that affect the child during his/her life. On the long term however, higher

incomes are likely to result in better education and living conditions, leading to indirect improvements of the nutritional status.

The situation of chronic diseases among SHs growing cotton and tobacco in Mozambique is unclear. However, due to predominant patterns of low-caloric diets and constant physical activity it seems unlikely to find high prevalence rates of chronic diseases associated to unhealthy diets or sedentary life in farmers. Regarding the use of tobacco, beliefs like the one that associates smoking with reduced risk for green tobacco syndrome could be motivating farmers to start smoking.

Lack of infrastructure and human resources, as well as poor financing of the health sector are likely to leave health services in rural parts of Mozambique ill prepared for the management of chronic diseases.

Disparities in income and the presence of migrant labour are factors that could facilitate the spread of HIV/AIDS among SH communities growing cotton and tobacco. The increased risk of HIV/AIDS transmission is likely to be due to changes in sexual behaviour, linked to unbalanced relationships of power and money and to social disruption. No detailed information was found about the knowledge, attitudes and practices or about the prevalence of HIV/AIDS in farmers growing cotton and tobacco in Mozambique. It is plausible that tobacco farmers have a higher risk of acquiring HIV/AIDS, as they earn larger amounts of money and hire more migrant labour than cotton farmers.

Careless management of natural resources by cotton and tobacco farmers can damage the environment and indirectly affect their own health. The contamination of land and water sources with pesticides and fertilizers can lead to poisoning of people unaware of these chemicals. Soil depletion, as a consequence of over exploitation of land can lead to lower yields of food and CC. Deforestation, as consequence of farm expansion or due to tobacco curing, can lead to desertification and to a shortage of wood for cooking and heating. These consequences can affect not only the farmer HHs but also the entire community.

Children working in cotton and tobacco farms in Mozambique are exposed to occupational health risks similar to those faced by adult workers. However, due to biological and behavioural characteristics children are more vulnerable to these risks than adults. Economic necessity is the main driver motivating parents to put their children to work. In spite of this, few are aware of the health risks associated to the cultivation of cotton and tobacco. The education and future development of children is also compromised as school enrolment rates tend to be low and absenteeism rates high among this group.

Although higher income could mean better affordability of health service costs, this appears not to be enough incentive to increase the use of health services by SH farmers. Factors like the level of education and physical availability of health facilities have larger impact on their health seeking behaviour.

The health implications, associated to the cultivation of cotton and tobacco are disproportionately larger for female farmers than for males ones. Biological factors (i.e. increased susceptibility to pesticides during pregnancy), cultural factors (i.e. higher physical activity resulting from the addition of HH and farming work) and socio-economic factors (i.e. lower education resulting in a handicapped position to negotiate) play a role not only by increasing the health risks of women but also by reducing their opportunities to benefit from the economic advantages linked to cash crop production.

Concerning the limitations of this study, it must be kept in mind that the present situation of farmers may not be fully reflected in this document since relatively little up-to-date data was available about the target population of this review.

## **CHAPTER 6: Conclusions and recommendations**

### **6.1 Conclusions**

This study has shown that cotton and tobacco can affect the health of smallholder farmers in Mozambique through diverse paths. Due to the contract farming system, responsibility over health and environmental risks are transferred from the companies to the farmers. Within farmer families, women and children are more vulnerable to negative health effects. Moreover, health risks have the potential to extend beyond the families to the entire community. On the other hand, cash crops do bring a larger income for the average farmer, which could eventually result into better health status.

The findings of this thesis represent a snapshot of the situation in the sectors of cotton and tobacco. Due to the complexity of the circumstances, it is likely that factors and effects may change with time. Therefore, it is relevant that the government, as well as other stakeholders, follow the process as it develops, allowing prompt interventions when necessary.

Economic development can not and should not be stopped in Mozambique. On the contrary, it must be pursued in order to allow people from rural areas to benefit from it. However, major efforts should be done to reduce the negative side effects associated to this process.

### **6.2 Recommendations**

*To the Government of Mozambique*

- Monitor closely the health and environmental impact produced by cotton and tobacco cultivation and inform the population
- Regulate and supervise the practices of contracting companies, regarding the provision of inputs and extension services to SH farmers
- Review the Contract Farming System, making companies partially responsible for health and environmental damage
- Make use of health promotion to change risky behaviours and reinforce healthy ones among farmers
- Include subjects related to occupational health risks in the curricula of health professionals
- Adapt and apply the present analysis to other economic sectors in Mozambique

*To the contracting companies*

- Put more emphasis on the education of farmers regarding occupational health risks and safe working practices
- Actively search for and promote safer processes to grow cotton and tobacco
- Take more responsibility about the health and environmental consequences associated to the production of cotton and tobacco

*To the farmers*

- Organize themselves in order to be able to share information and claim rights to the government and to the contracting companies
- Use traditional knowledge to find new and safer ways to cultivate cotton and tobacco
- Actively protect women and children from occupational health risks associated to the cultivation of cotton and tobacco

*To civil organizations working in the sector of agriculture*

- Lobby in favour of the rights of farmers
- Stimulate the organization of farmers, specially involving females
- Make the population aware about the health and environmental risks associated to cotton and tobacco cultivation

*To academic institutions*

- Complete grey areas of knowledge with new and up-to-date information

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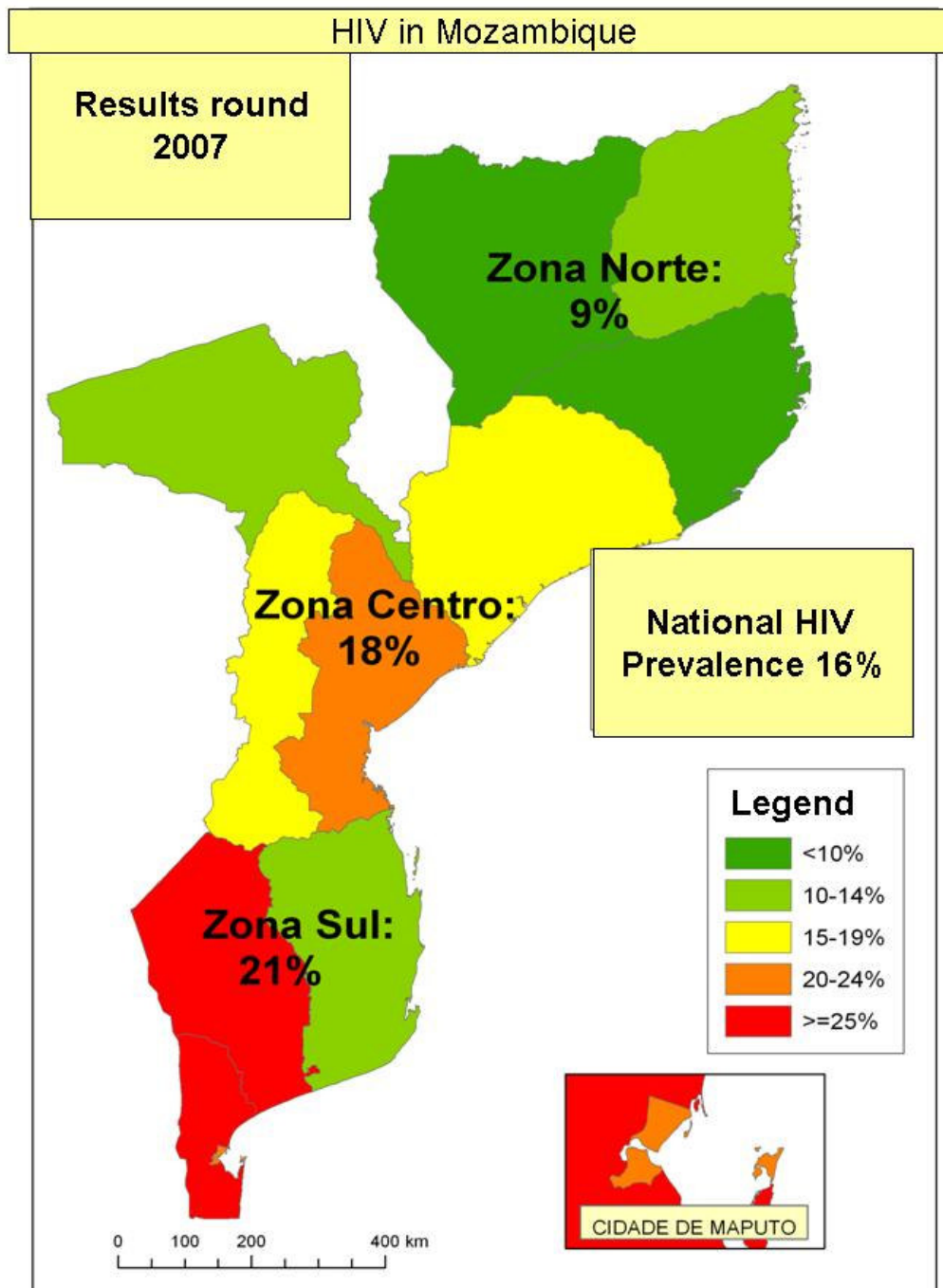
## Appendices

Appendix 1. Map of Mozambique



Source: (MEASURE DHS+/ORC Macro 2005)

Appendix 2. Prevalence of HIV/AIDS per province, Mozambique – 2007

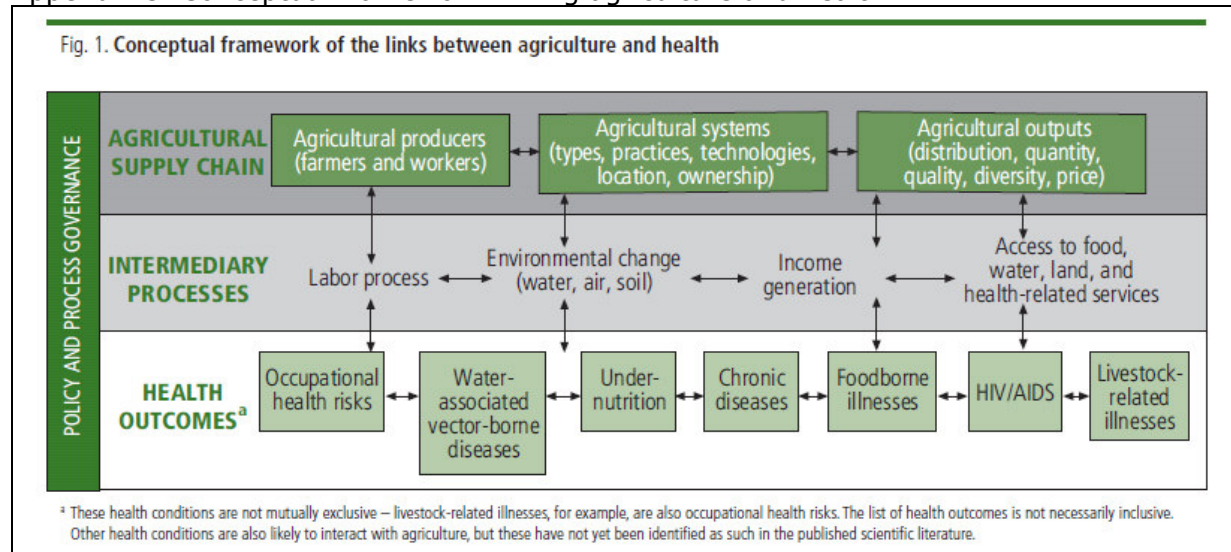


Fonte: Ronda de Vigilância Epidemiológica 2007 em mulheres grávidas, Moçambique. Estimativas provinciais baseadas no EPP.

Source: (MISAU 2008)



Appendix 3. Conceptual framework linking agriculture and health.



Source: (Hawkes & Ruel 2006)

Appendix 4. Companies working with concessions of cotton or tobacco in Mozambique

	<b>Cotton companies</b>	<b>Tobacco companies</b>
<b>Niassa</b>	SAN/JFS	JFS, STANCOM/MOSAGRIUS
<b>Cabo Delgado</b>	PLEXUS, SODAN, MOCOTEX	JFS
<b>Nampula</b>	SAN/JFS, SANAM, CANAM, IAM/MEMBA	JFS, STANCOM/SONIL
<b>Zambezia</b>	MOCOTEX, AGRIMO, SAAM	-
<b>Tete</b>	AGRIMO, DUNAVANT, COTTCO	MLT, DIMON
<b>Manica</b>	COTTCO, CAN	MLT, JFS, DIMON
<b>Sofala</b>	CAN	DIMON
<b>Gaza</b>	-	JFS

Source: REF=N40