ROAD INFRASTRUCTURE AND TRANSPORT CONDITIONS IN NORTHERN MOZAMBIQUE AND ITS IMPLICATIONS FOR FOOD SECURITY
- a minor field study of Cuamba area in the Niassa province

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SUMMARY
Since food security is about access to food either through production or trade, it can be said that road transport and climate conditions influence food supply and food security. Whereas roads are important for trade, climate is for production. As it turns out climate, and then especially precipitation, is also of importance for road quality. Food insecurity can not only be combated by increasing the agricultural production, if there are no means of distributing it. And so, good cultivation conditions can exist side by side bad road conditions, as in the case of Mozambique. The north-south transport connections are very bad and since there is a somewhat constant food shortage in the south as compared to the fertile northern parts which produces surpluses, the south imports while the north exports. Niassa province in the far north, is one of the few areas with regular and sufficient rains and neither draughts nor floods are common. It was not even affected by the floods of 2000, as contrary from the economic active south. The favourable cultivation conditions of Niassa are however hampered by grave problems concerning infrastructure and roads, and so it does not even take extremities to destroy these bad conditioned roads, only normal rains every rainy season.

Field observations and interviews in the economic centre of Cuamba exemplified these bad roads even though also a “good” road, in its relative sense, was studied. The bad roads presented very many indicators of the destructive force of water and so the connection appeared to be clear. In the developed grading system the worst road sections were assigned with a class 10, where 1 is the best. Variations even within short distances were common. The farmer interviews along each one of these in total three roads however showed that the roads are not necessarily perceived in this bad way, by the people mostly dependent on them. And so, even deeper connections were revealed for instance that it is not only a question of road quality, but more of need. Consequently, even though the roads by some were interpreted as impossible to pass during the rainy season, they were merely difficult to others, namely farmers. Still, examples of farmers facing difficulties in transporting there products were not non-existent, like the fact that it can take them up to 5 hours to bicycle a distance of only 20 km. Furthermore, the loads are often heavy and the bicycles old, but since they sell when they need the money they go no matter what and so where it is not possible to pass, they just carry their bicycles and maize on their shoulders and walk/climb instead.

Of course, different interpretations characterize this as well as many other developing issues and these mainly seem to be present between different social groups and not necessarily between different farmers. For instance, the buying period which does not coincide with the rainy season has been claimed to be a reason for there being no problems with the roads, while farmers on the other hand emphasize that they are dependent on roads for other activities than selling, like going to the hospital, and so they can not be governed by if the roads are in season or not.
CONTENTS

Summary

Preface

1. Introduction 1
   1.1 Purpose 2
   1.2 Key questions 2
   1.3 Disposition 3

2. Mozambique, Niassa & Cuamba 4

3. Methods 7
   3.1 Maps, literary and oral sources 7
   3.2 Field observations 7
   3.3 Interviews 8
   3.4 The use of different methods 9

4. The food supply situation in the region/country 11
   4.1 Overall food supply features 11
   4.2 Cultivation conditions and agricultural production 13
     4.2.1 Climate/precipitation conditions 13
     4.2.2 Soil conditions 14
     4.2.3 Agricultural production 14
   4.3 Transport conditions 16
     4.3.1 Trade/transport patterns 16
     4.3.2 Road/transport conditions 17
       4.3.2.1 Maintenance, reparation and construction traditions 18
   4.4 A connecting and explaining closure 20
     4.4.1 How climate/precipitation influences cultivation 21
     4.4.2 How soil type influences cultivation 21
     4.4.3 How cultivation influences food supply 22
     4.4.4 How climate/precipitation influences road quality 22
     4.4.5 How soil type influence road quality 23
     4.4.6 How road quality influences food supply/distribution 23

5. The roads of Cuamba 24
   5.1 An overview: Map info versus field observations 24
   5.2 A deepening: Field observations on selected roads 25
     5.2.1 Presentation and background information 26
     5.2.1.1 Good road 26
     5.2.1.2 Bad road 27
     5.2.1.3 Side road 27
   5.2.2 Road characteristics present 28
     5.2.2.1 Common combinations and reflections 31
   5.2.3 Grading system 33
   5.3 “The good, the bad and the worst”: a comparative and explaining closure 35
     5.3.1 Water related explanations 35
5.3.2 Explanations related to importance, maintenance and traffic intensity 36
5.3.3 Explanations related to timing and kind of observation and means of transport 38
5.3.4 Why a bigger variation spectrum on the bad road? 39

6. The farmers of Cuamba 40
6.1 Four farmers on four topics 42
   6.1.1 Farmers on the field – cultivation and production conditions 43
   6.1.2 Farmers in the market? – sale conditions 44
   6.1.3 Farmers on the road – road transport and distribution conditions 46
   6.1.4 The past, present and future – everyday life, aspirations and ways to get there 48
   6.1.5 Revealing information about the road conditions from the farmer interviews? 51
6.2 Different interpretations of the problem and solutions 51

7. Discussion 58

8. Conclusions 63

9. Facing the future 64

References 68
PREFACE

This master thesis is the result of a Minor Field Study (MFS) performed as part of the education subject Geography at the Department of Physical Geography at the University of Gothenburg (Göteborg University), Sweden. The purpose of the study, which involves investigating the impact of road transport and climate on food security, can be considered of high geographical relevance since it combines both physical geography and human geography. The field study was conducted in the north of Mozambique during September-October 2005.

My education has brought me in contact with the problems posed by Mozambique concerning precisely infrastructure and distribution of food. Also, I have since as long as I can remember, had a significant interest in developing issues and developing countries and so it came naturally for me to strive for a greater study and work related experience and to promote an exchange of both cultural and scientific knowledge, within the frames of a MFS.

There are a lot of people who deserve my gratitude for contributing to what I like to call my “dream scenario MFS”. Since I cannot mention every single person, I will hereby give a brief statement of a few without ranking order. First I would like to thank my supervisor Björn Holmer, Associate Professor at the Department of Physical Geography (Göteborg University) for believing in me and being the best supervisor possible, both before, during and after the actual field study. I also want to thank Lars Bergh, Programme Director for Swedish Cooperative Centre (SCC) in Niassa, who functioned as my contact on the spot and who turned out to be even more helpful and generous than I dared to hope for. Also the staff at the SCC office in Cuamba deserve very much credit: Nina Bld, Lucrécia dos Santos, Cabral Mutinquinhene and Amur (who I unfortunately do not have the surname for), as well as their driver Amisse Momade who during my visit conveniently enough for me also functioned as “my” driver and in his optimistic ways always answered every one of my questions with é possível! (Portuguese for “it’s possible!” or in some senses also “it can be done!”). I also would like to thank the four farmers and three buyers, not mentioned by name, for participating in my interviews.

In Mozambique I was very fortunate to meet a lot of different people who not only gave me the time (when, of course, the meetings finally took place) and the information I needed but also were patient enough to both understand my Spanish and to allow me to understand their Portuguese. While on the subject of languages, it was also very highly valued that Gregório Martinho Armindo, Secretary at Universidade Católica de Mocambique – Faculdade de Agricultura, helped me with last minute translations of recorded buyer interviews in Portuguese and also agreed to be present as an interpreter when it was decided to perform the farmer interviews in English. On the more non-study related level Amur was very much appreciated when accompanied me to the not so pleasant hospital in Cuamba for malaria testing.

In Sweden, the patience that my family and friends had with me being engulfed by this study was indeed of high value to me. Furthermore, the never-ending support and encouragement from Markus Olsson meant the world to me and the fact that my parents (Danny & Yvonne Michael) had decided to come and visit me in Africa at a specific date after the completion of my study had a distinct disciplinary effect on me and my work, and so I would like to thank them for this, among other things.
1. INTRODUCTION

Food security is about adequate access to food, whether it is acquired through production or trade. This issue is of particular concern for Africa and according to Godwin (2002) Africa is the only region in the developing world where the regional average of food production per person has been declining over the last 40 years. The food consumption exceeds the domestic production and the food security index is the lowest in the world. The problems of increasing agricultural production in tropical Africa and ensuring adequate supplies of foods have been important subjects for research and debate for many years. Since agricultural production depends on favourable climate, droughts as well as floods have a negative influence and often result in food shortages. When home production has failed, food imports are important. Besides being regarded as an occasional necessity due to agricultural failure, food imports in the past have often been dismissed as a luxury item resulting from dietary habits introduced at a time of colonial dependence. Their existence in countries which are mostly dependent on agriculture as their leading economic sector, has been subject to complaint and despite attempts to eliminate them, food imports have not only persisted but in many cases increased and can all too often be considered as established features of the economy (Morgan 1977).

According to the United Nations Food and Agricultural Organization (FAO 29th March 2006a) Mozambique has made impressive gains in restoring the food production since the end of the civil war in 1992, and is virtually self-sufficient in terms of food grain production at a national level. However, spatial unevenness of growth and natural disasters such as floods and droughts are still considered to cause temporary food insecurity. In Mozambique, food imports neither seem to be constricted to luxury consumption or agricultural failure, but instead lack of infrastructure and transport possibilities for distributing the food within the country. For, food insecurity does not end with there being a high agricultural production if there are no means of distributing it.

Mozambique consequently demonstrates a complex developing problem which is interesting and important to acknowledge, for it can both be considered as self-sufficient and as having shortage of food. The infrastructure is still by colonial conditions, which means that transport routes from countries without coast lead to the ports of Mozambique. Very little has been invested in north-south connections and rural development. Seeing that the roads are bad, particularly in the fertile northern parts, the farmers face difficulties in transporting and distributing their surpluses while at the same time a deficiency situation prevails in the south (Utrikespolitiska Institutet 2003). This in turn, not only affects people of the south who approach the issue by international import or in worse cases are in need of food aid, alternatively risk famine, also the farmers up north suffer from absent sales incomes.

While the roads are better in the south, the relatively high precipitation rates that characterize the north compared to the precipitation poor south, are considered favourable for agriculture. The floods of 2000 which destroyed large parts of the country, left the north however unharmed. In accordance with a description made by Hammarström (oral communication 15th February 2005), former Niassa Programme Officer for the Swedish International Development Cooperation Agency (Sida), Niassa province in the north is very interesting for it is one of the few areas with regular and sufficient rains and neither draughts nor floods are common. He continues explaining that extreme climatic variability otherwise is relatively common in many neighbouring regions in southern Africa as well as unfertile soils, contrary to Niassa. This province is a perfect example for my study aim, since it is a region characterized by not only favourable cultivation conditions but rather the most favourable agricultural conditions in the country (FAO/World Food Programme [WFP] 1998), but grave
problems concerning infrastructure. The important economic centre of Cuamba will be studied more in detail.

It is my comprehension that transport infrastructure problems generally deserve more attention in developing countries in order to achieve a more sustainable food security and development, and will therefore be tackled in this paper. When issues of food security are on the agenda, the focus seems to have been with inefficiency, low productivity and low technology, mainly concerning farming techniques, or climatic factors. Also, even if previous works exist concerning the importance of infrastructure for development and development in Mozambique, there seems to be a lack of studies connecting the components of infrastructure and development in Mozambique, not to mention connections between favourable agricultural conditions in relation to unfavourable distribution conditions. Therefore, this study can be considered as quite rare in its kind and provides an understanding of the problem and connections of the different components. This was approached by conducting a field study in Niassa province in northern Mozambique, during September-October 2005.

Since food security is about access to food either through production or trade, this paper not only focuses on the trade component (transport infrastructure), but also on climate since it is probably the most important and determining factor for production. The climate variable in focus is precipitation, since rainfall patterns exercise a major influence on agriculture and since the precipitation affects the roads and transport possibilities not only when extreme events occur but also on a more regular basis like every rain season. It should be noted however, that the climate mostly is treated when of relevance for the road situation and not necessarily separately. Within infrastructure I will focus on road transportation, for an effective transport system is not merely an instrument for trade and exchange of goods and culture but also a prerequisite for rural development. Transportation of goods is still in focus.

Farmers are in my point of view the most exposed and vulnerable group since they are not only dependent on climate for cultivation but also on roads in order to get rid of their surpluses and be able to buy the other things they need for their subsistence. They are therefore of interest for this study and it is important to take into consideration the local population’s knowledge and opinions. Furthermore, small subsistence farmer families and not commercial large-scale production units are studied, as well as food crops in particular. Also, the crop maize is referred to in a larger extent than others.

1.1 Purpose
The purpose of this study is to investigate the impact of transport infrastructure and climatic conditions on food supply in relation to food security.

1.2 Key questions
In attempting to reach the purpose, the following questions should be viewed as a red line throughout the whole paper:

- How does climate affect the farmers’ cultivation and food supply conditions as well as the road transport/distribution conditions?
- How does road transport affect food supply and the farmers’ ability to distribute and sell their agricultural production?
In order to answer these questions, three additional and more specific questions were necessary for outlining and exemplifying of the problem as well as give room for the voices of probably the most important group of people concerning this issue:

- What food supply situation characterizes the country/region and why? What are the connections between climate, road and food supply?
- What does a “typical good” and “typical bad” road look like and why?
- In what way are the farmers affected by these road and climate conditions in their production, selling and everyday life? Are there any differences of opinion?

1.3 Disposition
Following this introduction and presentation of the issue of food security as well as the specified purpose and key questions for this study (section 1), an area description over the country, as well as the study region, Niassa and Cuamba, will be provided (section 2). This is followed by a presentation of the methods and sources used and the proceedings of this study, which involves some degree of critical approach (section 3). This paper can be said to consist of three main parts; one concerning the food supply situation in the country/region with focus on the important components of cultivation and transport conditions (section 4); the other one exemplifies through field observations what a “typical good”, “typical bad” and “typical even worse” road looks like in Cuamba and what causes this (section 5); and the last one focuses on the most important group to take into account when on the subject of these issues, namely farmers who have been interviewed (section 6). Since each of these three sections are comprehensive in itself and should be viewed slightly separate from each other, they are all in need of their own closures where comparisons, connections, explanations and interpretations are made, instead of saving it all for one big discussion in the end. Consequently, the discussion of this paper (section 7) tries not to repeat such material but rather put the pieces together on another level. After this, the conclusions are presented (section 8). The answers to my key questions will hopefully not only provide an understanding to why it is so important to consider certain aspects of development, but also a background for thoughts about the future, which will bring this paper to an end (section 9).
2. MOZAMBIQUE, NIASSA & CUAMBA

Mozambique is located on the east coast of southern Africa by the Indian Ocean. It borders to South Africa in the south/southwest, Swaziland in the southwest, Zimbabwe and Zambia in the west, Malawi in the northwest and Tanzania in the north. The country which is about 1 750 km long and a maximum of 1 100 km wide has a total area of 801 590 km². There are eleven administrative provinces, one of which comprises the capital of Maputo which is located far south. Niassa in the northwest (figure 1), where this study was conducted, is the largest out of all provinces and its provincial capital is Lichinga. This is however just the political capital and administrative centre while Cuamba is considered to be the economical capital of the province (Maloa, Engineer/Agronomist, Dirrecção Provincial de Agricultura e Desenvolvimento Rural do Niassa, oral communication 13th September 2005). Cuamba was where the specific field observations and interviews were performed.

Figure 1 Map showing the location of Mozambique, Niassa and Cuamba, as well as main features in transport infrastructure.
(Source: after Caballero et al. 1984 & INE 2000).
The biggest lake in the country is Lake Niassa, which is the Mozambican section of Lake Malawi. Major rivers include Zambezi in the middle and Save and Limpopo in the south. Out of the country’s total area, 2 % are inland waters (FAO 29th March 2006a). With some exceptions towards the Zambia, Malawi and Zimbabwe borders, Mozambique is in general a low-lying plateau of moderate height descending to the Indian Ocean with; a coastal belt covering about 44 % of the country; a middle plateau ranging from 200 - 1 000 m in elevation and covering about 29 % of the country; and a plateau and highland region with average elevations of around 1 000 m to the north of the Zambezi River covering about 27 % of the country. In Niassa the altitude ranges from 500 m up to the high plateau of Lichinga at 1300 m above sea level.

The climate varies from tropical and subtropical in the north and central parts to dry semi-arid steppe and dry arid desert in the south. There are two main climate seasons: a warm and humid one (November-April) and a cooler dry season (May-October). Precipitation increases both from south to north and from inland to coast. The high precipitation rates in the north and central part of the country are caused by the northeast monsoon and high mountains. The highlands in the country’s interior are also cooler. Climatic extremes like draughts and floods have been recurrent features in the country’s history.

About 78 % of the total area is covered by natural vegetation, consisting mainly of thicket, wooded grasslands, low forest, high forest, and mangroves. The total cultivable land is estimated at about 45 % of the total area of the country, but only 5,5 % are actually being cultivated (FAO 29th March 2006b). Still, agriculture occupies about 80 % of the population and contributes with a considerable part to the GNP (21 %), even though overrun by trade and service which holds 54 % (Utrikespolitiska Institutet 2003, p 22).

The total population was estimated at 18 million in 2002, with a population growth rate of 2 % (FAO 29th March 2006a). The population density is 22,5 inhabitants per km² and 60 % live in rural areas (Utrikespolitiska Institutet 2003, p 4). Niassa has the smallest population with only one million (Instituto Nacional de Estatística [INE] 2000, p 18) in spite of it being the largest of all provinces, and consequently the province is also the most sparsely populated (INE 2003e, p 3). Niassa also contributes the least to the country’s GNP with only 3 % (Programa das Nações Unidas para o Desenvolvimento [PNUD] 2001, p 25).

In 1975 Mozambique reached independence from the Portuguese, who colonized the country in the 16th century. Shortly after the ten year long independence war (1964-1975) the country found itself at war again but this time a civil war which lasted from the 1980s to 1992. It was initiated by the opposition party Renamo, which mainly has its support in the rural north and central parts. Frelimo, the ruling party since independence, is strongest in the south. There are some ten national groups in the country and the Makua-Lomwe in the north (including Niassa) make up for about half of the population. In spite of cultural diversity, the domestic conflicts have not mainly been caused by ethnical issues (Utrikespolitiska Institutet 2003, p 5).

Immediately after independence a centrally planned economic system was adopted but by 1987 the support from the eastern block was gone and the government who had sought new aid donors and changed politics, signed the first economical adjustment programme with the World Bank and the International Monetary Fund in 1987. Following the drought in 1991/92 Mozambique earned the unwanted label of “poorest country in the world” (Arndt et al. 2003, p 141). Mozambique is one of the most aid dependent countries of the world and 25 % of the GNP consists of aid (Utrikespolitiska Institutet 2003, p 22). A big problem is the vast
differences between north and south and that practically all of the economic activity and investments are concentrated in Maputo and the southern parts of the country.

High unemployment, low education, low average length of life, high infant mortality, the presence of AIDS and other health problems, also represent significant problems for the country and even if the wars are over people are still getting killed and hurt by the remaining mines. In 2001 GNP per capita was estimated at 210 US Dollars (ibid, p 22). Out of the population, 70 % live in absolute poverty and the United Nations Human Development Index ranks Mozambique on place number 170 out of 173. The River Zambezi that cuts through the country divides the Mozambicans geographically as well as socially in Northerners and Southerners. The Northerners, who constitute more than half of the population, are poorer and have worse access to education and health care than the Southerners, who also are overrepresented in the governmental administrations (ibid, p 5).

The infrastructure system links countries without coast to the ports of Mozambique. The sandy but important coastline measures 2 515 km. The southern port of Maputo, the central port of Beira and the northern port of Nacala along with the railway lines that lead there from the neighbouring countries are still very much used, but also River Zambezi provides access to the interior of Africa from the eastern coast, as it flows from eastern Angola. Nacala is connected with a railway running west to Malawi, through Cuamba which is a kind of a connection point in Niassa (figure 1). The road network is bad, especially up in the north and north-south connections have not been prioritized. Niassa is no exception when it comes to bad roads, on the contrary it has the worst conditions and despite which, Cuamba is the connection point also when it comes to roads.
3. METHODS
My approach consists of a combination of multiple methods and material gathering both in Mozambique (2005) and Sweden (2005/06). This however does not exclude the works from other countries, but invited material in English, Portuguese and Swedish. The use of multiple methods was considered to increase the possibility of attaining as reliable and valuable results and conclusions as possible. Both primary and secondary sources were used and consisted mainly of literature, maps, field observations, interviews and other oral sources.

3.1 Maps, literary and oral sources
Visits and talks with representatives from various governmental and bilateral institutions as well as private companies and NGOs (Non Governmental Organizations) in Niassa, took place. Since it proved difficult to get a hold of written material from most of these but many conversations still were interesting enough to be presented, they are as oral communication sources. In spite of the problematic in resting too much on oral sources, I believe it to be even more serious not to present as many views as possible which after all have influenced me and my study. The conversations had made me realize that the problem of course did not present itself exactly the way I had thought before leaving for Mozambique. Worse still, it is not to take advantage of the knowledge which exists within the country, based on personal and professional experience just because this not necessarily has been formulated in writing and print, or gone through the process demanded by science. I found that the literature on the issue from within Mozambique was often describing while material from outside of Mozambique also tend to involve a more researching approach. It should be noted that most oral communications took place in Spanish/Portuguese but that no material overshadowed by the slightest language difficulties have been presented in this paper. Different maps of different scales were also used, but still the information about road network quantity seems to be better than about road quality, which is one of the reasons why field observations were considered necessary.

3.2 Field observations
It seemed suitable to approach the field observing and interviewing part by comparing of places. The selection process aimed at resulting in the same favourable physically given cultivation conditions (i.e. climate and soil) and that, in order to increase the relevance of the study, both areas have a significant population and agricultural production (relative to Niassa as a province). For, if there is no population or production, how does one motivate the need for better roads? I only allowed one variable to differ in order to increase the credibility of the results, namely the road conditions, which were to be “good” and “bad” (in its relative sense). These criteria and the fact that Cuamba, the connection point, economic centre and population magnet of Niassa, stands out significantly, resulted in the possibility of finding a relevant comparison site outside of Cuamba to be reduced. Consequently, Cuamba was chosen as the study area within which different roads were chosen for comparison. This, despite the fact that the physical cultivation conditions are considered slightly better in the north, where also the provincial capital of Lichinga can brag about having the only paved road section in the province. It might be also argued that since Cuamba is the connection point of the province the roads there might give a false image of the conditions, however following the pilot field observations in the area it could be stated that it still was not a matter of good roads.

All in all three roads were chosen for study, one “good”, one “bad” and one “even worse”. Field observations were conducted on all of them and the distance studied was 20 km starting from Cuamba centre. (Distances were measured with a GPS.) It might be reasoned that the
first 20 km from a bigger place does not say anything about the actual road conditions for the quality might be interpreted to normally deteriorate the further away one gets. However, since it was obvious that it still did not involve especially good conditions not even close to Cuamba town, the significance of the reasoning empties.

A checklist consisting of different road characteristics was developed and each characteristic that presented itself was ticked. After this an index was elaborated in order to grade the roads according to their quality. This allows a valuation even of different road sections, in which the roads were divided, which is important since great variations occur even on one and the same road. The grading system involved the assigning of different points to the different road characteristics and then the total score resulted in different classes on a scale from 1 to 10. The estimation was based on how suitable driving (car) and transporting on different road properties were experienced to be, and how large obstacles and negative influence they posed on the road. A four wheel drive (4x4) jeep was used and besides me, there was a driver present. Developing an own classification system, might be justified by the fact that one and the same road often is classified different depending on map and type of classification and that categories such as paved or unpaved do not necessarily reveal anything about the road quality. A broader classification of roads, not only in “paved” and “gravel” road categories but also inclusive of potholes and other properties, is allowed. However, this reason can of course be challenged by questions of objectivity (section 3.4).

Other observations of importance such as rivers and bridges/aque ducts were also recorded as well as speed possibilities. The latter can be subject to questioning concerning its meaning, but since it should be more viewed as a complement to provide understanding of the road conditions, I believe that it is enough to be conscious about and emphasize it. Also, a less extensive overall registration of number and type of traffic that operates on different roads was attempted by observing the different vehicles that passed by during a half an hour at rush hour. Even though the original thought was for this to help visualize the intensity of the traffic in order to connect to road suitability, the small amount of time studied does not leave more than a pretty reasonable indication of what means of transports are the most common ones.

3.3 Interviews
In order to establish in what way and to what extent the interpreted road conditions, obtained from the field studies, have impact on the people who live in the region I found it relevant to perform interviews with farmers living along the three roads. In total four farmers were interviewed, one on each road and yet another on the worst road. Since there in a way seems to be no limit for how far the farmers cycle to sell, and they all go to Cuamba to sell, the distance that all farmers were decided to have to the market was considered enough at about 20 km, since this was the distance studied in the field observations. Even longer distances would probably present more difficulties for the farmer but since the bad conditions were not exactly invisible anyway, 20 km was enough. It may have been more interesting to study even more remote road sections within the Cuamba area, but it was considered more consistent to let the farmers have the same distance to the market but live along different roads.

The interviews were of the semi-structured kind and the topics focused on cultivation, distribution/transportation and sale conditions. A semi-structured kind was chosen to be able to take into account different interpretations of the farmers’ environment, situation and the actual problem. Even if I allowed alternative spontaneous inputs and did not just focus on predestined questions and problem areas, I sometimes felt urged to introduce certain aspects into the conversations. The main differences of opinion were not considered to be the greatest
between farmers and so an additional three buyers were interviewed. The focus however, is still on the farmers, which is why the buyer interviews are not presented thoroughly. I recognize the desire to have a greater number of respondents in order to be able to draw relevant and reliable conclusions, however I believed the contribution from the buyer respondents to be more positive than a greater number of farmers since the study subject was considered more likely to invite differences of opinion between different social groups than within. The buyer interviews were performed by me in Spanish/Portuguese, while an interpreter later participated at the farmer interviews and the languages used then were the local language Makua and English. In some rare cases it was necessary for me and the interpreter to take support from a more “neutral” language, Portuguese.

It could be regarded as a methodological problem that I deliberately chose to formulate the interview topics and questions as late as possible, allowing other data collection to affect the interview questions. However, I considered it being more negative to be locked and try to hold on to predestined perceptions about the problem since new point of views appeared constantly and I wanted as much background as possible, to increase the relevance of the questions. Still, it never involved a total abandonment but rather a modification of the questions, since I had the purpose of investigating certain conditions whether they had proved less important than one first had imagined or not. Also, the argument runs weak if one has chosen semi-structured interviews with the motivation that one wants to allow different interpretations of the actual problem, if this only applies to the actual interview situation and not the study as a whole.

Since the main aim was not to represent the opinions of specific farmers (except for in relation to the different roads), but more represent the problems through the eyes of farmers, when possible, it did not matter too much that all but one interview took place in a location surrounded by either the people in the village or the family, even if the opinions of other farmers sometimes made its way through the selected respondents. They did however not make its way through without me noticing. Still, when one farmer emphasized that he never spend his money on drinking beer or so, I could not help reflecting over the fact that his wife was sitting right next to him, even if it of course can be as simple as him not drinking.

I am content about the way in which the farmer interviews were performed and it seemed as though the interpreter understood me and was not afraid to ask even about the, for some, obvious things which the farmers could find amusing at times. Still, it should be noted that the interpreter’s knowledge in Portuguese was greater than in English and so there might have been some information losses since a third language Makua was used. However, since the interpreter’s knowledge in English overall was estimated to be greater than my Portuguese, the gains were still considered greater. Some questions seem to have caused more diffusion than others and for instance when asking about sale volumes the answer was either given in sacks or cans, which of course invites questioning to what kind of sacks or cans, or even what kind of maize. The same goes for distance to market which by most farmers was estimated in kilometres, but by others in hours and consequently it could differ with reference to different times of the year. However, even though the farmers not always knew how many kilos one sack or can contains, the interpreter’s estimations were the ones used. Also, since the distance to market was already known to me, it was merely asked out of curiosity.

3.4 The use of different methods
The lack of written material in Mozambique led me to rest on several oral sources and even if I understand the problematic in doing this, I believe it to be a bigger weakness not to present
the kind of material which still very much has influenced my perspective and presentation of the problem, as well as selection of study sites and formulation of interview questions. Whether it is field observations or interviews that are being performed, the results very much depend on who the observer and interviewer is. The field study method in itself invites many different interpretations and since I recognize the fact that my results are the result of my own experience and framework, I consider the reliability of my results to be high. Furthermore, subjectivity is the case with field studies in general and not my study in particular. Also, it should be noted that the quality of the roads, or rather ones perception of the quality of the roads, are highly dependent on time of observation and if they recently were maintained or not. Differences were actually interpreted between the pilot studies and the actual studies. When it comes to the interviews, while they where designed in order to try and investigate normal conditions mainly, some of the answers might have been affected by the fact that the year of study (2005) was not considered a normal one, but one with less rain and less maize.

Some of the interview answers could also have been formulated in a certain way depending on precisely the fact that I am who I am. Consequently, when the farmers emphasized their poverty even though they did not want to complain too much or blame anyone, the thought involuntarily entered my mind that maybe this answer was the result of me being the one who had money. As always when it comes to interviews, it is hard knowing how truthful answers one gets, considering that the respondent might be scared of answering truthfully. This is probably more the case with sensitive issues and the only questions in my study that might have been interpreted like this, I believe to be the ones concerning economic/selling conditions. Still, the field observations in a way provided a suggestion as to of what kind of conditions people dependent on those roads might have to put up with and then it should be noted that my visit was not during the worst period of the year.

As mentioned before, pilot studies were conducted before the actual field studies. The purpose of them was not only to facilitate the choosing of roads and set the standards but also to test the method, collect ideas concerning procedure and outline, make way for improvements and try to reduce possible shortcomings as much as possible. Even though these facilitated the work tremendously, retaking still was necessary. Concerning the interviews my ambition was to perform pilot studies for these as well, but time unfortunately did not permit this. In retrospect it can be said that it would have been good however to both get a chance to test the topics/questions and reduce possible language barriers but also maybe be more “strict” in the introduction of certain specific aspects. However, since I had chosen a semi-structured method I found this at times difficult to balance. In fact, one of the weaknesses with the so called interview guide approach which I used, in accordance with Mikkelsen (1995, p 103), is that the interviewer’s flexibility concerning sequence and formulation of questions, may result in very different responses from different perspectives, consequently reducing the comparability of responses. The structuring of results made me realize that this was actually the case regarding some questions, but since comparison was not in exclusive focus I still value the information provided by these interviews.
4. FOOD SUPPLY SITUATION IN THE REGION/COUNTRY

In this section there will be a deeper presentation of the food supply situation and problem in the country as a whole as well as in Niassa and Cuamba. Focus will be on those two components of the food supply system which are considered the most important ones, namely cultivation conditions (section 4.2) and road/transport conditions (section 4.3) and then the connections will be explained in section 4.4, but first a more overall presentation of the food supply/food security situation in the country and region will be presented (section 4.1).

4.1 Overall food supply features

Mozambique has experienced many severe droughts since independence in 1975 and for many years after independence the maize crop production in Mozambique was far below the level needed to meet domestic requirements (Arndt et al. 2003, p 139). The need for additional food supplies in order to diminish effects like large-scale food deficits, hunger and famine, was great and the economic consequences for the country were far-reaching. It received international assistance but the distribution of imported food was often hampered by security and transport problems (Europa Publications 2003, p 749). The civil war totally devastated the economy and after the peace, people started returning to their villages and resumed cultivation. By the end of the 1990s the economy started showing progress and Mozambique has according to FAO (29th March 2006a) “…made impressive gains in restoring food production and at a national level the country is virtually self-sufficient in terms of food grain production...However, this growth has been uneven spatially and natural disasters such as flood and drought are an important cause of temporary food insecurity.”

The economic progress ended abruptly in the beginning of 2000 when devastating floods, fed by tropical cyclone Eline, swept in over the country, killing lots of people and sweeping away many roads, bridges and buildings. Large areas of food crops were also lost to the floods and especially the agricultural sector suffered severely (Utrikespolitiska Institutet 2003, p 21). It should be noted that the damage of these floods was concentrated primarily in the four southern provinces while the principal maize-producing areas in the north, like Niassa, were largely unaffected. Consequently, the total production of maize was not affected that much (Europa Publications 2003, p 749). Aid donors quickly promised reconstruction help but new heavy rains during 2001 delayed the recovery (Utrikespolitiska Institutet 2003, p 21). The economy however, now seems to be recovering slowly but one should keep in mind that this development proceeds from a very low level and Mozambique remains one of the poorest countries in the world. One of the greatest obstacles for development is lacking infrastructure which economically isolates important sectors in rural areas.

In 2002 Mozambique experienced a serious drought and the need for food aid was anticipated to be high. Even though there was an increase of the total cereal production in 2001/02 compared to the previous campaign, surpluses from the north and centre of the country traditionally reach the deficit areas in the south at greatly inflated prices due to high transport costs. This makes it more cost-effective to import maize from South Africa and to export surpluses to Malawi, Tanzania and Zambia. Focus has therefore been given to rehabilitation of the commercial networks that link areas with surplus maize to neighbouring countries and to the ports of Nacala and Beira (Europa Publications 2003, p 749). Cuamba town can be seen to be some sort of a spider in this net.

The northern region is considered the “food basket” of the country with large surpluses of maize, while the central region is more or less self-sufficient in maize and the southern region usually has large cereal deficits (FAO/WFP 1998). According to Hammarström (2003, p 2)
Niassa has been endowed with exceptionally good conditions for agriculture and every year Niassa has a food surplus while other regions south more or less have a constant shortage of food (Gouveia, Technical Coordinator, Associação Moçambicana Para o Desenvolvimento Rural [AMODER], oral communication 14th September 2005). Still, it is too economically unpractical to transport from Niassa to the shortage areas. Even if Niassa stands out in comparison to the rest of the country, differences appear within the province and Lichinga is because of its cooler and wetter climate considered to have better conditions than Cuamba when it comes to food supply. The last years have, according to some sources (Manuel, Supervisor, Cooperative League of the USA [CLUSA], oral communication 22nd September 2005), presented slightly more irregular precipitation and rains coming too late, in the Cuamba region and also during the time of study, the rains were suspected to be late and that it would result in food problems.

The main function of the family-based agriculture, which dominates the country, is to provide its members with food and other elementary subsistence goods, but isolation from markets is a feature of many of these households (Arndt et al. 2003, p 141). There are practically no commercial farmers in Niassa, and the farmers first and foremost produce for consumption within the family and sell eventual surpluses. However, each subsistence farmer family usually harvests about 800 kg per hectare in average, which leaves about 500-600 kg per hectare to the market (Gouveia, oral communication 8th September 2005). Usually the procedure goes that the farmer in the beginning of the rains estimates if it will be a good next season or not, and out of this he/she decides how much to sell (Maloa, oral communication 13th September 2005), but everything is not sold at once, farmers usually sell when in need of money.

There is in reality no actual limit for how far the farmers cycle in order to sell their products and Colaço (Technician within Architectural Projects, Engenharia Gestão e Consultoria [EGC], oral communication 17th September 2005), exemplify farmers who cycle for more than 100 km “just to” sell some hens. Long distances which require overnight stops usually involve that the overnighter has to sleep on the porches of people living along the way. However, there are some stretches which are practically empty of people and the overnight has to take place under the bare sky among dangerous animals and such. It is not only the farmer who moves in order to sell, it is all a question of access and demand if the buyer goes to the farmer or the opposite. It should be noted that a different situation prevails concerning cash crops such as tobacco, for these farmers are normally located along good roads and the buyers almost exclusively come to them and not the opposite, since the farmers do not have that big transport vehicles. Also, large companies often have sole right of purchasing these (Europa Publications 2003, p 748).

In order to deal with the problematic situation concerning market access and distribution of products, the commercialization of agricultural products plays a big roll in the region. AMODER is a private company organising buyers in order to facilitate the procedure of selling, distributing and marketing. This activity is important since it allows farmers living further away from the central market of Cuamba town to also get their products sold, even if they lack the transport means necessary, or the money to lay out for the arranging of transport to Cuamba. Cuamba attracts products from a large area, not only the whole of Niassa province but also, in those cases where the production is being exported to Malawi, it goes through Cuamba even if it origins in the much bigger city of Nampula. It should be noted however, that the prices offered to the farmers in remote areas are of course lower as a consequence of this. Not surprisingly enough it is the lower prices that encourage the buyers to collect from
these inaccessible places. Some areas are still left out because of inaccessibility and bad roads. However, Gouveia (oral communication 14th September 2005) means that it is all a matter of demand and so if the demand is higher than the supply as a cause of a drought for instance, the buyers can go “into the bush” on the worst roads in order to buy. One of the big buyers is Export Marketing, a wholesale company concentrated on exporting food crops. It has a big warehouse in Cuamba town, where the “catch of the day” is dropped of before it continues to places like Malawi and India (Ramez, Main Buyer, Export Marketing, oral communication 24th September 2005). There are also small private buyers, who can drop of the products at the warehouse, take it somewhere and sell, or store it while waiting for worse times and better prices.

So, when it comes to how the roads affect the food supply and the farmers’ ability to distribute their production, good roads can be considered to increase the accessibility and the farmer is therefore encouraged to produce a lot. Accordingly, bad roads can be considered to make it more difficult for farmers to distribute their products. In spite of the bad roads the farmers will still go to the market, it only takes longer time and prices consequently go down if he/she for instance is unable to reach the market on time because of waiting due to destroyed bridges during the rain period. When farmers have a hard time getting rid of their production, they rather lower their prices than keep it or let it go to waste. The following season they usually cultivate a smaller area and this decreases the surplus. Hence, if the farmers choose to increase or decrease their cultivation is dependent upon how the demand was the previous season (Gouveia, oral communication 14th September 2005) apart from the estimated rain conditions of course.

According to Colaço (oral communication 17th September 2005) the farmers only have problems with distributing their products when it rains a lot and the roads are buried. However, the commercialization does not normally take place during the rain period, and even during this it does not rain every day. It gets problematic however since the farmers seldom live right next to the roads but further away which makes it difficult since they are said to transport three sacks with 50 kg each on one bicycle. This “road less” terrain can not only be difficult but also dangerous in some areas because of dangerous animals, as mentioned before, or even land mines in those places where they have not been cleared.

### 4.2 Cultivation conditions and agricultural production

Cultivation conditions are probably the most important factor to consider when studying food supply and distribution issues since they determine if there is any cultivation/production in the first place. The focus is on physically given cultivation conditions such as climate/precipitation (section 4.2.1) but also soil (section 4.2.2). Concerning non-physical cultivation conditions like level of mechanisation, this will be mentioned in section 4.2.3 together with other production related characteristics.

#### 4.2.1 Climate/precipitation conditions

In spite of Mozambique’s large latitude extension the country can be regarded as being of the tropical climate type, either wet or dry. The precipitation rate varies considerably between different parts of the country and the relatively low precipitation rates that cover the southern parts and inlands are in contrast to the humid climate in the north and by the coast. The temperature during most of the year is high, especially during the rain period, with an average of about 30 °C except for in the cooler highlands in the country’s interior. The dry season’s coldest months are not more than 20 °C. In accordance with it being cooler in the highlands and country’s interior, Niassa and Cuamba is slightly cooler during the rain period with the
average temperature being above 25 °C (Uatata 1994, p 27). The high precipitation rates in the north and central part of the country is caused by the northeast monsoon and high mountains (FAO 29th March 2006a). Within Niassa the north western region, including Lichinga, has in accordance with being the highest part of Niassa, the highest precipitation rate which can reach 1800 mm per year (Uatata 1994, p 27). The central region, which includes Cuamba, receives 900-1200 mm per year and the driest region in the south east only receives 800-1000 mm per year if not less. The climate of Cuamba is humid tropical and has one rain and one dry season. During the rain period, from October/November to March, the average precipitation is always above 800 mm (Uatata 1994, p 25).

“Since heat is a constant condition of the tropics, rain is all-important...” (Leroux 2001, p 321). Rainfall seasonality and inter-annual variability are distinctive climatic features in the tropics and since the majority of people living there depend on agriculture for their livelihood they are thus controlled by climatic extremes, like droughts and flood, which can cause famine (Reading et al. 1995, p 50). While the highlands in the west and north receive a lot of rain, erratic rainfall is to be expected in the southern provinces (Arndt et al. 2003, p 137) as well as sudden weather changes with wind, rain and thunder (Utrikespolitiska Institutet 2003, p 4). According to Maloa (oral communication 13th September 2005) neither draughts nor floods are especially common in Niassa. At the most, the water level of the rivers rises during heavy raining, but never causes floods.

4.2.2 Soil conditions
The high annual rainfall which is common throughout most of the humid tropics encourages intense and deep weathering and specific soil formation processes. The soils are characterized by red colours, the accumulation of iron and aluminium, clay, and a high leaching. It is the iron that gives the soils the red coloration. Out of the many red soils, ferralsols are the most common ones in Africa (Reading et al. 1995, p 85). There are four main groups of soils characteristic of the humid tropics in Africa, namely ferrallitic soils, ferrisols, ferruginous soils and vertisols. The first three are freely drained red/yellow soils in contrast to the last one which is dark in colour and poorly drained, often called black clays. The larger part of Mozambique consists of these red and yellow soils, but also the dark grey and the black soils exist (ibid, p 32). The south is in general sandier than the rest of the country which is more clayey and the coastal areas of rivers Zambezi in the centre and Limpopo in the south are characterized by clayey alluvial soils/fluvisols (FAO/United Nations Education, Scientific and Cultural Organization [UNESCO] 1973). When it comes to Niassa, a larger part (i.e. the highlands with surroundings) is dominated by red clay soils, but a significant part in the north eastern and eastern lowland contains reddish clayey-sandy soils. Cuamba represents a combination of these two but also has spots of shallow rocky soils (Ministério da Educação [MINED] 1986).

4.2.3 Agricultural production
Out of the country’s total area, 45 % is estimated as being arable land (FAO 29th March 2006a). However, only 5,5 % are cultivated (FAO 29th March 2006b). While Niassa represents the smallest area cultivated out of all provinces, with the exception of the small Maputo province, the largest area is represented by Niassa’s neighbouring provinces Nampula and Zambézia (INE 2003e, p 15). Mozambique is considered to have a varied economy in comparison to its neighbouring countries, with trade and service contributing the most to the GNP followed by agriculture (Utrikespolitiska Institutet 2003, p 23). The agriculture however occupies about 80 % of the population but the larger part produces for own consumption and not for commercial purposes (ibid, p 24). The smallholder family sub-sector operating
subsistence farms as in contrast to the commercial sub-sector accounts for about 95 % of the area under production and produces almost all the food crops (FAO 29th March 2006a). Families are the single most contributing unit with its 51 % of the GNP, followed by the government with 6 % and companies contribute with only 5 % (INE 2003e, p 5).

The smallholder family production is characterized by small areas cultivated, low inputs, inadequate equipment and low yields and returns (low productivity). Hoes, machetes and axes are the most commonly used means of assistance while animal draughts, not to mention tractors, are very uncommon. Furthermore, 98 % of all fields use neither chemical fertilizers nor insecticides (ibid, p 28). Almost all production is rain fed as the farmers can not afford to install irrigation systems. Only 3 % of the country’s total area cultivated use irrigation (ibid, p 26) and even less in Niassa (INE 2003b, p 98). At an average every family in the Cuamba district cultivates about 1,6 hectares, which is more or less the same for the rest of the country (Dirrecção Provincial de Agricultura e Desenvolvimento Rural do Niassa 9th September 2005b). The commercial production which consists of small and medium private companies, often producing cash crops for national markets, usually have some technological know-how, use agricultural inputs, have access to credit and irrigation (FAO 29th March 2006a).

Before independence, agriculture of the more large-scale modern kind was mainly under Portuguese control (Europa Publications 2003, p 748). The agricultural production in Mozambique is considered to have been adversely affected by the scarcity of know-how as a consequence of the Portuguese leaving the country, but also due to the internal conflict which prevented many Mozambicans from farming the land, and due to droughts, floods, cyclones and insect pests. In 1996 the government signed an agreement with South Africa, called the Mosagrius programme, allowing some 200 000 hectares of farmland in Niassa province to be leased to South African farmers. The goal was to develop the agriculture in Mozambique by combining its favourable cultivation conditions and space with the technology and experience from the South African large-scale farming. Mozambican farmers were to learn from this so that they could develop commercial agriculture, and were supported with for instance tractors (Mozambique News Agency 1999). It was thought that bringing expatriate farmers with know-how and capital to cultivate the millions of good agricultural land in Niassa, was viable and would also be an effective way of eradicating poverty in the province. Even South Africa would gain because of lack of land and high costs of large-scale farming, as well as a discouraging security situation threatening white farmers and also the number of unwanted refugees from Mozambique was believed to reduce (Öhrn 1999, p 161). This project can be viewed as an indicator of the regions suitability for agriculture and according to Hammarström (oral communication 15th February 2005) the South African farmers who previously in their home country could only harvest about 3 tons of maize per hectare, in Niassa could harvest 10 tons per hectare. The initiative however fell victim to the hands of corruption and has been criticized for being an attempt to export apartheid to Mozambique (Öhrn 1999, p 161). Another problem was the conflicts that arose when some South African farmers tried to take the best lands by evicting local farmers (African Studies Centre 1997). There are however, still South Africans farming the lands of Niassa, one of their main constraints being the lack of infrastructure.

The main crops cultivated in the country are the subsistence crops cassava and maize, with an emphasis on maize in Niassa. Cash crops are cultivated in a much lesser extent (INE 2003e, p 23). The major cash crops are cotton, cashew nuts and sugar. Cotton has traditionally been the main cash crop of northern Mozambique (Europa Publications 2003, p 748) and cashew nuts are almost exclusively concentrated to Nampula and Inhambane provinces (INE 2003e, p 24).
Niassa is however, seeing a rapid expansion of tobacco production (New Agriculturalist Online 2004). The western part of this province produces mainly maize, sorghum, cassava, beans and potatoes; the central region even tobacco and cotton; and the eastern region concentrates on cotton, tobacco, groundnuts, cassava, beans and vegetables (Dirreccção Provincial de Agricultura e Desenvolvimento Rural do Niassa 9th September 2005a). It should be noted that practically all farmers cultivate maize and it is common to sow other crops like beans in between (Gouveia, oral communication 8th September 2005). Most of the production in Niassa is concentrated in the south and in Cuamba, because of the higher population and economic activity, even though the cultivating conditions are better in the north (Dozenta, Food security Agronomist/Project Official, Oxfam GB, oral communication 22nd September 2005).

4.3 Transport conditions

Even if roads are in focus in this paper, different kinds of transport and trade patterns will be treated (section 4.3.1) when of relevance for understanding the road/transport conditions (section 4.3.2). A map covering the main transport features have already been presented in section 3 (figure 1). An effective transport system is an instrument for trade and exchange of goods and culture, as well as a prerequisite for rural development. As is often the case in the developing countries of today, the infrastructure in Mozambique is still very much according to colonial conditions, as already has been mentioned.

Many countries still use the southern port of Maputo, the central port of Beira and the northern port of Nacala along with the railway lines that lead there from the neighbouring countries. The ports are not only important outlets for land-locked countries like Zimbabwe, Swaziland, Zambia and Malawi, but also South Africa and the Democratic Republic of the Congo. Cuamba happens to be on the railway line between Nacala port and Malawi, and also has an extension to Lichinga. This may be one of the reasons why Cuamba is considered a relatively important connecting point. The railway lines and the ports are important sources of income and Maputo is the second largest port in Africa (Europa Publications 2003, p 752). All of the railway lines in Mozambique are intended primarily to export the products of land-locked countries, and secondarily to transport Mozambican goods. Since the effective functioning of the international lines is vital to Mozambique’s neighbours, most of them are controlled by international conventions.

“Railway-dominated Mozambique suffers from a lack of good roads.” (Europa Publications 2003, p 752). The road network is bad, especially up in the north. Little has been invested in north-south connections and the infrastructure as a whole can be seen to form a distinct western-eastern pattern. It should be noted that the presentation of the most important roads in figure 1, says nothing about its quality and so the perceived north-south connections should be considered carefully. Also, the north-south connections have been cut repeatedly in the past. During the larger part of the civil war most provincial capitals were only accessible from Maputo by air. The restoration of civil order and the rehabilitation of the road network have considerably reduced the dependence on internal air transport.

4.3.1 Trade/transport patterns

Mozambique has suffered from unprofitable terms of trade and consequently has a trade deficit, like many developing countries. The export earnings have traditionally only covered a small proportion of the country’s import costs, but the opening of a new smelter in 2000 had by 2001 resulted in a doubling of total exports due to a dramatic increase in aluminium exportation (Europa Publications 2003, p 753). Before this “aluminium boom”, agricultural products made up the major source of export revenue for Mozambique (ibid, p 748). While
the export products are restricted to food (including fish products) and aluminium, the import consists of a set of diversified products. The main source of imports and the principal market for exports are South Africa. Portugal is also an important source of imports and Zimbabwe an important market for exports.

A large part of the production in Niassa goes to, through or from Cuamba. As will be shown in section 5, Cuamba is a connecting point also when it comes to roads. The larger part of the transports from Cuamba goes by train to Malawi or to other countries via Nacala port. Even on a national level, Malawi is one of the principal export partners even if not the biggest. According to Dozenta (oral communication 22nd September 2005) Malawi is constantly having food problems and is consequently the biggest consumer of Niassa’s maize production. Malawi also imports for further distribution to countries like Zambia, Zimbabwe, Nigeria and Somalia (Ramez, oral communication 24th September 2005). The trade with Tanzania is much smaller and according to Fumbe (Bachelor of Economics/Coordinator, AMODER, oral communication 17th September 2005), people from Niassa mostly go there themselves to buy and not to sell. Since it is apparently only possible to reach Tanzania from Niassa by bicycle beyond Mecula, it is however not especially common.

If transports by boat and train are important for international trade, then roads are of bigger importance for domestic distribution. In rare cases transports heading far south use the port of Nacala (Dozenta, oral communication 22nd September 2005), but as mentioned before Niassa does not normally supply these areas. Products seldom get distributed to the north, for the northern part of Niassa is considered both as self-sufficient and unpopulated enough not to need it and so it is more common that this part sells its produce in Cuamba than the opposite (Fumbe, oral communication 17th September 2005). Some of the produce goes to Nampula by rail or road in order to be processed in fabrics, but Nampula can also be an important stopover when distributing within the country. Some products are also being exported because they need preparation and processing which sometimes is not possible in Mozambique (Gouveia, oral communication 8th September 2005) and according to Fumbe (oral communication 20th October 2005) it even happens that the products return to Niassa and Mozambique again after having been processed in the “nearby” bean factories in Malawi for example.

Öhrn (1999, p 166) gave a slightly different interpretation of this problem. In 1999 there were practically no nuts available for preparation at the cashew nut factory in Nampula province, while at the same time several trucks loaded with raw nuts passed daily heading for the port of Nacala, from where they got shipped to India for peeling, drying, salting and packing. This is an example of a conflict between the Mozambican government who wanted to protect their industry by taxes and the World Bank who demanded a reduction/abandonment of the export taxes or the country would loose a great part of its aid assistance. Since this of course is not an option for such a heavily aid dependent country as Mozambique, the country obliged. By 1999 all but three of the country’s 14 principal cashew processing plants had closed (Europa Publications 2003, p 748).

### 4.3.2 Road/transport conditions

The main roads in Mozambique are penetration lines toward bordering countries and are very insufficient for the country’s own purposes. Most of the northern provinces are lacking in roads although attempts are being made to construct a paved road from the Tanzanian border down to the south. The civil war’s poor security situation affected all normal road transport to and from most cities. These either halted or made it necessary to organize military guards for
There are many different ways in which to classify roads and to apply one easily invites questions about its meaning (section 5). In attempting to classify all components of the road network, INE (2000, p 49) refers to three different categories namely classification by importance, surface material and condition and out of all of the country’s bad condition roads Niassa makes up for 18.4 %. On the national level the category unclassified roads are less common than the main roads/principal roads (INE 2004, p 28). Furthermore, in 1999 it was estimated that some 30 400 km of roads existed in Mozambique out of which 5 685 km were paved, which equals 18.7 % (Europa Publications 2003, p 766).

When it comes to importance of the road, over 30 % of the roads in Niassa were in 2003 considered unimportant enough to even be classified and are therefore so called none-classified roads, equally big are the tertiary and secondary road category, while the principal roads only make up for about 6 % (INE 2003a, p 82). Regarding surface material 6.3 % is paved, 28.1 % gravel and 65.6 % consisted of dirt roads. The fact that 15 % was termed as being in good condition, 24 % in reasonable condition, 38 % in weak condition, 20% in bad condition and 3 % in impassable condition (INE 2002, p 50) proves that road categories such as gravel road or paved road does not necessarily reveal much about the road quality (section 5). The roads of Cuamba will be treated more in detail in section 5.

4.3.2.1 Maintenance, reparation and construction traditions

One of the reasons for the bad road quality is the lack of maintaining and rehabilitating. As one can see in the above presentation of the share of good and bad roads, the infrastructure challenge for many developing countries, including Mozambique, not only lies in construction of new roads but also in maintaining and repairing existent ones. To be considered a maintenance or construction work is often a matter of definition and PAMA’s (Programa de Apoio aos Mercados Agrícolas) aqueduct/bridge projects in the Cuamba region should according to Geilinger (oral communication 30th September 2005), Civil Engineer for Atiku Associates/PAMA, be viewed as new constructions and not just reconstructions, with consideration to the bad shape in which the roads and aqueducts/bridges were before and the large amount of work that needed to be done. In 1964 dos Santos (1964, p 180) wrote about an extension of road network in spite of the bad condition most roads in Niassa were in. Niassa and the neighbouring province Cabo Delgado by then had a total of 1 878 km of roads and in 2003 Niassa alone had 3 031 km of roads (INE 2004, p 28). It is however hard to interpret how much of this is the result of the Portuguese colonials and the independent government/international donors, for in 2000 (INE 2000, p 49) the numbers appeared to have been the same. According to Cherule (Director, Direcção Distrital de Obras e Publicas, oral communication 23rd September 2005), the technical knowledge left with the Portuguese. Still, it is claimed that for most of the colonial period, most roads in Africa were unpaved, which meant that they were impassable for at least some periods during heavy rains (Gleave 1992, p 43).

The ten year long independence war and then the civil war which took on soon thereafter, caused the government to focus on other issues than rehabilitating roads. In 1994 international donors and the World Bank announced a five-year rehabilitation programme, which was to rehabilitate the country’s roads and bridges. All in all it involved a reopening of 11 000 km of roads closed during the hostilities, an upgrading of 3 000 km of paved roads and 13 000 km of secondary and tertiary roads (Europa Publications 2003, p 766). Another programme was introduces in 1998 and aimed at increasing the percentage of roads in “good” or “reasonable”
condition from 39 % to 70 %. However, owing to the widespread destruction of the floods of 2000, much of this reconstruction work had to be repeated. The floods caused serious setbacks and several sections of the only north-south route were destroyed as well as a number of bridges over the main Save and Limpopo rivers, but most roads have since been restored (ibid, p 752).

In 2001 the government announced a wide-ranging road maintenance and rehabilitation programme. PAMA, which is a smallholder agricultural development initiative of the government financed by International Fund for Agricultural Development (IFAD), do work on smaller roads like tertiary or unclassified roads in order to facilitate smallholder farmers’ way to local markets and help them participate more effectively in the market economy. Hence, the focus is not only on the bigger roads which normally is the case for governmental undertakings. Fortunately, PAMA projects targeted Niassa as in need of their activities and they are, at the time of writing, operating their projects there (figure 2). Also Sida is supporting a bigger rehabilitation project in Niassa on the eastern leading road from Lichinga, which started in 2002. When finished, this will represent the only major paved road in the whole Niassa province, with the exception of shorter road sections connecting Lichinga (Dirreccão Nacional de Geografia e Cadastro [DINAGECA] 1997).

Within the Cuamba district there are still bridges/aqueducts which have not been rehabilitated since colonial times (Cherule, oral communication 22nd September 2005). A few new constructions in metal were made in 1997. The bigger roads were mainly rehabilitated in 1997 but the unclassified roads did not get any attention until 2003 and then only a very small part got simpler rehabilitation. The larger part is often considered as being the responsibility of the farmers. Also, in 2003 there were some new constructions of bridges on these roads, before, there were not even traditional wooden arrangements.

The government is responsible for maintaining roads but far too long time often passes due to lack of funding. Also, Colaço (oral communication 17th September 2005) points out that the government does not have enough interest or respect for the importance of preventive measures like taking precipitation and general hydrological factors into consideration for more sustainable constructions. He means that the techniques, specialization and information
is lacking, but all this was regular procedure during the colonial times. So called voluntary work on the roads exists, as the farmer interviews (section 6) reveal, but Colaço means that this is only the case when the voluntaries (farmers/community leaders) see economic gains in it for them and even then the maintenance does not cover great distances but rather those stretches which are in direct connection with the farmers’ property/land and it therefore has little importance.

Geilinger (oral communication 30<sup>th</sup> September 2005) criticizes the local road maintenance and that the waiting period often is too long that maintenance is not really enough anymore. How frequent a road might need maintenance is dependent on the kind of road and the need can be as much as once every month but once every year is more the case. This routine maintenance often involves filling of potholes and cutting grass while other so called periodic maintenance is needed more seldom, even if they might be needed more often than is the actual case. Additionally, inefficiency when actually performing maintenance seems to be a problem. The roads in Cuamba area, which are all dirt roads, are maintained first by the refilling of dirt (figure 3), after sometimes scraping it, and then by the adding of water and finally the compacting. Normally a tractor is used to transport water on a trailer and the water is then distributed over the road. In spite of there being basic weather information available concerning “specific” days when rain can be expected, no real adjustments are being made even though water is a very important component in this maintenance process. Since a tractor does not drive faster than about 15 km/h the process could be made much more efficient by just making sure that the road is refilled with dirt before it rains and that one just has to be ready to compact it afterwards.

![Figure 3](image.jpg)

**Figure 3** Local road maintenance: collecting of soil/dirt used to refill the road.
(Photo: Daniela Michael)

4.4 A connecting and explaining closure
In this section explanations will be given concerning how the different key factors are connected with each other, more specific in the region. The key factors of this study are climate (and soil), cultivation, road/transportation and food supply. As could be seen in
section 4.2.3, maize is the most commonly grown crop in Niassa and its specific climate and soil requirements will therefore be mentioned. It should be noted that some new material is presented in the following sections (4.4.1 - 4.4.6).

4.4.1 How climate/precipitation influences cultivation

Agricultural production is highly dependent upon the quality and duration of the rainy season, and if rainfall varies from the norm, both in terms of total precipitation and in timing, food security is affected. According to Arndt et al. (2003, p 137) data from Mozambique illustrate the nexus between precipitation rates and grain yields. Maize was the grain exhibiting the highest yield variability and between 1961 and 1993 maize yields fluctuated from 0.2 to 1.1 tons per hectare. These wide fluctuations paralleled the changes in annual rainfall. Manuel (oral communication 22nd September 2005) explains that some crops like maize, have a long growth/development cycle (five months) and when the rain arrives too late or there is a shortage at the end of the season, the maize harvest will not be as successful. Planting/sowing normally takes place when the rain season starts in October-November and harvesting is in April-May. Since the rain period lasts for only five months more or less there is not much marginal. The ideal water requirement during the growing period is 500-800 mm (Landon 1996, p 287). The rain period in Cuamba region is characterised by an excess of water, more than the grains need. This implies that they could survive years of shortage if one were to engage in irrigation (Uatata 1994, p 28). Since irrigation is very rare in the region, as presented in section 4.2.3, the farmers are left with rain fed agriculture, under which the crops are dependent upon direct precipitation (Barrow 1993, p 149). In Lichinga the climate are considered slightly better than in Cuamba for agriculture.

Considering the fact that the weather and climate over southern Africa is considered highly variable with extreme events, such as droughts and floods and their negative consequences for the agricultural sector, as frequent occurrences (Vogel & O'Brien 2003, p 3), Niassa can be considered as having a favourable climate for agriculture, with its high and relatively regular precipitation rates.

4.4.2 How soil type influences cultivation

The old and highly leached ferrallitic soils which characterises Africa are often poor in organic material and are normally considered soils with low natural fertility and low agricultural value (Bridges 1970, p 69). Different factors such as texture, depth of horizon, structure and consistence, moisture conditions and organic matter/plant nutrients, can however make them more or less good (Landon 1996, p 270), and so, the suitability of these soils for agriculture varies. Furthermore, they are less susceptible to erosion than many other soils, easy to work, well drained but at times dry and maintaining the soil organic matter by for example manuring are important management requirements (Driessen & Dudal 1991, p 165). Even though maize can be grown on a wide variety of soils, the best ones are well-drained, well-areated, deep, clay soils with adequate organic matter (Landon 1996, p 298). In the high-altitude region of Niassa the soils are considered slightly more fertile than in the surrounding area even though it is still “only” low to intermediate in the former and low in the latter. In the lowlands however, the soils are considered as having low to intermediate fertility. Cuamba region is located where there are both low and low to intermediate fertility, but small spots are characterized by shallow rocky soils non-suitable for agriculture (Atlas Geográfico, MINED 1986). Considering the fact that most soils in Africa are bad, where desert soils or so called non-soils occupy 28 % of the entire African continent (Bridges 1970, p 66) and another 18 % are covered by poor ferrallitic soils, the soils in Niassa can still be considered as relatively good, even though many areas are characterized as having low fertility.
4.4.3 How cultivation influences food supply
To summarize both climate and soil conditions in Niassa/Cuamba can be considered to be favourable for agriculture. Favourable physical cultivation conditions (i.e. climate and soil) are prerequisites for agricultural production even though other non-physical cultivation conditions, like level of mechanization, might be hindering. This is because most farmers in both Mozambique and Niassa/Cuamba are subsistence farmers and will therefore always need to produce in order to consume for themselves at least. Dependent on the size of the production surplus there might be a possibility to secure food supply on a larger level.

4.4.4 How climate/precipitation influences road quality
Even if the precipitation conditions are considered favourable for cultivation they do not necessarily have to be for roads. Problems occur where there are aqueducts/bridges and every year/rain season presents impassable days where one has to take another way around or simply wait (Dozenta, oral communication 13th September 2005), as is exemplified in figure 4. However, on bigger/secondary roads, transport time just differs (Geilinger, oral communication 20th September 2005). In some places in the Cuamba-region the old wooden and rock bridges could imply a monthly long impassable period each rainy season. It should be noted that information about the number of impassable days was often very blurry and different. According to Geilinger it could be considered possible to pass with a 4x4 car after some rearrangement of rocks, but it is much more difficult with a bicycle which is the most frequently used vehicle. The new PAMA-bridges allow for the water to pass faster seeing how they are designed to let the water pass underneath but also over the bridge when the water level is at its highest. Accordingly the number of impassable days is reduced to one week during the rainy period. Since even bigger bridges are too expensive one has to settle with having just a reduced number of days which are impassable. It should be noted that the water level and the situation is very different in different sections of roads.

The PAMA-works are built on proper bedrock, so that they will not erode. Other aspects of importance for road work include that a flat landscape increases the risk for flooding while a too steep one allows for a high velocity of the water. It is therefore important with some kind of a slope on the road so that the water is allowed to run off easily and thereby not even form potholes. It is also important to lead the water away from the ditches, in which it accumulates.

Figure 4 An example of a water drowned road during the rainy season. Note the half-drowned poles indicating the side limitation of the road. (Photo: David Geilinger).
4.4.5 How soil type influence road quality

Some soils which are suitable for cultivation function badly as road material. Geilinger (oral communication 30th September 2005) explains that the heavy dark clay soils that exist in Cuamba are not suitable for driving on, even though favourable for some crops. The ultimate road material in this instance contains a combination of clay, fine sand, core sand and bits of stone. In general the top layer is no good and it is necessary to drill down to a depth of about 20-30 cm. While the bits of stone are important as resistance against wearing/tearing of heavy vehicles, the clay glues the parts together and is needed so that water does not percolate through the bits of stone and accumulates in the road. Clay alone can be considered as the most inappropriate road material, but gravel on a slope is no good either. The most ultimate is well-drained soils on a light slope. Niassa can still, according to Geilinger be considered to have relatively good soils for roads/driving in comparison to some places where it is needed to bring in soil from the outside, which is expensive. It should be noted that farmers often live far away from the road because of the soils and the cultivation tending to be better there, as compared to right next to the road (Colaço, oral communication 17th September 2005), or maybe it is the roads that tend to be located in a certain area where the soils allow. As will be presented in section 5 there are however roads leading very much through cultivated areas and consisting of clayey cultivation soil, as illustrated in figure 5.

![Figure 5: Road or cultivation soil? (Photo: Daniela Michael)](image)

4.4.6 How road quality influences food supply/distribution

The most obvious influence of road conditions on food supply and the farmers’ ability to distribute their production is the relation between bad roads making it more difficult and good roads increasing the market accessibility and therefore encouraging the farmer to use the cultivation potential, produce more and distribute. Distribution problems and bad roads present themselves mainly when it rains a lot, but the farmers will still go to the market. In spite of the bad road conditions, the biggest problem concerning the food supply in the region is according to some, climate and not infrastructure (Dozenta, oral communication 22nd September 2005). It has also been claimed that since there is a certain commercialization period, there is no problem with the roads for it occurs when it is not raining (Maloa, oral communication 13th September 2005). The farmer interviews however showed that farmers want to and do sell at other times as well (section 6).
5. THE ROADS OF CUAMBA

In accordance with being the connection point of Niassa province, there are in total five roads connecting to Cuamba town (figure 6). Overall field observations were performed on all of these (section 5.1) before two of them were chosen for more detailed study (section 5.2). Section 5.3 then rounds up with a comparative closure. It should be noted that in addition one more road was subject to the detailed study even if not treated in section 5.1. This is because of it in accordance with being a side road, is not even represented on maps. It has still been included and illustrated in figure 4.

The five roads are spread out in their geographical direction and runs more or less east, north east, north west, south west and south from Cuamba. None of the southern roads connects with so called important places and it is considered more effective to use the bigger road from Nampula, which is reached by Cuamba’s eastern road, when transporting to/from the south. In much the same way both of the roads leading north west and north east can lead to Tanzania in the extension, but these alternatives are complicated and unusual for this purpose, due to poor road quality and a restricting national reserves etc. Instead, the north western road which splits into two by the border town of Mandimba and continues in one direction north to Lichinga and in another west into the neighbouring country Malawi, can be considered of international importance.

Figure 6 Map showing the location of the five roads connecting to Cuamba town, including the side road. (Source: after DINAGECA 1999)

5.1 An overview: Map info versus field observations

To say that different maps present different features depending on scale and type of map is to state the obvious, however, there are also different ways in which to present one and the same feature. When it comes to roads some of the maps covering Cuamba focus on classification after importance (DINAGECA 2004), some after road material (DINAGECA 1997) and others try to combine the two (International Travel Maps [ITM] 2001). Classification after importance allows classes to differ for one and the same road because of scale differences and some of the roads are consequently classified as principal on maps covering only the
province, but *quaternary* on nation covering maps. Furthermore, a classification by importance does not necessarily mean that a more important road is of bigger size and better quality, even though it is easy to assume so. It seems more to be about if the road connects to important places or not. Classification after road material is easily considered less complicated in the sense that it is either tarmac or not (gravel or dirt). As we shall see however, since all of the five roads are so called *rough dirt roads* or *unpaved hard surface roads* (or according to some maps, *tracks*), this classification does not necessarily provide a deeper understanding for just as well as a paved road does not necessarily imply a good road, not all dirt roads are the same. Hence, complementary field observations revealed that roads assigned with the same classification on one and the same map is no guarantee for the representation of this in reality. It was because of the fact that classification often differs between maps, that a neutral presentation of the roads was chosen in figure 6.

The roads running to the north west, north east and east is classified as principal roads on provincial maps and as tertiary unpaved hard surface roads on national ones. The southern and south western road are classified as secondary and quaternary rough dirt roads. In spite of this categorization no two roads were observed to be the other one like. The road running north west of Cuamba to Mandimba was observed to be the best of all five, and the north eastern one leading to Marrupa the second best. The remaining principal road does not occupy third place but rather does the south western road to Mecanhelas, which according to the maps is of less importance. Instead the eastern leading principal road to Nampula was by me considered to be second to worst, even though it in the maps was compared to the two best. The southern running road to Etatara was observed to be the worst of all five.

Accordingly, the north western road was chosen to represent the good road example and the southern road the bad road example in the following detailed study (section 5.2). Since there is only so much a map can say and it is evident that a gap exists between information obtained through maps and information obtained through observations beyond what can be referred to as a question of scale, it was considered necessary to deepen the road studies through more detailed field observations. This does not include any deeper comparison between maps and observations but will among other things make way for an understanding of the actual road conditions and the complexity of the problem, when for instance differences even between different parts of one road present themselves frequently. It can also be seen to explain why the roads were considered “good” and “bad” in the first place and what indicators can be said to have more or less influence on road quality.

### 5.2 A deepening: Field observations on selected roads

In addition to the north western road to Mandimba which was chosen to represent the good example and the southern road to Etatara the bad example, one more road was considered interesting enough to be included in order to widen the spectrum of the farmers’ conditions. This one is a side road to the bad road and consequently much smaller and worse even though it also may lead to Etatara (as was shown in figure 6), it is however not used for this purpose anymore and all products still go to Cuamba. The road does not connect to Cuamba town, like the other two, but to the bad road some 8 km away from Cuamba. The distances studied were 20 km on the good and the bad road but only 10 km on the side road, which can be explained by an ambition that all of the interviewed farmers along these roads (section 6) were to have more or less the same distance to the market in Cuamba town. The good road was divided into 4 sections and each 5 km was studied as a whole and the bad road was because of its great variability divided into 20 sections (1 km each). The side road was however studied as a whole, since the variations only occurred for very short distances here and there. It should
also be noted that since it was not until after the field observations on the good and the bad road was done that the side road was decided to be included, the observations and measurements are sometimes of a somewhat different kind. The field observations were performed during dry season, in October 2005. First a brief presentation of each selected road will take place (section 5.2.1), then focus will be set on different characteristics and if and how they presented themselves on the roads/road sections (section 5.2.2) and finally section 5.2.3 covers a grading system which was developed in order to classify different road sections according to the characteristics they presented in the previous section.

5.2.1 Presentation and background information
In this brief presentation of the selected roads, a description of the environment and surroundings in which they are located will be given. Altitude was recorded with GPS at the start (i.e. Cuamba) and finish points. Also, general road features which are of importance but not covered in the detailed presentation, such as road width and reflections concerning speed possibility, driving conditions and suitability, will be accounted for.

Width was measured at every road section using a measuring tape, and then an average was calculated. The widest part refers to the widest of the ones measured. These measurements most often included verges since these, where present, are as much used as any other part of the road since road users tend to move all over the road in search of the best road part for the time being. It should be noted however, that the verges on the road sections on the good road which were characterized by horizontal unevenness were not used like this (section 5.2.2.1) and consequently not included in the width measurements. The extreme narrowness of the side road did many times not even allow for any verges and since this road was very difficult even to define, width was only measured at one point to exemplify. Since there is an absence of road signs with speed limits or outspoken speed limits in any other way and speed seems to be governed by other conditions such as what is possible/suitable, the highest speed possible and lowest speed necessary was registered by observing the car’s speedometer when it was at its highest and lowest, when driving “normally”. Also, speed average was calculated from distance registered by a GPS and time registered by a stopwatch.

5.2.1.1 Good road
The physical landscape through which the good road runs is very open and flat and consequently there are no slopes on the road. The altitude is 614 m above sea level in the beginning of the road and 671 m at the end. The road is also very straight, more or less free from curves and the widest part is 9 m and the narrowest 6,5 m. With an average width of 8,4 m it can therefore be considered as a wide road. People in the area live in small houses, i.e. huts, which are generally located further in from the road. Even the vegetation is present further in, which can be a cause of it being dry season at the time of study or of burning which is common here. Only two large bridges were observed (figure 12). They do not overarch perennial rivers but ones that were dried up at the time of study.

The sight is very good over large areas, which can be explained by the open landscape, the small and well located huts and the control of vegetation. The only thing that can be perceived to worsen sight conditions is the huge clouds of dust that swirl up in the air as a result of vehicles passing each other in high speed. In spite of the great width of the road, it is the thick layer of coarse-grained dirt that makes up the road which necessitates speed reduction in this instance but also in some curves where sight can be good, in order not to risk skidding. Passing and overtaking was at best difficult and at worst dangerous. The average speed for the whole section was 68 km/h, even though some parts allowed a maximum of 110 km/h and
others required a reduction down to 40 km/h. Another thing that seemed to cause speed reduction was the presence of pedestrians and cyclists. As will be seen next, this did not seem to be the case on the bad road which maybe can be explained by the roads’ speed differences.

5.2.1.2 Bad road
The bad road runs through a landscape with features more typical for Africa, i.e. flat and large open areas punctuated here and there by so called inselberg formations. There are a few small slopes on the road but it can not be referred to any kind of mountain road for these formations are not especially close to the road. The altitude starts at 587 m above sea level and ends at 633. The huts however, are close to the road which may allow a lower speed in comparison with the good road. It is also recorded to be a higher density of people on or nearby the road, in comparison with both the other roads. There is not much vegetation close to the road, leafless trees and taller vegetation only present themselves further in from the road. This might again be a cause of burning and dry season which means less lush vegetation. There is only one larger river with perennial water and this is “equipped” with a bridge, the rest are water bearing only during the wet season. However, these small watercourses/rivers are many (figure 12) and their influence on the road can be considered significant (section 5.2.3).

The absence of vegetation and the hill formations which are located not too close to the road, offers relatively good sight conditions. The road is relatively straight and even though the amount of curves is not many it is still more than on the good road. Maybe this is because of the bad road being narrower, with a minimum of 3,4 m and a maximum of 6 m and an average of 4,4 m. The average speed was 38 km/h, but the highest speed recorded was 80 and the lowest 15 km/h. The only factor that seems necessitating speed reduction is the presence of characteristics such as potholes and penetrating rocks (section 5.2.2). In contrast to the good road pedestrians and cyclists who are on the bad road are expected to hurry down in any possible ditch and leave way for approaching cars. However, when meeting with other vehicles it can sometimes be necessary to reduce speed because of the narrowness of the road. Driving on this road can also be likened by a risky challenge were it is very common to cruise all over the road in search of that part of the road which is best for the time being and not surprisingly enough this often means last second yielding for meeting traffic.

5.2.1.3 Side road
Even if the landscape is much like that through which the bad road runs, the term “bush road” truly is suitable for this road both in the sense that it leads into the bush and also that it is characterized by vegetation very close to and on the road. If it is not vegetation from surrounding bushes and trees hanging in over the road or growing on it, it is plant material such as branches and straws lying on top. Any eventual absence of vegetation is due to burning. There are not many slopes on the road. It is however very curvy even though occasional variations occur, e.g. there is one part were the road runs through a very straight, relatively wide and well disciplined alley, even if only for a short distance. Neither aqueducts/bridges nor watercourses/rivers could be seen, but by looking on the road it is still obvious that water is very much present in this area (figure 5). The huts are sparsely located and not as many people as on the other two roads could be seen, except for the small gathering around the local water pump. This can be interpreted both as less people living there and as the relatively dense vegetation making it difficult to register objects beside the road.

Not surprisingly, the sight conditions can not be considered to be good, however the quality of the road does not allow driving especially fast anyway so it does not really affect driving in any direct sense. An average speed of 27 km/h was possible on this road even though some
parts required 10 km/h and others allowed 40 km/h. No obvious speed reduction could be perceived not even due to the narrowness of the road, which may be the cause of the speed being so low to begin with. It was difficult to decide were the road started and ended sidewise, since no clear defined boarders were apparent. It either looked like driving on a path since the narrowness often meant that the road was part of the field (figure 5), alternatively the opposite, or the road seemed to be part of a boundless landscape. Therefore it is estimated that the maximum width was “endless” and the minimum was approximately 1.5 m. It should be noted that the road was more often narrow than endless in width, and two cars meeting is impossible. This might seem irrelevant and unimportant since this road almost exclusively is dominated by cyclists at best. However, not even one car meeting a cyclist is possible.

5.2.2 Road characteristics present

In order to get a deeper understanding of the actual road conditions and to exemplify and concretize the characteristics of the roads and there great heterogeneity, different categories of characteristics were first identified at pilot studies. These were then used as a model when observing the roads and all of the characteristics that could be said to dominate individual sections were registered. The purpose was to describe as much as possible of things having to do with quality for each road section. Table 1 presents the different categories used and their presence on different road sections, starting from Cuamba.

The top layer could either be thick or thin, consisting of either coarse-grained or fine-grained material and while horizontal evenness implies sloping of the road sidewise (from the middle to the verge/ditch), vertical evenness covers height differences in road surface e.g. as a consequence of potholes. The structure of the driving surface could either be smooth or rough, e.g. as a consequence of stationary rocks projecting from underneath. Moreover, apparent bedding or not can be dependent on thickness of top layer and it should be noted that it usually was in the form of compact hard soil on the good and the bad road, while on the side road it did not have to be that compact. Waves refer to a “washboard” structure in the road lengthwise, often as a result of scraping of the road in preparation for maintenance. Tracks from tires refer to lengthways running depressions in the ground in the same size and form of tire tracks, often as a result of heavy usage and tearing. Loose solid material refers to pebbles, branches, sticks and plant material lying on top of the road. Also this category has different meanings on different roads, pebbles only occurred on the good and the bad road, while also branches, sticks and plant material occurred on the side road. Stationary solid material refers to rocks projecting from underneath almost exclusively on the bad road, while the side road also had tree roots and clay lumps projecting from underneath. Potholes and major holes are holes in the road of different size, which are formed through the influence of water. Also tracks from water erosion and major tracks from water erosion indicate a previous presence of water but not restrained to holes, rather more like bigger tracks.

The general characteristics are so called either-or-alternatives. For instance, top layer could either be thick or thin, coarse-grained or fine-grained, horizontal and vertical properties could be even or uneven and road surface smooth or rough. They are general in the sense that they in one way or the other always are present because they are wide in there definition and common. A standpoint was a must for every single general characteristic, in contrast to the detailed characteristics which had to be represented only if and where they occurred. Table 1 reveals that sometimes both of these either-or-alternatives were chosen, e.g. smooth and rough bedding. This may seem confusing but can simply be explained by the observation that both features appeared more or less equally as much and it was therefore difficult to decide which one was more dominant than the other. In these cases both of them are accounted for
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<th>Bad road section</th>
<th>Side road section</th>
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<td>major tracks from water erosion</td>
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* implies a characteristic important enough to be represented even though it was perceived only to dominate about half of the section. This was only the case on some of the longer road sections, consequently on the good and the side road.
and in coming calculations each one is counted as half its worth, irrespective of if it has to do with distance (figure 7) or value/points (table 3). This was sometimes also the case in the detailed characteristics group, even if this one has nothing to do with either-or-alternatives. The reason is instead the length of the road section which for the good and side road was much longer. Therefore, these properties could honestly not be said to dominate the whole road section and was considered only to cover half of the section. Consequently, representation of half of one characteristic is only present on the mentioned roads.

In figure 7 general road characteristics are presented in percent of total road distance, for each road. Since these are either-or-alternatives they could either be regarded in a positive or negative form. Thick top layer, coarse-grained material, horizontal and vertical evenness and smooth road surface, are all considered to be positive properties and the rest is on the negative side (table 3). The lined parts in the diagram represent the negative properties, e.g. 50 % of the bad road is characterized by horizontal evenness and 50 % by horizontal unevenness.

It is obvious that while the good road is dominated by the positive characteristics, the opposite goes for the side road. The bad road is a little in between. It should be noted however that depending on surrounding factors these characteristics could be perceived in another way for example, top layer thickness and coarse-grained material are normally considered positive. However, just as well as a thick layer of fine-grained material can result in loosing road grip when driving in thick sand, more or less the same situation may occur on a thick layer of coarse-grained material since the particles are not “glued” together like on paved roads. Moreover, horizontal properties are considered negative and they normally seem to form when car drivers start using ditches in order to avoid bad road parts. On the good road however, this property was seen to have a more intentional presence and a clear purpose, for a built-up road is considered a good and more resistible road because it allows the water to run off easier. This should be kept in mind when interpreting figure 7. Finally, a smooth road surface can in some rare cases also be perceived as negative if you also take into account that a non-existent top layer for a longer stretch means that driving on the bedding is smoother than on patches of top layer.
The representation of detailed road characteristics on each road, in percent of total road distance, is presented in figure 8. The characteristics are arranged in order of negative influence on road quality and accordingly the lower the characteristics are placed on the axel, the larger the negative influence is considered to be. This order is based on the scoring system developed for the calculation of quality classes where different points were assigned to different characteristics (table 3).

Seeing that the characteristics are arranged in order of negative influence on road quality, it is easy to understand that the larger the characteristics negative quality influence gets the more representation the side road gets. It is also apparent that the good road is underrepresented when it comes to characteristics having a negative influence on road quality. The good road only presents two of these characteristics and one of them, apparent bedding, is a very common characteristic and in a way the most general one of all. The other category, loose solid material is, as mentioned earlier, of a different kind compared to that of the side road. On the side road this category involved branches, sticks and plant material lying on the driving surface and is considered negative. Not to imply that the expression form of this category on the good road is positive, it still can be seen as a consequence of the road material. For, sometimes the coarse-grained material could be perceived to be too coarse and therefore more in the shape and size of pebbles, which is considered bad road grip, for example. Too sharp pebbles can also pose a risk for having flat tyres, especially on bicycles.

5.2.2.1 Common combinations and reflections
Besides describing and presenting the dominating characteristics for the roads (which section 5.2.2 already has covered), it felt necessary to also account for some of those patterns which could be observed. It was obvious that some characteristics tended to present themselves together with others and to take these into consideration will help to understand the characteristics deeper and in some cases also understand why they exist in the first place.
Fine-grained material often occurs with a thin top layer and tire tracks. Waves on the other hand, tend to be present only on thick top layers with coarse-grained material. In some aspects waves can be considered the opposite of tracks where they seldom occur together unless in rare cases where tracks have been filled with new coarse-grained material in order to even out the road, and so the waves can present themselves in the tracks. Also, potholes tend to develop easier when there is no gravel or coarse-grained material left.

Aqueducts are considered to be a desired feature on these roads for the alternative of water running free is probably not a good one. Still, it was often perceived that the aqueducts posed some sort of obstacles on the road for, they tend to be uneven in the sense that they are either built-up in comparison with surrounding road stretches, or they tend to be assaulted by potholes. This makes way for combinations of the perhaps more complex and interesting kind which deals with potholes being a very frequent coexistent feature with aqueducts, either it is before, after or even on the aqueduct itself. Even if they present themselves at other times too, they tend to grow bigger closer to aqueducts. Aqueducts are indicators of water running through the area and since water is the most important component in the forming/developing of potholes it can be regarded as not that astounding. What is less obvious though is that roads tend to widen temporarily close to potholes and aqueducts. For instance one point at the bad road measured 8 m in width in comparison to the average 4,4 m (figure 9).

Road widening seems to be caused by car drivers wanting to avoid potholes as much as possible and therefore drive around them instead of in them. This way, they do not have to reduce speed as much in order to protect the car. Driving on these roads seems to be governed by what is ok for the vehicle itself and not necessarily for the people inside it. It should be noted however that the road widening only occurred on the bad road and not on the side road. It could be that while big potholes on the bad road result in a wider road section, on the side road it only results in a bad quality road. This may be due to there being no sides to use on the side road or that there are practically no cars, which are the ones trying to avoid potholes. The only other thing that seems to have a discouraging effect on drivers is stationary solid material, like rocks, projecting from underneath. They tend to occur in slopes together with other grave unevenness like tracks from water erosion. This may be explained by the running water reaching a higher velocity when sloping and therefore makes up a more powerful eroding force.

![Figure 9 Potholes in association with road widening. Also some tire tracks.](Photo: Daniela Michael)
5.2.3 Grading system

In attempting to grade different road sections according to their quality, an index was elaborated. This allows valuation of different roads and different road sections. It is important that information about individual road sections is not lost since variations occur even on one and the same road. The grading system was performed by assigning different points to the different road characteristics presented. This assignment was based on a judgement of which properties were considered to be of more or less importance and consequently which were considered to have a small or large negative influence on road quality. A straight, even/smooth and generally “perfect” dirt road is used as a basis/reference. As table 2 presents, 0 indicates a neutral influence on road quality and 30 a major negative influence.

<table>
<thead>
<tr>
<th>Negative influence on road quality</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>neutral</td>
<td>0</td>
</tr>
<tr>
<td>small</td>
<td>10</td>
</tr>
<tr>
<td>medium large</td>
<td>15</td>
</tr>
<tr>
<td>large</td>
<td>20</td>
</tr>
<tr>
<td>major</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 2 Size of negative influence on road quality and its valued worth in points

In developing the grading system it was both considered that the number of categories and type of categories present were to determine the resulting quality class. Since some important categories were perceived to have more influence alone than quantity necessarily did, e.g. tracks from water erosion and potholes, these categories were assigned with much higher points to be able to play a more independent roll (table 3). Section 5.2.2 revealed that there are general characteristics which in some rare cases can be perceived as negative even though they most often are positive. They are assigned with 0 points, since it still is considered more correct to assign a 0 than a 10 to it.

<table>
<thead>
<tr>
<th>General characteristics</th>
<th>Points</th>
<th>Detailed characteristics</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>medium thick top layer</td>
<td>0</td>
<td>appearant harder bedding</td>
<td>10</td>
</tr>
<tr>
<td>thin top layer</td>
<td>10</td>
<td>waves</td>
<td>10</td>
</tr>
<tr>
<td>coarse-grained</td>
<td>0</td>
<td>tracks from tires</td>
<td>10</td>
</tr>
<tr>
<td>fine-grained</td>
<td>10</td>
<td>loose solid material</td>
<td>15</td>
</tr>
<tr>
<td>horizontally even</td>
<td>0</td>
<td>stationary solid material</td>
<td>20</td>
</tr>
<tr>
<td>horizontally uneven</td>
<td>10</td>
<td>potholes</td>
<td>20</td>
</tr>
<tr>
<td>vertically even</td>
<td>0</td>
<td>tracks from water erosion</td>
<td>20</td>
</tr>
<tr>
<td>vertically uneven</td>
<td>10</td>
<td>major holes</td>
<td>30</td>
</tr>
<tr>
<td>smooth/soft bedding</td>
<td>0</td>
<td>major tracks from water erosion</td>
<td>30</td>
</tr>
<tr>
<td>rough/hard bedding</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 General and detailed road characteristics and their assigned points.

The total score of each road section was calculated and then assigned to different classes on a scale from 1 to 10 (table 4). Accordingly, there are certain criteria in order to get a certain class, e.g. for a road section to be classified as a class 1, the total score has to be within the interval 0-18. The lower the total score and class are, the better the road is considered to be. The ranking should be viewed as a relative grade, where 1 does not represent a perfect road section and 10 does not represent an impassable road section, but rather the most perfect/the best and the most impassable/the worst of all the studied road sections. No attempt has been made at estimating the gap between 1 and perfect or 10 and impassable.
A scale consisting of 10 different classes may be considered to many, however in order to represent the great variability between different road sections, fewer classes were considered inadequate. Furthermore, as table 5 shows it may be argued that since there is a gap between the very last (class 10) and the second to last (class 8) there should also be one between the first and second since this too is a sort of boundary between different roads. However, the differences between the bad and the worst/side road are by far greater than the differences between the good and the bad road. So even if the good and the bad road should be considered very differently, even though class 2 is represented on both, it is more important to bring forth the slow deterioration of road quality that characterizes the lower classes and the faster deterioration in the higher classes. In figure 10 the specific road sections and their classification is presented in the form of a map to illustrate the distribution of classes.
The fact that class 2 on the bad road has been assigned to road sections that is preceded by class 5 and followed by class 7, may be subject to some questioning. However, it mainly shows the great variability of the road over relatively short distances, and this was one of the reasons why so many sections were needed for the bad road. It should be noted that even if the north western road to Mandimba was considered to be the best of all five roads connecting to Cuamba, even this one is said to vary even if not in the same way. The road quality actually deteriorates notably after Mandimba according to Momade (oral communication 17th October 2005), Driver for Centro Cooperativo Sueco (CCS). Study of a longer road distance might have shown this, but since the bad road presented so many different classes on the same distance, it is more an example of the inconsistency and great variability that characterizes the roads in general, and the bad road in particular.

5.3 “The good, the bad and the worst”: a comparative and explaining closure
In the previous map (figure 10) it was shown that section 1 on the good road is one of three sections which got a class 1 rating and the whole side road got a class 10 rating. If one were to look back at table 1 which presented every single characteristic for every single road section, one would see that the differences between the best (e.g. section 1 on the good road) and the worst road section (the side road) are that when it comes to the general characteristics the good road presented the positive properties exclusively while the side road almost exclusively presented the negative properties. In the detailed characteristics group the side road was, among others, characterised by all of those properties labelled as having a large to major negative influence on road quality, while the good road presented none of these. As mentioned in section 5.2.3 the differences between the bad and the worst road are by far greater than the differences between the good and the bad road. Even though the good and the bad road pose very differently, they are both more or less passable throughout the whole year, while the worst one is not. A wider comparison and explanations concerning why the quality of the roads may differ like they do, will now be in focus. It should be noted that some new material will be presented.

5.3.1 Water related explanations
Seeing how none of the water related characteristics (potholes/major holes or tracks/major tracks from water erosion) were present on the good road but on both the other two, makes one consider water as a very determinant factor. These characteristics are also the ones considered to have the largest negative influence on road quality. It could be argued that the presence of water is higher in the area through which the bad and side road runs than what is the case with the good road. This assumption is partly confirmed by figure 11, which shows how many bridges/aqueducts the respective roads have. The side road had neither bridges nor aqueducts and is therefore not represented in the figure.

The figure reveals that the good road had 2 bridges while the bad road has 1 small bridge and 62 aqueducts. This should be viewed in comparison with the total road distance studied which was only 20 km. The large bridges were built high above the ground but still in road surface level, while the small bridge was heavily built-up from the road surface. As mentioned in section 5.2.2.1, the aqueducts were very often built-up in relation to road surface. It was difficult to decide how the influence of a certain number of aqueducts/bridges could affect road quality. For, a large presence of aqueducts/bridges can either be interpreted as having a negative impact on the road section in question, if one also assumes that this is an indicator of high presence of water in the area and the somewhat obstacles that they often pose. It can also be interpreted that an absence of aqueducts can have a negative impact on the road if, lets say,
the water therefore is allowed to run more free. No apparent pattern could be identified between number of aqueducts and road quality except for the frequent combination of potholes nearby aqueducts and potholes and its connection to road quality, has already been represented.

Even though an absence of aqueducts on the bad road probably would result in an even worse road, it is still only aqueducts and the water appears to have a large influence in the area, for no water related characteristics was observed at all on the good road, not even close to the bridges. This may not be a surprise, however since proper bridges are more resistant to water influence. Furthermore, the good road is a built-up one and consequently the horizontal unevenness can be considered positive from a water vulnerability perspective. It is not unbelievable that different roads are vulnerable to water/rain in different degrees. For instance fine-grained material is more easily removed from the road surface than coarse-grained. A thick top layer also protects the bedding which in this area is rich in clay and when soaked in water, it is unstable and easily deformed. This is probably why water erosion tracks were common on the side road. Roads with vertical unevenness can also be considered more water vulnerable in the sense that it is easier for water to accumulate in road depressions. Seeing how the side road had no aqueducts/bridges is no indication for water absent in the area for, as mentioned earlier, it has plenty of other water related characteristics represented. It can though, be a question of importance of the road and traffic intensity.

5.3.2 Explanations related to importance, maintenance and traffic intensity
It is probably no coincidence that the good road is the one connecting important places, the bad road is connecting just places and the side road practically does not connect to any place at all (or at least not used for that purpose). The good road however, is the main road connecting not only Cuamba or Niassa but the northern provinces of Mozambique to the neighbouring country Malawi. It also leads up to the provincial capital Lichinga. The side road is practically only used to get to small villages/huts along the way and not really connects to anywhere else like at least the bad road does. The reason why the good road had more proper bridges (as was presented in figure 11) than the bad road could also be a consequence of it being a more important road, even though the bad road is important enough to at least have aqueducts, and the reason why no such investments have been made on the side road is because it has very little importance.

The importance of the roads could partly be seen when registering the movement on the different roads (table 6), which was registered during 30 minutes on a Monday and Tuesday.
morning (6:40 - 7:10 a.m. and 7:00 - 7:30 a.m. respectively). No extensive traffic registration was performed on the side road, however while driving on it no real road users could be observed at all and this road is therefore left out in the table.

Table 6 Registration of traffic intensity and means of transport on the good and the bad road and its movement direction from or towards Cuamba.

<table>
<thead>
<tr>
<th>Traffic intensity &amp; Means of transport</th>
<th>Good road from Cuamba</th>
<th>towards Cuamba</th>
<th>Bad road from Cuamba</th>
<th>towards Cuamba</th>
</tr>
</thead>
<tbody>
<tr>
<td>on foot, without load</td>
<td>16</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>on foot, with load</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>by bicycle, without load</td>
<td>11</td>
<td>5</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>by bicycle, with load</td>
<td>7</td>
<td>13</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>by motor vehicle</td>
<td>1 car + 1 tractor</td>
<td>1 car</td>
<td>1 car</td>
<td>1 motor cycle</td>
</tr>
<tr>
<td>total movement</td>
<td>38</td>
<td>20</td>
<td>23</td>
<td>34</td>
</tr>
</tbody>
</table>

Even though no remarkable differences could be seen between the good and the bad road in terms of traffic intensity, both of them were observed to have a lot of movement during the specific time of study, at least in contrast to the side road. Additionally, public transport is said to run on the good and the bad road but not on the side road. The relative small differences between the good and the bad road can be referred to eventual shortcomings of the registration method, since only 30 minutes of different morning hours on two different weekdays were observed. Even though no big differences between weekdays is said to exist, this could be of influence. The morning hour is the hour when farmers mostly move (e.g. to the market) and was supposed to be the hour of more intense public transport (even though they seldom obey time schedules and instead are governed by number of passengers and therefore did not make its way in the table). Consequently, heavier transports like trucks and more cars might present themselves at another hour and with reference to the transportation pattern in the region there is good reason to believe that this increase first and foremost will be presented on the good road, having the quality that allows for it in another way.

One might argue that also the none-motorized traffic should have had a higher representation on the good road but since the speed is so much higher, walking for instance might be preferred next to the road where the open and vegetation-free landscape allows. In a way this can be considered to be the case on the side road which is so bad that there is not any big difference between using the road or the surrounding areas. No matter if one argues that the relevance is low since bigger vehicles both have a larger impact and are more dependent on road quality, or if one emphasizes the importance of observing the farmers movement since they are one of the cornerstones in this study, the registration at least presented a good picture regarding which means of transport is by far the most common one (section 5.3.3).

Concerning the good and the bad roads which present relatively high traffic intensity, it can be discussed whether or not they receive enough maintenance with consideration to how much they would need. It could be that the bigger and more important roads tend to have a lot of traffic destroying the otherwise better quality. The problem might therefore be that maintenance not always is in relation to traffic intensity, but more static than flexible. As a consequence of some roads being more important than others, the good road can be assumed to be better because it receives more maintenance. According to Momade (oral communication 8th October 2005), while the bad road is maintained twice a year, once before the rain period and once after, the good road receives maintenance more or less every third month, “when needed”. Geilinger (oral communication 30th September 2005) thinks that the
road between the bad road, due to its traffic intensity actually needs maintenance more frequent than only twice a year. Since the good road is considered so much better to begin with, “when needed” is defined differently by different people. Also, the type of maintenance differs between the roads. For the side road however, no official “timetable” for maintenance is set out, for it does not receive any, as is the case with many side roads.

5.3.3 Explanations related to timing and kind of observation and means of transport

Since the good and the bad road is maintained at least once before and once after the rain period, this results in maintenance periods more or less in August-September and January-February. This leads into yet another factor which should be considered when trying to explain the quality of the roads. It was very obvious that the timing of the observations were very important for the observations and consequently the perceived quality of the road is very much depending on when one observes the road. The relatively bad resistance all of these roads seem to possess in accordance with being dirt roads, implies a vulnerability to the impact of usage and other factors like rain. Therefore, the perception of the roads quality depends on whether some sort of maintenance has been performed recently or not.

Since my observations were performed during the so called maintenance period, the good road was allowed to pose quite differently between the pilot studies and the actual field observations, and the time elapsed between the two was not more than 12 days. Also, when the bad road has just been maintained it is apparently possible to drive at 120 km/h (Momade, oral communication 27th September 2005), in comparison with the 80 km/h which at the time of study was measured to be the maximum possible speed.

Of importance could also be the fact that my observations are made with my eyes and by driving a 4x4 car. For, while the driving suitability and hence road quality is judged by car which is my frame of reference, most farmers and other road users cycle or walk as was presented in table 6. The bicycle is not always cycled upon but sometimes pushed, for instance when loaded with bulky and heavy objects like tree logs. The load had to be of the “bigger” kind in order to be registered and presented in the table and consequently children on their way to school carrying their school books were not recorded as having load. Walking with load refers to load being carried on the head, while it often was tied on the bicycle when cycling. It should be noted that just as well as babies were tied on the back of their mothers and cars/tractors included several people, one single bicycle is sometimes packed with 3-4 people plus load.

Since a road is perceived differently depending on the means of transport used, an observation performed by bicycle or foot may have different results. Cyclists probably do not relate the same way to road characteristics, as drivers with four wheels. It can be assumed that it is more difficult to use a bicycle on these roads in terms of heavy load and since they are expected to leave way for bigger vehicles. While four wheel cars slope when horizontally uneven, a bicycle does not have to be at all affected since it only has two wheels. Also, vertical unevenness like potholes can be thought not to affect in the same way, because of the low speed to start with. It is easier for two wheels to adjust than for four wheels (as the interviews in section 6 will present). Furthermore, it is considered comfortable and smooth to drive a car on thick layer of fine-grained material, but is next to impossible with a heavily loaded bicycle. Additionally too coarse-grained material or sharper pebbles, and thin top layers with harder bedding or rocks projecting from underneath probably increases the risk for flat tires.
5.3.4 Why a bigger variation spectrum on the bad road?

Except for the explanations given above concerning why the different roads might differ the way they do, it could also be interesting to address why the bad road presents so many variations and different classes in comparison to the others. The good road is good and important enough to present a whole other type of road, namely one that in comparison is very wide, built-up, smooth and well maintained. This makes it more resistant to negative influence factors such as water, which was obvious on the other roads. It is difficult for destructive forces like water to get rooted on this lightly sloped road in the first place, and it is even more difficult for it to result in a variety of quality classes. One might argue that since the side road is such a badly founded road, this too should present many variations. I believe the determining factor here, to be the importance of the road and traffic intensity which is low in both cases on the side road. It can be regarded as the bad road being a somewhat “in between-road” for the bad road is closer to the good road when it comes to importance, but closer to the bad road when it comes to vulnerability level. Therefore, since the bad road in comparison has high traffic intensity this results in the bad road having to deal with all quality influencing factors and therefore a more strained resistance on the already under-equipped road which consequently allows a greater variation spectrum. In contrast, the good road has the traffic influence but is not especially vulnerable to negative road characteristics whereas the side road is very vulnerable but has no actual traffic influence.
6. THE FARMERS OF CUAMBA

As presented in section 4.2.3, a larger part of the population in the country and the region is occupied with agriculture. The smallholder family sub-sector accounts for almost all of the area under production and produces almost all the food crops. Furthermore, the farmers are the ones who cultivate and when one cultivates one has food and first when one has food one can talk about food supply/security issues. In spite of their importance, it is usually the farmers who are domed with bad negotiation terms, just because they are farmers. They are responsible for the first part of the chain where no margins present themselves and they are extremely vulnerable to setbacks, for if they can not produce one year, where will they get food from or even the money to buy food?

These facts do not only give reasons as to why it is important and necessary to interview farmers when it comes to food supply issues but they also in a way set the terms for the interviews. For instance, families producing food crops for their own consumption were candidates and it was decided that they all live more or less at the same distance from the market town Cuamba, even though along different roads. Since 20 km of road stretch carefully had been studied (section 5), 20 km were decided as the approximate distance the farmers should have to town. It was considered that the longer the better but only in combination with that it was within the road stretch studied in order to get a clearer image of the road conditions which affects the farmers. Furthermore, since most of the agricultural work is performed by women but mostly in charge of men (INE 2003e, p 25), even though this is not always admitted by the men, I decided to concentrate on the men in the families to reduce eventual differences in answers due to sex. For, to be in charge of also involves money matters such as selling (and transporting), and the interviews of course concerned these issues.

For the complete checklist of topics and questions used at the interviews see table 7.

Since the interviews were of the more semi-structured kind the checklist was used as guidance and not as a strict framework. Consequently, the questions were not necessarily asked in the presented order and some questions could differ in formulation and appearance between different farmers even though the same topics were treated. Some questions were also formulated during the interviews. It should be admitted that even though the aim was to allow the conversation to run free, certain key subjects like food supply, climate/precipitation and road conditions sometimes had to be deliberately introduced into the conversations, and so more and less specific questions were asked. The interviews took place in the locations of the farmers’ homes and were conducted individually, even though two of them took place with surrounding villagers/families as audience. The interviews took place in October 2005, a time of the year when the farmers are mostly waiting for rains and preparing their fields.

Four farmers were interviewed, one along each road and yet another along the most problematic one, i.e. the worst road. Since the study subject was regarded to be of that kind that differences in opinion first and foremost could be expected between different social groups and not between different farmers, it was considered necessary to complement with a few buyer interviews instead of more farmer interviews. These will be presented in section 6.2 but in relation to different farmer opinions, which are still in focus. And so, instead of dedicating the last section (section 6.2) to a round up with an exclusive comparison between different farmers’ opinions, it will round up different thoughts and interpretations about the actual problem in general and consequently invites opinions from other than farmers.
### Table 7 Checklist of topics and questions for farmer interviews

<table>
<thead>
<tr>
<th>About the respondent - background</th>
</tr>
</thead>
<tbody>
<tr>
<td>- age</td>
</tr>
<tr>
<td>- how long he's lived/cultivated in the area</td>
</tr>
<tr>
<td>- size of the family</td>
</tr>
<tr>
<td>- who/how many in the family cultivates?</td>
</tr>
<tr>
<td>- size of area cultivated</td>
</tr>
<tr>
<td>- crops cultivated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cultivation and production conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- reasons for this selection of crops and not others</td>
</tr>
<tr>
<td>- factors affecting cultivation</td>
</tr>
<tr>
<td>- good or bad cultivation conditions (climate and soil)?</td>
</tr>
<tr>
<td>- variations in harvest volumes</td>
</tr>
<tr>
<td>- is the production enough for the family and selling?</td>
</tr>
<tr>
<td>- reasons for not extending cultivation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sale conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- reasons for producing/selling</td>
</tr>
<tr>
<td>- crops sold</td>
</tr>
<tr>
<td>- quantity sold</td>
</tr>
<tr>
<td>- is the family quantity sometimes sold and why?</td>
</tr>
<tr>
<td>- ways of selling</td>
</tr>
<tr>
<td>- time of selling</td>
</tr>
<tr>
<td>- location of selling</td>
</tr>
<tr>
<td>- selling partners</td>
</tr>
<tr>
<td>- prices</td>
</tr>
<tr>
<td>- ways of payment</td>
</tr>
<tr>
<td>- factors affecting selling</td>
</tr>
<tr>
<td>- good or bad sale conditions?</td>
</tr>
<tr>
<td>- selling on whose terms?</td>
</tr>
<tr>
<td>- variations of sale conditions with different years or different parts of the year (e.g. rain season)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Road transport and distribution conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- responsible seller and transporter</td>
</tr>
<tr>
<td>- means of transport</td>
</tr>
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<td>- do you sometimes fall down, get flat tires?...</td>
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<td>- variations of transport conditions with different years or different parts of the year (e.g. rain season)</td>
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6.1 Four farmers on four topics
The results from the farmer interviews, which will be presented in this section, are grouped according to subject/topic and so section 6.1.1 covers the farmers’ opinions concerning their cultivation and production conditions while section 6.1.2 concerns their sale conditions, etc. Four topics are dealt with and since only four interviews were performed and the questions were not static, the results from these will not be presented quantitatively (as contrary from the field observations). Specification of different farmers will only be made where and when considered of importance, for instance if differences occur. One farmer lives along the good road, one along the bad road and two along the worst road. Figure 12 is a map showing the location of the 4 interviewed farmers and they are referred to as farmer 1, 2, 3 and 4. Number 1 refers to the farmer along the good road, number 2 refers to the farmer along the bad road, and number 3 and 4 refer to the farmers along the worst road.

![Figure 12 Map showing the location of the four farmer respondents and the roads by which they live.](image)

Farmer 1 lives 20 km away from Cuamba town along the road to Mandimba (i.e. “the good road”). He is 35 years old and has been living there since he was born and has been producing agricultural products for 15 years. His family consists of seven people and all of them work with the cultivation even though he and his wife have to work the most since the children are very young. The cultivated area is 4 hectares large out of which 1,5 is dedicated to food crop production, like maize, for the family. The rest is occupied by tobacco and cotton production which is conducted by hired help.

Farmer 2 lives 20 km away from Cuamba along the road to Etatara (i.e. “the bad road”). He is 26 years old and originally from Zambezia province but has been living in Cuamba for 14 years, out of which 10 years as a family supporting farmer. Including him and his wife they are seven in the family. The children are too young to work with the cultivation, so only he and his wife work and the total area which they cultivate is 2 hectares, 1 hectare maize and 1 hectare cotton.
Farmer 3 lives 20 km away from Cuamba along the side road (i.e. “the worst road), even though the first 12 km of these are along the bad road which then cuts of 8 km into ”the bush”. This man, who is also the community leader of the village, is 45 years old, born in the area and has been cultivating from the start. The family contains seven members and the whole family normally helps out on the field, even the children when they are not in school. The cultivation consists of 2 hectares of maize and 3 hectares of cotton.

Farmer 4 is more or less located at the same place as farmer 3 but is 30 years old and has been living there for 16 years. He lives with his wife and two orphans, so they are four in their family. The children go to school and he and his wife work with the agriculture. The cultivated area is 6 hectares and the produced crops are maize and cotton.

6.1.1 Farmers on the field – cultivation and production conditions

The farmers reveal a focus on the same crops from year to year and maize seems to be the most common food crop and cotton the most common cash crop. When the farmers say that they produce maize it is often understood that other food crops like beans, cassava and sorghum are also produced, sometimes in between. Farmer 1 is the only one producing tobacco and while he explains that he produces tobacco and cotton because he needs money, farmer 2 means that tobacco production needs a lot of money in itself, and this is why he can not produce it. Instead he would like to cultivate and sell soy beans since many people in Cuamba are looking for it, but he does not know where to find or buy them in the first place.

Soil suitability and water availability are the reasons most often given for the selection of crops, for when the farmers try to produce other crops it fails. The soil conditions in general are considered to be favourable but the lack of rivers in the area are a problem for crops like tobacco and consequently, the main reason for not producing tobacco is that it needs a lot of water. Even though climate mainly is considered to be good, the size of the harvests is first and foremost dependent on the amount of rain. Normally when there is a lot of rain the production is high but when the rain is not enough, there is shortage of food. While farmer 3 says that the size of the harvests varies from year to year, farmer 1 claims to always be harvesting the same volume and apparently that particular year (2005) was his first production failure, due to lack of rain, since he started producing 15 years ago. Farmer 2 says that the harvest sometimes is so good that they “forget” some of it in the field, because it is too much to harvest. All farmers seem to be of the opinion that the food normally is enough for the family as well as for selling, and farmer 2 even means that his production can support his family until the next campaign even when they do not have enough rain. It should be noted that farmer 4 points out that years of too much rain also can be negative and destructive of the agricultural production, but according to farmer 1 this does not happen often.

When it comes to good and bad factors concerning cultivation in the area, farmer 3 believes that rain is the most important thing. Other problems include weed, insects and rabbits which destroy the crops and hinder the farmers from cultivating more. What is good is that the production comes from their own efforts and that the families work hard in order to have a good production. So, considering how the physical cultivation conditions are good, the main reason for why the farmers do not cultivate more than the area mentioned before is because of lack of energy and strength/power. They already have to work very hard on the area cultivated. Lack of money is also a problem for the cultivated area could be increased with more people helping out in the agriculture.
6.1.2 Farmers in the market? – sale conditions
Cash crops like cotton and tobacco are cultivated only to be sold and are not kept for private consumption. When it comes to food crops, farmer 2 means that it is not always that farmers sell their maize, unless they are in need of money that is. Farmer 4 means that selling food crops like maize is not as good/easy as selling cash crops since too many people cultivate it, which means low prices and low profits. Farmer 3 prefers to store his maize since he does not know what is going to happen, for instance if it is going to rain or not. Nevertheless, as mentioned before all farmers normally consider their production to be enough both for the family and for selling. Farmer 2 usually sells about 600 kg of maize each campaign. The size of these parts varies and according to the same farmer, before the family sells the maize they calculate how long they are going to live until the next campaign, so that they have enough food to support all this time. If the time left is expected to be short, a larger quantity is sold.

The farmers do not sell their maize to make money, they sell when they need something else, which is not available right where they live. They also do not sell it all at once, but every time they need something. The reason for why farmer 2 does not sell all his maize at once is because he fears that if all is sold in one day, the money will also be spent quickly and so he prefers to sell small quantities and then wait for some three weeks to see what might happen, for instance if his children get sick or something. Just like the other farmers, this one sells by can and not by kilo and one can is about 20 kg (figure 13). More than two cans, he explains, are normally not sold since this quantity sold at “normal” market prices is usually enough to respond to the problems they might be facing in the family.

Farmer 4 explains that he sells maize when the family is suffering/starving or needs money. This might seem strange, to sell food when hungry, but in fact farmer 3 also said to sometimes be selling the family quantity, for instance when dealing with sickness or other difficulties in the family. This happens when they produce less, like the year of study. Other instances
where the family quantity is sold includes when it is not possible to make money alternatively by selling cut trees and collected fire wood in town, when the cotton is finished, when the water has closed the road, according to farmer 4, or when it is believed to rain which will bring more food, according to farmer 2.

As the question mark in the title of this section indicated, the selling does not necessarily take place in a well defined market place, but when it does it is always in Cuamba town. Farmer 2, 3 and 4 prefer not to sell their maize in the market but to private consumers in their respective areas, either by visiting different villages and asking people at their houses or by meeting more casually on the road on the way to the market. The farmers avoid the market because it is a place full of people wanting to resell their maize, and consequently the buyers want low prices so that they can profit. It is considered easier to discuss prices when outside the market or warehouse and the prices are much better when selling to people buying for their own consumption. Farmer 3 also points out that they are not safe in the market for people in town know that they are farmers from the field and so steal their money or say different things that do not make the farmers happy. Furthermore the farmers have to pay money for selling and occupying a place in the market. According to farmer 3 there are a lot of problems that farmers face in the market which is why they are not encouraged to go there.

Concerning if the buyers go to the farmers to buy, farmers 2 and 3 say that it sometimes happens but they normally have to go themselves to town. Farmer 2 points out that it is both good and bad that the buyers come to him. The good thing is that the buyer brings the money and it is the buyer who makes the effort to come to him but as thanks he agrees to low prices. The bad thing is also that one never knows when the buyers come and one might have to wait even though in need of money. The situation is a bit different for farmer 1 who says that he normally waits for the buyers in town to come to him and buy. This tobacco producing farmer says that since he gets asked by government representatives at forehand to prepare crops, the buyers later know that he has something to sell. Normally products being bought on location include cash crops but farmer 4 says that buyers often come from town to find him, especially that particular year when there was a shortage of maize. Farmer 3 however says that because of the bad production the cotton buyers did not come to him, like they usually do. At times, the warehouse can also send money to community leaders who gather people wanting to sell their maize, but not that particular year since there was no food to buy.

According to farmer 1 and 3, most buyers come to the farmers during the campaign (July-October) and farmer 4 points out that the warehouses are only open then. Even though most selling takes place during the campaign, farmers have no time limit for selling and consequently when the buyers stop coming during raining time when the campaign has finished, it is up to the farmers to go to town themselves to sell. However, this involves food crops for the cash crops are normally all bought up by that time. Farmer 1 says that since he sells his cotton and tobacco first, he normally has enough money from August until November. By raining time, it starts getting difficult again and so he starts selling his maize. But he says that every month every moment when farmers need to sell something they do it.

Just as well as the farmers sell anytime they need and to anyone they usually also sell anywhere even if some selling locations might be preferred over others, as mentioned before. Farmer 1 is alone in thinking that the prices do not differ between different locations. Farmer 2 explains that the prices in the market in town are higher than when the buyer comes to him, since the buyer has made an effort and taken care of the transport issue. Farmer 4 also says that the prices are very different between selling on the market or to the warehouse which are
both in town, and selling to private people in other locations. According to farmer 1 Cuamba as a whole (even if there are different markets and locations where to sell) has the highest prices in the area and so there is no other place where farmers can go and sell at higher prices. People from Maua district (northeast of Cuamba) however, can benefit from selling in Cuamba because the prices are higher than in Maua. Since distances are far however, most farmers there do not sell directly in Cuamba, but instead via buyers that go there (section 6.2).

The prices not only differ between locations of selling and type of buyer but also between different times of the year, and different years. The prices are normally low in the beginning of the campaign and high during the rainy period, when there is less maize. Consequently farmer 2 says that since he knows that most people are looking for maize during this time, he tries to keep and sell during the rainy period. Farmer 3 explains that when there is a lot of maize, he suffers from less money for the prices are low. Shortages increase prices, like that particular year, but still he could not take advantage of this since he did not have any maize.

The prices used by farmer 1 and 4, was at the time of study 130 000 Meticais for one can of maize (which equalled about 5 US Dollars, at the time of study). Farmer 4 however, explains that this is not the normal price but the one used when they are starving. So, when farmers see that the maize is starting to run out they keep it and try to sell at high prices later. Farmer 2 expresses a kind of satisfaction because of the high price. The price is normally lower and when the production is good farmer 4 sells one can for 30-50 000 Meticais. It should be noted that farmer 4 also stated that when he is really anxious and desperate for money and needs to sell, he can sell one can for as little as 10 000 Meticais. All farmers say that they get paid in cash only and that no trade takes place.

When it comes to feeling satisfied with the prices, farmer 1 is alone in expressing a satisfaction when selling. This might be explained by the fact that he often knows what the price will be before he starts producing, at least for his tobacco (and cotton), since he is asked to produce at forehand. However, sometimes the prices change to the worse after he has started producing but since tobacco can not last for a very long time, and since he was asked to produce, he says that he can not refuse to sell. Even though other farmers would agree in trying to keep their products and sell when the prices are high, farmer 1 is also the only one who says that he normally brings his products back from town when the prices are too low in the market. There are days when farmer 4 feels very angry with the people at the market and does not want to sell at low prices. Since it is too hard going all the way back home again with the products, farmer 3 & 4 say that when they go to market to sell they normally need the money and so they prefer selling even at a low price. Consequently, they never get satisfied. Since the buyers normally want the farmers to reduce their prices and the farmers don’t, “negotiation” begins. However, as the quotation marks implied, all but one farmer says that in the end it is always the farmer who looses and walks out of the discussion unsatisfied. The exception is once again farmer 1, who said to sometimes refuse to lower the prices.

6.1.3 Farmers on the road – road transport and distribution conditions

While all four farmers use bicycles when transporting their products, the buyers normally hire a car to come and pick up what they have collected. Of course transport by foot is also an alternative for farmers but according to them, not when transporting their maize to sell (figure 14). Farmer 1 normally takes 2 cans (40 kg) on his bicycle before heading off to the market in Cuamba town, farmers 3 and 4 carry 3 cans (60 kg) each, and farmer 2 says to be carrying 6 cans of maize, which makes 120 kg on one bicycle! Even if 120 kg may cause doubt about its likeliness also since he earlier said not to sell more than 2 cans at the time, 40 or 60 kg is still...
a whole lot to carry for one person on one bicycle. As mentioned in section 4.1, the total quantity sold during one campaign can be more than 600 kg which makes many rounds.

The distance for all farmers to the market in Cuamba is about 20 km, which take farmers 1 and 2 about two hours with load, and about half the time without. Farmer 3 and 4 spend some three hours on the same distance. Like most farmers, farmer 2 most often goes and sells alone and points out that it is far and not a good job for women. The family has two bicycles but when one bicycle is broken they can only use one and so this farmer carries the maize, his wife and himself all on the same bicycle. In general farmer 1 and 2 consider it not being difficult or tiresome to get to the market, while farmer 3 and 4 do, with reference to the bad road condition, the far distance and the old bicycles.

Farmer 2 sometimes falls from his bicycle during the rainy period because of all the water and stones. According to farmer 4, practically everybody there falls when carrying load, but farmer 1 only associates falling with times when he is coming back from the market after having gained some money and having had some beer or wine. He also falls less often now after he has bought a new bicycle. Still, he gets off his bicycle by small rivers where there are no “bridges” and then push the bicycle instead. Farmer 3 stops to greet and talk to friends and ask what is happening in town, how the prices are, if they have seen anything like police or so. He also stops when his bicycle breaks, like one day when his wheel “exploded”. Bicycle problems like flat tyres are frequent among the farmers, especially on old bicycles with old tyres. Farmer 2 only says to be stopping out of his own free will so to speak and never stops because it is difficult or heavy, because he does not believe it to be.

The roads are normally considered to be good even though they are more difficult to pass at times. Still, none of the farmers label the roads as impossible to pass and they always try to pass. The times referred to is raining time. The problems however, do not occur every day during this time (it normally does not rain every day) and the farmers can not agree on which

Figure 14 A common transportation sight in Cuamba. (Photo: Daniela Michael)
period is the worst. Farmer 3 says that it is difficult to pass every day between December to February and during other months it is just difficult sometimes. Farmer 4 has difficulties mainly between January and April, and then it is also every day. Since it is very difficult during this time they try to stay put. Naturally they may still need things from town and so they try to pass but with grave difficulties and it is necessary to invent ways to pass, where they can avoid the water.

Even though farmer 1 and 2 consider these problems being small, farmer 1 explains that years when it is very hot or raining a lot with/without thunder cycling is difficult. Farmer 2 on the other hand does not seem to be affected at all by rain when it comes to time spent on the road. This though, surely seems to be an issue for farmer 3 whose three hour cycling, mentioned before, was of course referring to the dry season. During the rainy season it takes more like five hours! Farmer 4 experiences it to be very difficult because of the water and mentions two kinds of problems which delay him on the road, namely bicycle problems and road problems. The road section from his house to the main road (the intersection with the “bad road”) is especially difficult during the rains.

According to farmer 1 the water caused problems mainly concern cars and not bicycles since bicycles can easier avoid the problems by going on the side of the road. Therefore this farmer does not even want to label it as difficult, but merely as taking a little longer. Water accumulation on the road can cause cars to stop unless people gather and push them past those parts. This does not affect bicycles in the same way but having to stop in order to arrange things on the road or having to walk or climb in order to be able to pass with the bicycles can still be a challenge. Farmer 4 finds it difficult every time he has to carry the bicycle on his shoulders when it is difficult to pass. First he has to leave the maize on one side and carry the bicycle over to the other side, then go back and carry the maize before he can be on his way again. Farmer 3 says that when the people in his area see that the road is inaccessible, they invite their friends and go and make small “bridges” and arrangements to be able to continue passing. When it rains the problems are mainly with the “bridges” which get destroyed by the water. The farmers normally cut trees and use wooden poles as “bridges”. He says that the farmers in his area repair the road like this once every year and that the government never comes and makes so called arrangements on his road, as is the case on the main roads by which farmer 1 and 2 live. Farmer 4 however, means that it is not possible to fix his road properly since there are no “bridges” on it and it just remains full of water. Also, the land in his area is very muddy and so it gets very difficult when raining.

The roads by which the farmers live (and the ones studied in section 5) are practically the only ones they use to go to the market. Farmer 1 however admits that he sometimes during the rain season takes another way to town because of the rain having destroyed the road. This other road goes through the bush and through cultivated areas but the land is not cleared, it is closed by trees and such. It is a small road and the one that farmers use to go to their fields but can, as presented, still be easier to pass at times. Farmer 2 never uses other ways than the main road, especially during the rainy period the best way for him to use is the main road. He considers there being no problems during this time of year.

6.1.4 The past, present and future – everyday life, aspirations and ways to get there
The farmers often expressed the climate being better years ago. Farmer 1 is alone in thinking that the year of study was the only bad year he has ever experienced. Farmer 4 also explains that most people living in his area did not produce much that year because of rain, but years ago the harvests used to be much bigger. He refers to the climate where he lives as changing
and farmer 2 said it used to rain more about five years ago. He also gives another view of the problem for when it rained more the “bridges” on the roads were destroyed more easily, but nowadays since it does not rain as much it is not a big problem. Also he refers to the road having been fixed and was in much worse condition years ago. Small “bridges” however still get destroyed when it rains a lot. One farmer however says that the roads were better before, or at least his road. According to farmer 4 his road turns into mud when it rains. About 15 years ago this side road was apparently the shortest road used to go to Etatara, but because of the muddy character it was replaced. And so, it is even more difficult for him now because the road is not getting any attention anymore.

The farmers’ perceptions about the factors that affect their living conditions the most included the lack of water and rain in the area. Farmer 4 explains that there is only one place for him to fetch water from and there are not many rivers. Farmer 1 pointed out that the fact that his family that particular year was starving, had a great effect on their living conditions for someone who does not get food, has no power to work and feels very week. Also farmer 3 mentions sickness in the family and their limited power/strength to produce as affecting of their living conditions. Even if farmer 1 is of the opinion that the climate only was bad that particular year and that transport issues normally make his selling difficult, if he had to choose between climate and road conditions the biggest influence on his living conditions would be that of climate, because the roads are so good. This corresponds with the answer given by farmer 2 who explains by referring to when there is no rain he and his family always starts starving but the roads are still open and the transport is always available because he lives close to the main road. Another problem for farmer 2 is money, which is not enough to cover everything he needs, but he agrees with the governor who has expressed that people must not wait for help but instead try to work (produce) themselves.

The biggest obstacle for a better standard of living and for selling, according to farmer 4 and also farmer 3, is that the condition of the roads is a bigger problem than climate. The road they live next to is in a very bad condition and it is therefore difficult even if they succeed in producing a lot. Also, when they get sick it is difficult to go to the hospital, because the distance is far. It should be noted that the roads are not only important for going to the market and selling products, the farmers use the roads for everything in their everyday life like visiting friends, going to the fields, going to the hospital etc. Farmer 2 also explains that he uses the road to protect himself by not passing in the bushes. Even if farmer 1 and 2 are of the opinion that the roads are good and that the climate is their biggest problem, they talk about times when they have produced a lot of maize and the biggest problem always being how to transport it because of the high prices of using a car. To transport big productions by bicycle is not easy, and it is explained that if one carried it for a week one would get sick and so all products would start disappearing because people can go and steal it and animals destroy it.

As mentioned before, the farmers do not first and foremost sell to make money, but when in need of money, but what is it that farmers spend their money on? Among other things, the money goes for clothes, shoes, blankets, plates, soap, hospital visits, drinks and different food products like salt, sugar and oil. It should be noted that farmer 2 was very firm on pointing out that he never spends money on drinks like beer, but only sells to be able to support his family. All farmers are of the opinion that the money never is enough and farmer 3 sometimes goes two months without any money. Since the money is not enough, the farmers are not able to save money. Farmer 3 explains that he sells, then gives his wife the money and they spend it. They all would however, like to save money in order to buy all the things needed/wanted.
Farmer 2 describes people who produce/sell a lot and get a lot of money as people with good luck. He means that different people spend money on different things, some prefer to cultivate more hectares, some buy motorbikes to transport their products and others go to the bank and save money to someday materialize their dreams/plans. He points out however that people in his environment are not used to having something good like money and have no sense of keeping it, even though it would be a good thing. Because of this people may prefer wasting it on marrying more women or just getting drunk. If he himself had a lot of money he would first save it and then spend it on building a better/bigger house and sending his children to school. Farmer 1 tries to get more money by producing tobacco to be able to buy a motorbike which can help him to go faster to town. Farmer 3 also wants to buy a motorbike, as well as build a good house, send his children to school etc. Farmer 4 wants to produce more but finds it difficult since he needs more rain to do this. Another problem is those times when the rain actually does come, and he has prepared for less. His goal however is to have more than 50 million Meticais and then he would go and save it in the bank. First then, he would start thinking about what to do with the money and describes it as a struggle because he does not know right now what to do with it. He only knows that if he had it he would keep/save it.

All farmers believe that they are poor, but expresses a “what to do?- attitude”. Farmer 1 exemplifies by saying that he after the interview has to go and work in the field under the hot sun. This he does not like but there is nothing else for him to do. The reason for his poverty he believes to be that he never entered school and that he spent many years fighting as a soldier. Farmer 2 says that he does not want to blame anyone, for his poverty depends on him. Since he is living in areas where there are no shops or jobs all people do is learn how to produce. He does not like the dry season for that very reason, that there is no work, while raining time gives him a chance to produce and work a lot. He would like to think of new ways to develop his life, for instance how to open more hectares because he does not want to be starving, but when he tries to do something different it is difficult and that is why he remains in the same condition. Farmer 3 expresses the same wish but failure to develop and even though he does not either want to blame other people for this, he believes that the reason for why they are poor is because their country is poor. He always tries to work and produce because producing is the most important thing, but if the government were to help them when they asked for something he believes that they would not be the way they are now. He continues talking about the problem being that the roads are not very accessible and that the climate is different from before. Farmer 4 has been facing the same problems since he has been living there and so he believes that he will just stay like this until he dies. If he could he would go somewhere else and find new ways to live, but he does not know what to do.

In dealing with problems like these, farmer 3 first wants to say that it is not easy for farmers to solve these problems. Still, they sometimes try to join themselves to discuss what to do and find the reason for their suffering, how to repair the roads, change the climate etc. Since they do not have the power to achieve that alone, the government needs to repair their road by opening it, widening it with tractors and making small “bridges”. The solution according to farmer 4, since the government never comes there to repair their road, is for farmers to join when approaching the campaign and open the road in order to let the cars pass so that they can come and buy their cotton. For farmer 1 the solution lies in praying and asking God for rain. No other solutions like changing crops, works. Concerning solutions for the climate (which by the way was a very amusing question), a suggestion coming from farmer 3 included elders performing ceremonies in which they ask for favourable rain. He continues explaining that lately everything has changed and that years ago people used to cultivate sorghum. This was prepared, offered, and used to make traditional wine, a wine that is some
sort of a prerequisite for this ceremony and since not many people produce sorghum anymore, it is not possible to perform these ceremonies. The reason for the decreased production is that people are starving nowadays and so he asks, who is going to take their family’s food and make ceremonies instead of feeding the children? The ceremonies however, traditionally have been said to help and brought more rains when asked for. The production of sorghum is smaller nowadays because of the rain being less. Since sorghum is used for ceremonies and these ceremonies can bring more rain, but the sorghum in itself needs a lot of rain, there has not been a lot of rain, and that is also why the sorghum is gone. Complicated indeed!

6.1.5 Revealing information about the road conditions from the farmer interviews?
Besides the specific questions about road conditions, the many illustrating details presented by the respondents reveal quite a lot about the road conditions and can in different ways function as indicators of these. For instance, the fact that the farmers do not sell to make money but only when they need money and that they do not sell it all at once, but every time they need, might be an indicator of the difficult transport/road conditions which discourage the farmers from engaging in selling and transporting if they do not really need it. Many of them also dreamt about having enough money to buy a motorbike, in order to facilitate their transports. The farmers also often accept low prices because of the difficulties that come with transporting their products, no matter if the selling takes place in the market or at their houses. The farmer along the good road did however say to sometimes be turning down the buyer’s prices, which can be an indicator of him not being as dependent on single buyers since he lives along the best road, and produces tobacco which is in great demand. Also, that most of the selling takes place during a specific time of year, namely the dry season, and the prices are higher during rain time as well as farmers try to stay put and not move too much during this time, imply that the roads get bad by rains. The differences in amount of time needed for the different farmers to transport can be an indicator of bad roads as well as different quality, in addition with the falling down, flat tires, need to get off the bicycle and sometimes carry it in order to pass. Still, if one were to only listen to the farmers concerning the roads not being impossible but just difficult to pass it can be perceived as though the situation is handled and might give an illusion of the roads being in better condition than they are (by my standards). However, even if the interviews could be interpreted as not having problems with the roads concerning selling since, the farmers always sell when they need, the fact that the problem is brought up in relation to needing to go to hospitals etc. indicates that the roads are not that reliable/good.

6.2 Different interpretations of the problem and solutions
Since the buyers are probably the single most important group after the farmers when it comes to questions concerning food supply and food distribution, additional interviews were performed with two small buyers and one big buyer in order to widen the understanding of different interpretations of the problem in itself, as well as its solutions. This is not to say that no differences in opinion can be interpreted between the farmers, even if the subject can be seen to allow more differences between social groups. The buyers interviewed are stationed in Cuamba but normally work outside of Cuamba and therefore farmers living in more inaccessible and remote places will in a way also be represented. While the small buyers work individually the big buyer represents a warehouse and exporting business. All of them only buy food crops. No other groups will be studied separately in this section and only the most relevant differences or similarities will be treated.

The farmers’ opinions about the physically given cultivation conditions concerning climate and soil, do not differ and it can be expected that their respective fields are not characterized
by very different conditions except for maybe soil. Still these soil variations might be more of importance for the road conditions when some roads have been described as muddier than others, than for the cultivation conditions since more or less the same crops are cultivated by all farmers. The major differences seem to concern factors related to road and transport conditions. This is not unexpected since this also is the factor that was chosen to be a differentiating factor from the beginning. One of the small buyers expressed the climate being favourable for cultivation while at the same time bad for the roads.

The climate and soil conditions are, by the farmers, considered favourable for cultivating even though the lack of rivers in the area are said to be a problem for crops like tobacco, which might explain why only one of the farmers cultivates it. The farmers also agree on there being a connection between high precipitation rates and big harvests, even though they disagree in a way concerning degree of variation between years. Also, the small buyers agree with there normally being a lot of food and maize when it is raining.

While all farmers agreed on there being a shortage of maize due to lack of rain during the year of study, one of the small buyers points out that even if that had to do with this first and foremost it can also be explained by more people having chosen to cultivate more cotton and tobacco instead of maize. Apparently, more people used to cultivate more maize but gradually farmers have chosen to cultivate cotton and tobacco since it pays more and it also provides some sort of “guarantee” that someone will come and collect it after harvest and so, the transport part is taken care of. The same buyer means that when it comes to maize it is always the farmers who have to arrange transport of the products to the market for selling. In the same way one of the interviewed farmers also acknowledged that selling food crops is not as easy as selling cash crops and also the farmer with the biggest cash crop production was said to be the most sure about having his production collected. With consideration to this, one of the small buyers means that a shortage of food can prevail even if the rains are good, when farmers prefer to produce cash crops like cotton and tobacco instead of the important food crop maize. Both the farmers as well as buyers talk about the shortage of maize that particular year, which increased the prices. The small buyers refer to it as a tough buying year and more products could have been bought if not the products were so expensive. And so, even if there was a shortage there were still products to buy, but expensive ones.

It should be noted that unlike the interviewed farmers who only sell in and around Cuamba town, the interviewed buyers prefer moving outside of Cuamba in search of the cheapest maize possible. One of the farmers showed a correct awareness of the fact that Cuamba has the highest prices in the area and so there is no use for farmers to go to other places to sell. However, farmers can still in a way welcome low prices, for instance when the buyers come to them. There is a point in buyers going to other places to buy and so they go to more or less remote, isolated and inaccessible places relatively far from Cuamba where the products are very cheap, since the farmers there can not say no or raise prices because then nothing would get sold. The big buyer however does not buy from everywhere and the reason for not choosing certain areas, he explains, is normally inaccessibility due to bad roads. Even though the interviewed farmers in Cuamba can not really be said to have good terms of trade, the difference is that they can be regarded as having more options of where and how to sell and consequently the prices vary, while the farmers in more remote areas have to take what they get since they either can not afford the transports and it is too far for them to go to Cuamba where the prices are high, or they sell at local markets and since these product in turn are brought to Cuamba the prices will not be that high either. The buyer has to consider all so
called buying expenses, which not only includes transport, but also food and accommodation, for a car normally takes time to fill up.

All the interviewed farmers prefer to sell to private consumers and not to buyers who just want to make a profit by buying and reselling, while one of the buyers expresses this reselling business as good, since it helps the buyer as well as other people who otherwise would have a hard time finding these products in town. When it comes to feeling satisfied with the prices one small buyer normally is, except for that particular year when prices where too high. This buyer means that usually both parties are satisfied with the prices even though it is not easy to negotiate. Among the farmers however, only one expresses a satisfaction when selling. It is a common opinion among the farmers that price “negotiations” in the end never are won by the farmers and even the big buyer admits that the farmers in the end never say no to buyers since farmers usually prefer to sell. The other small buyer at the same time expressed unhappiness with the prices being high, since the transport costs are high, and so it is difficult to resell with profits later. This buyer says to be buying even when the prices are high, for otherwise there are no products to sell.

All of the interviewed farmers get paid in cash only and no trade takes place, but one buyer revealed that there are farmers in the remote areas who sometimes do not want money for their products since it is far for them to go to Cuamba and they have no use for money where they live. Such people might want things, for instance salt, sugar or soap, in exchange. One time this buyer traded cookies and sweets to get some maize from some orphans, who did not even know what it was but wanted something else anyway.

The reasons given by the farmers for not selling all of their products at the same time, are many and even though the four sell the larger part during the campaign period it is obvious that this does not exclude them from needing to sell during the complicated rainy period. As was obvious in the interviews, they sell whenever they need money, no matter what time of the year, if it is raining or not. The need can not be adjusted to if it is campaign or no campaign. The buyers normally claim however, that there are no products left by rain time, that the products left are from the previous campaign and consequently not valued as high, that farmers have no good storing facilities, or that the farmers are busy producing new food crops and working their fields which often are at a distance from where they live and consequently it is difficult to find them. The big buyer also expresses that since the farmers need money and have bad transport possibilities it is good for them to sell when there are buyers. As the farmer interviews revealed however, one farmer even expressed that since he knows that most people are looking for maize during the rainy time, he tries to keep and sell then. When it comes to the buyers, most buyers prefer buying during the campaign/dry season because the bad road conditions make it impossible to reach the relevant places by car, at other times of the year. It is also said that people normally stop moving during the rains, even though it is possible to pass, it is however not possible to buy. Also, the only people transporting maize to sell during the rains are orphans. While buyers express a negative attitude concerning the rain season being too long one interviewed farmer expressed that he likes the rain season more than the dry season for it allows them to produce.

One small buyer expresses a will to buy at other times as well, and not only during the campaign. However, the issue gets more complicated by money for if the buyer does not have any money left by the end of the campaign the buying can not continue. The other small buyer explains that there are too many drivers who refuse to drive on the worst roads when there is risk for rain and because of this the buyer can not go there. The yearly rains are frequent and big and even if it rains a lot and then stops, the water remains for a long time. The negative
relationship between rain and roads causes problems since there are too many places with a lot of production, and for instance maize throughout the year, which can not be reached.

While all farmers say that they use bicycles when transporting their products, the buyers normally hire a pick up, or use a combination of different means of transport depending on what is available, for instance from one place to another by local transport, then a private vehicle is often required to get to the specific places with the products. The time required for transport depends on the type and whether there are complications on the way or not (figure 15). The buyers interviewed never use bicycles because it is too far and the quantities are too big.

The procedure explained by one of the small buyers is that the buyer first goes to the location where some time is spent collecting, either by receiving farmers who know that the buyer is there or by visiting them. When the volume can fill a pick up, a car is hired to bring it back to Cuamba. Since farmers normally do not want to sell too much at once, as could be seen in the interviews, the small buyers explain that it is necessary to ask at many different places in order to fill up the pick up. A less attractive alternative is to bring back the products by chapas, which is the public/local transport. However, these only go to fixed places and consequently not to the houses of farmers and so, other means are still needed. Even trains are used but since they stop in small places only for a very short time one has to be very quick in loading/unloading of the products and the time is sometimes not enough. The big buyer of course only uses trucks. The small buyers only visit small farmers while the big buyer does not collect from single farmers unless their production exceeds a certain volume. This buyer also collects from local warehouses which in turn have smaller buyers who have collected the products from the surrounding area.

Transport problems not only include drivers refusing certain areas, as mentioned earlier, vehicles being unavailable but also lack of diesel. One buyer says having to sometimes wait
for several days before the diesel arrives. The buyers’ visits to the farmers can be done by bicycle but in order to bring products back, a car is needed. One of the small buyers actually owns and prefers a motorbike considering the high cost of diesel and the fact that a car not always can get to all places, even though it is easier to load. Motorbikes can pass where cars can not and can stop wherever to ask for maize. She usually goes by motorbike to locate where the maize is and then returns by car to collect it. As could be seen in the farmer interviews, many farmers expressed a wish of buying their own motorbike to facilitate the transport issue. (It can also be assumed that a motorbike is much more affordable for a farmer than a car.)

It is interesting to see that while the interviewed farmers either considered the roads to be difficult but possible to pass during the rainy period, or according to some not even difficult, and disagree on which period the worst is, one of the small buyers means that it is not just difficult it is impossible to pass at all during the entire rainy season, in the area in which this buyer works. What is possible is to go by bicycle or motorcycle but only without maize, it is not possible to transport products. Even if the interviewed farmers talked about difficulties concerning them having to carry their bicycles and maize over bad road sections they still do it. This can be an indicator of different living standards but also different perceptions of the main problem depending on which one is the most influencing one. For instance, the buyers normally have other occupations during that period of year when they do not sell (i.e. before and after the campaign) and so their livelihoods can be considered not to depend on if they reach a certain farmer at a specific time or not. For instance, one of the small buyers also works as a teacher. By contrast, the farmers have to sell when they need money.

Another thing is that since the buyers are more involved in money related activities they might have a greater possibility to always buy maize at least for themselves. The farmers can not buy food unless they have produced food for this is practically their only source of income (except for selling of fire wood etc.) And so, the farmers are first and foremost dependent on rain to even get some food, let alone sell and get money, while the buyers do not necessarily need rain to be able to buy food, however they need roads in order to transport and make a business. While the farmers expressed a constant lack of money, dissatisfaction with their lives and poverty, one of the buyers feels happy with her life even though she says that she would not be engaged in buying and selling maize if she was not poor. The other small buyer considers buying and selling maize as a good business because it guarantees him money, even if just a little. When buyers talk about difficulties it often involves the roads bad condition and that they are difficult to pass. It is not difficult to see that both groups struggle, however it can easily be interpreted as farmers struggle to stay alive and buyers struggle to make money. And so, it can be regarded that the lengths that farmers go to in order to stay alive are bigger and consequently they cycle with maize during the rainy season even though it by some is considered impossible! Not surprisingly, it is also out of the question for buyers to join and fix bad road parts, which is considered a responsibility of the government unless it is a really small road, then it is up to the local community leaders to arrange with the villagers.

The small buyers consider their commercialization businesses as first and foremost dependent on money and transport. Without money it is not possible to buy and without transport it is not possible to transport the products bought. One of them still means that money is more important for if the budget is big it is theoretically possible to visit all places including the ones which are more inaccessible. Still, the climate can be considered to affect the food security more than the roads and the roads can not be the biggest problem since they are used for going and buying, but if it does not rain enough there is no food to buy. One small buyer
expressed that since climate is natural it can not be fixed, as contrary to roads. Because of this the climate can be considered as a bigger problem, even though it is mostly favourable. The interviewed farmers often consider the climate as the biggest problem even if the bad road conditions on the side road were not left far behind by the farmers along this road. This can be interpreted as farmers having a greater ability and pressure to adjust to whatever bad situation and so they do not consider the roads as their main problem since they are used to them, have ways of overcoming them and practically bicycle “no matter what”, while the climate on the other hand is believed to be left up to God. Also it can be expected that ones interpretations of problems and the severity of them very much depend on what frame of reference the observer has and so it was not surprising that the farmer along the bad road expressed a happiness with his road quality for in comparison both to how it used to be and to worse roads in the area it is indeed good. It seems however, that transport issues should be considered separate from road issues which might explain why the farmers along the better roads still could talk bad about difficult transport conditions, even if not necessarily bad roads.

It should be considered that even though the farmer interviews indicated that the farmers living along the worst road, perceived their road and transport conditions to be more difficult than the other two, differences in background may also have influenced their perceptions. For instance, the farmer living along the best road expressed the overall greatest optimism and “easy” living, which might be influenced by the fact that he, besides living along the best road, is the only one producing two different cash crops, namely cotton and tobacco. This cash crop business might be what is providing him with more money, and in a way a better existence. Except for it being a question of different living conditions, differences in level of poverty, education and experience it might also be a personality issue. One of the farmers on the worst road did express it not being safe for farmers like him in the market for people in town know that they are farmers from the field and consequently steal their money or say mean things. Even if the farmer on the good road said not to be having any education, he used to be a soldier and his different occupations might have influenced him in a positive way, at least if one compares to one of the farmers along the worst road who just has lived and produced in the same place for all his life and believes that it will continue like that until he dies. This farmer also does not know what to do with money if he had it, unlike the others.

When it comes to suggested solutions the differences of opinion between the farmers and buyers are greater concerning the climate than the roads. One of the small buyers believes that the food security is a problem for the government to solve, since it depends on farmer roads not being repaired, even though the rains are good for cultivation. According to this buyer the farmers can not solve this problem themselves for it is too big for them to handle. This buyer says that when she asks the farmers why they do not cultivate more maize they say it is because they want to concentrate on money generating cotton and consequently they have to go to the market to look for and buy food instead. On the other side this is considered a good thing by the other small buyer. He explains that since it is normally easier for farmers to sell when living close to the road, in comparison with those living far away and producing a lot but having no possibility or money to distribute, it would be better to produce cash crops like cotton, since someone always comes and collects this.

Another buyer suggestion involved joining of a few farmers in a sort of union, to make possible the production and selling of bigger quantities, since it is hard working alone. This corresponds with farmer expressions of it being strenuous to work in the agriculture and if they had money they could hire help. The buyer also believes that the government should support the farmers with tractors, cows, etc, in order to facilitate this. So, if it does not rain a
farmer can still get food from others that have succeeded with their other crops, instead of being left without food because of focus on one or just a few crops. It is important with a focus on developing more resistant crops and a diversification for if one crop fails, the farmer is not as vulnerable. Factors that can contribute to a better infrastructure are according to a small buyer that farmers even within this area join and fix the roads like they used to. He means that the farmers nowadays are too lazy and just wait for the government to take care of things instead of joining again. In spite of accusations about laziness the farmer interviews revealed that the farmers still do this job. This buyer also believes that more people should cultivate more cassava and other resistant crops that do not require as much rain and are more resistant to climatic variations. He means that maize, rice, groundnuts and beans are not especially resistant and so the risk of hunger is bigger because of the focus on these. None of the farmers mentioned this as a solution, and one farmer even expressed that not even the changing of crops would help.
7. DISCUSSION
Since the three main parts of this paper (sections 4-6) were considered in need of their own connecting, explaining and/or comparing closure, it should be noted that this final discussion first and foremost aims at putting the pieces together and not to repeat itself by interpreting specific sublevel results again.

It has been my aim not to remain locked in my own preconceptions about this study problem especially since it appeared not to present itself in a certain expected way. I found it important not to stay blind before alternative data or interpretations in the hunt of a certain problem. Developing researches concerning similar issues unfortunately more often tend to be the products of western minds and just as important as it is to consider this often more theoretical knowledge, it is to also give room for practical knowledge from the specific developing country/region, which in this case also tends to be less general and more location specific. Different people presented different perspectives and scales of the problem and all levels I believe to be important, even though an awareness of the fact that the problem is presented in a certain way depending on who the presenter is, is necessary. The many differences of opinion confirm the complexity of the problem and consequently the necessity of engaging in different methods, sources and the inviting of different opinions, like in this case from governmental institutions, private companies, NGOs, students, farmers and buyers to name a few. Not to do this would be to neglect the full scope of the problem.

My original thought from the very beginning of this study, namely that transport infrastructure is of crucial importance for food supply systems and food security and that functioning roads are a vital necessity for rural development as well as overall, can be verified. However, the way in which the problem takes shape was not as simple as imagining there being surplus areas/farmers letting their production go to waste while at the same time shortages prevail in other parts, just because of difficulties in distributing it. (Even though one farmer did say to sometimes “forget” to harvest some part of the production if it is too much for him.) However, this can be interpreted in some descriptions of the situation in the country (Utrikespolitiska Institutet 2003). This does not imply that problems do not exist concerning unfavourable terms of trade and difficulties in selling and transporting, but merely that the farmers sell when they need money and when this is the case no bad conditioned roads, old bicycles, bad health or bad weather stops them! Still, it is possible that other farmers than the ones interviewed in Cuamba, living in even more remote and inaccessible places than what the worst road in my study tried to represent, would present a different situation. A further study of this subject could therefore be benefited and give a different presentation of the problem with the inclusion of such farmers. For, even if it was obvious to me that the roads were bad even in Cuamba they are still, seen through “local eyes”, relatively good.

Therefore, I recognize possible flaws in my study as being that all farmers interviewed were at the same distance from Cuamba and that there might have been more obvious results in comparing areas which are more clearly good and bad. However, even if the food supply conditions can not be said to differ substantially between the interviewed farmers along the different roads, since all farmers sell even if difficult when in need of money, the effort put into selling and distributing appears to be higher as well as the returns from the selling lower on the worst roads. There was a purpose with choosing the same distance for all farmers, namely that the only variable to differ between the farmers was to be the different types of roads in order to reduce other factors influencing as well as increase the relevance by concentrating on a higher production area. With consideration to the farmers actually interviewed in this paper, it can be said that the phenomenon of food going to waste, might be
limited to more isolated events like natural disasters and following food aid situations, which is abnormal from the beginning. It can be considered a paradox if farmers get wiped out by aid donors who might be there to help. Belfrage (2004, p 3) questions the motives of food aid and if it in reality is contra productive in its dumping of surpluses from donor countries and if this undermines local production in receiver countries and according to FAO/WFP (1998) the deficit southern provinces do at times face difficult food access problems, occasionally in need of precisely food assistance.

As mentioned in the first section of this paper, FAO (29th March 2006a), describes Mozambique as having the potential of being self-sufficient on food grain. The import-export solution for the uneven distribution of production surpluses might give an impression of the problem being solved. However, Zondi (2004, p 1) expresses more severity to the situation when describing Mozambique as one of the six countries with chronic food shortages in southern Africa. Even if I do believe that an increased regional cooperation and economic integration in southern Africa is preferable since one of Africa’s main problems is its segregation from international capital markets (Zack-Williams et al. 2002, p 4), I still consider it more sustainable and secure to in worse case scenarios, where it may not be possible to import from South Africa, have the ability to distribute domestically. This could also decrease eventual dependence on food aid and its negative effects. I believe it not to be a farfetched thought since bad case scenarios do occur and since South Africa very much is part of that southern Africa which is referred to when on the subject of climatic extremes as occurrences and accordingly this country too was hit by the devastating floods of 2000.

There is yet another reason for being careful about the exporting business in the north, namely that it already has led to a type of deindustrialization where raw products are exported instead of processed, as was presented in the cashew nut example in section 4.3.1. Consequently, the processing capacity has deteriorated and I find it unsatisfactory that Africa’s relationship with the global market in many instances has continued to be based on dependence on imported manufactured goods in exchange for raw materials, as Zack-Williams et al. (ibid, p 2) describes it. In fact, one of the considered detrimental trends in food trade has been that Africa’s presence in the world market is largely in the form of primary products and the importation of non-primary products and so African export products are not competitive in the world market (Zondi 2004, p 18).

Since rehabilitation of the links between the northern surplus areas with neighbouring countries and the ports has been in focus instead of with the south, is it not possible that rehabilitation of north-south links too would fade away its high cost transport-label, or would it still be cheaper to import from South Africa? This aspect would be interesting to investigate further, for instance if the prevailing situation is a consequence of the products being cheaper in South Africa due to a more effective large-scale agricultural production and/or low export taxes, or a consequence of the expensive transports from the north. Even though the range over which transport can operate is increased in direct proportion to the reduced cost of it (Johnson 1933, p 270) it seems as though the thoughts are not at all in this direction of change and that there is an acceptance of the status quo. As a matter of fact, the development strategies of the governing classes that took over from the colonialists have been described as essentially “business as usual” (Zack-Williams et al. 2002, p 1). However, since development is very much about striving forward and thinking long-term it is important to break away from this. Mirza (2003, p 233) points out that there seems to be a tendency for national governments as well as aid donors, to focus more on recovery from natural disasters than on the creation of adaptive capacity. Would it not in the long term perspective be more cost-
beneficial and effective to prevent disasters than to recover from them, and thereby invest in more resistant infrastructures for example?

Differences of opinion is a recurrent feature of this developing problem and several officials spoken to in Niassa claim that there are no problems with their roads in relation to food distribution since the selling/commercialization period does not coincide with the problematic rain period. It is however obvious to me that these, even though they work for governmental departments, companies or organisations who say they aim for rural development, do not listen to the voices of the rural person, namely the farmer. The farmers did express that even if it is not especially difficult to sell during the rain period, since they “just have to carry their bicycles and maize on their shoulders in order to pass”, the isolation is still a problem since they have to sell whenever they are in need, irrespective of commercialization period or not, and need roads for other important activities like going to the hospital. Whether farmers have grave difficulties with transporting to the market or they are afraid of even going there, it is obvious that the selling is not on their terms, yet it is performed. Also, it can not be considered as secure for those farmers living in remote areas having to rely on a few ambulating buyers who might or might not come. Such “smaller” details seem to be ignored as long as the distribution of production on a higher level is guaranteed. Even if I acknowledge some positive aspects of the commercialization business, there are still too many aspects of the food security and development problem that needs attention. For instance, how secure and sustainable is it really having to estimate how much of the production that can be sold depending on how much and when it is thought to rain the coming season, as Manuel (oral communication 22nd September 2005) expressed, or depending on how many members of the family are estimated to survive, as one farmer expressed?

This is according to me not to develop but to settle and in order to develop one must start taking advantage of the potential that exists. So, instead of giving all the attention to single damaging events like the floods in 2000, focus should be on areas spared from similar events. Just as important as it is to try to predict, prepare and adjust to climate extremes which affect some parts of the country more than others, it is to spread the development and economic activity, which in today’s Mozambique is highly concentrated in the very same area as these events. It might also be cheaper and easier since climate projections are complex, involving uncertainties as well and difficulties in reaching out with the information to the most isolate areas (O’Brien & Vogel 2003, p 199). Still, if the households and countries that stand to lose food production due to climate change are also those that depend most on agriculture, then falling harvests will certainly undermine household and national food security (Devereux & Edwards, p 24). While on the subject of climate it can also be said that even if the purpose of this study was to focus on transport infrastructure and climate mostly when of relevance for the former, it is important to recognize the possible contribution made by a deeper focus on climate, concerning how often droughts and floods do occur as well as future climate scenarios. For instance, might food and transport conditions change as climate changes? This is only mentioned briefly in section 9. A continuation of this study could however benefit from engaging in such questions.

Just as well as recovery from extreme events seems to be a trend with governments and aid donors, even “normal events” may in the long run also prove to be destructive. Whether it is about extreme rains or normal ones, it is obvious that water and rain have a large negative influence on the road condition and road quality in Mozambique, but just as well as the higher precipitation extremity the higher road vulnerability, also the worse road condition the higher road vulnerability. The floods of 2000 left Niassa unharmed but it does not take away the fact
that the roads of Niassa still are very vulnerable to rain, due to their worse condition to begin with. Another one of my preconceptions was that the climate for cultivation was good and that the roads are so bad that they do not need extreme rains to become difficult or impossible to pass. While this proved to be true, the most serious problems “only” seem to face cars on the roads. Not all of the farmers expressed dissatisfaction with reference to the bad road conditions and climate fell more naturally into the conversations. This is not to say that farmers do not face problems, however they expressed a difficulty rather than impossibility. As the interviews stated, it is all a question of need and not merely the quality of the road. According to FAO/WFP (1998) the farmers sell maize to meet their urgent needs for cash even when they do not have enough surpluses. Still, it would have been interesting to have performed this study during the problematic rain season. However, since many roads at this time are impassable by car, this was dismissed. A continued study, could still benefit from this.

Further on, it could be argued that since bicycles are by far the most dominating means of transport on these roads and it is “always” possible to pass by bicycle, there is no problem and the need for better roads is minimized. However, with the risk of in a way glorifying our western time focused society, it is hard not to ask the question if it is really sustainable and reasonable to have a food supply system depending in part on farmers cycling with about 60 kg of maize on an old bicycle and spending up to five hours on the road even if the distance is not that far. Time and efficiency is also money, as well as staying healthy. Hansson’s (2003 p 14) presentation of the concept of time geography involves how improved communications decrease the time distance and thereby increase the attraction of regions located in the periphery. I believe it to be important to consider this for breaking the isolation. While on the subject of bicycles one might also claim that it would have been more relevant to perform the field observations by bicycle and not by car, for the reasons mentioned above. However, with reference to the fact that it should be a future development aim to use more efficient means of transport, it was considered justifiable. Securing the food does not only lie in the constructing of better roads but also in the increasing of production and an increased production also requires the means of transporting it, and I argue that the means referred to are not bicycles!

Also, because of the bad roads it is only possible to transport goods by bicycle. Even though this is true, that only bicycles are possible to use during certain times of the year, it is probably safe to say that this also has to do with more complex economic factors, such as bicycles being the only means of transport affordable to most farmers. This indicates yet another aspect of the infrastructure problem, namely the high cost of transports and so roads being destroyed by rain are not the only problem. According to Johnson (1933, p 270), if the transport charges are so high that the produce carried is unmarketable at destination, then the transport facilities might just as well not exist. Even though socio-economic factors are not in focus for study in this paper, their importance should not be left unspoken and one must bear in mind that distribution constrains are not only the cause of lacking road infrastructure but also of poverty and low purchasing power among the population. The pilot studies also revealed another form of impassability, than the one I studied, namely villagers having placed large obstacles on their road refusing to let people pass unless they first receive payment from the government for fixing the road, and then they were said to open it again. The interviews also revealed crop selection according to other than just soil and climate suitability, for instance according to money situation or ceremonies needing certain crops to be performed. Landon (1991 p 269) expresses that ideal conditions are rarely attained in practice, while economic and social constraints are often very important factors in determining even the final choice of crops.
During colonial times focus seems to have been with cash crops rather than subsistence crops (Gleave 1992, p 46), and since there is a lack of both economic funds and a diversified agricultural production, it might just be that Mozambique would profit from resuming some of these “colonial strategies”, next to more modern commercial large-scale farming techniques as mentioned in section 4.2.3. One of the interviewed farmers did also say to be producing more cash crops (i.e. cotton and tobacco) to get more money and even in his other statements, it could be interpreted that his standard of living was better than the others’. Even though the Mosagrius project was abandoned it would have been interesting to investigate it more and learn from it in detail, concerning strategies for cultivating as well as selling and transporting in order to maybe succeed the “next time”. However, even if cash crops can provide the incentives for money generation preoccupation with export of cash crops, continuing from colonial times, has been regarded as a reason for the falling trends in food production (ibid, p 192) and so it is important to take this into consideration in order not to loose what might be gained. Also, it should be recognized that cash crop production should not replace food crop production but merely complement it, for what kind of food security would otherwise prevail? This was also expressed by one of the buyers who not only explained the maize shortage that particular year with bad rains but also that more and more farmers prefer to produce cash crops instead in the search of money.

It might be safe to say that a newly built good road in a certain area does not necessarily guarantee usage since the farmers still produce relatively small volumes, relative the potential. Even if the problem, as mentioned earlier, does not involve agricultural productions going to waste in any widespread form, the potential is not put into use. As mentioned, the commercial big farmers left with the Portuguese during independence and most of today’s farmers are subsistence ones. In accordance with producing only for own subsistence (i.e. the food produced including other necessary products bought with the money from the sale), the farmers only sell when they need money and not to make money. This was very obvious in the farmer interviews. If however, they were to aim at not just selling when they need money but also at making money, which can function as security during bad years, they could start investing in bigger productions. Since it is not especially encouraging having to cycle under the described conditions more than one needs, the farmers do not sell more than they need and can also be thought not to produce more than they need.

A better road, which allows their products to be bought from ambulating buyers because of their big productions and not because of their isolation and the associated low prices, would however be encouraging. At the same time the farmers’ unfavourable terms of trade could be improved. Incentives to increase production and marketed output are hindered if the costs of moving goods to and from local markets are too high (Cleaver & Schreiber 1994, p 163). National transport systems linking local markets to cities and ports, function in much the same way. Also, the time and effort spent on just transporting could easily be spent on producing instead and so the farmers would have what they believe to be important for a bigger cultivation, namely strength. In this way the farmers’ production can be influenced by the transport conditions, even though the farmers’ production quantity has not in direct terms been explained by the road conditions but by limited capacity (strength and money) to cultivate more. It is also said however that farmers with access to roads and transport infrastructure use land more intensively, adopt efficient techniques and modern inputs, produce more and employ more labour. Improving of both the quality and quantity of the road network is important, and then include isolated areas like Niassa, for a development can not be development without including rural development and sustainability.
8. CONCLUSIONS

Having reached this final stage, on ending it is safe to say that road infrastructure and climate conditions have a major impact on food supply and food security, on a national as well as regional/local level in Mozambique. To repeat the introducing sentence of this paper, food security is about adequate access to food, whether it is acquired through production or trade, and while production requires favourable climate conditions trade requires favourable transport conditions. It is also rather obvious that the cultivation conditions in Niassa, not only involving climate but also soils, stand out in a favourable way even though the road situation was a bit more striking, in a negative sense. While the north produces surpluses, shortages are common features of the south. The inefficient and expensive transport system does not allow transporting from the north to the south, and so the situation is handled by the south importing from mainly South Africa and the north exporting to various countries. All farmers in the Cuamba region sell their surpluses in Cuamba, which in turn is the connection point of Niassa and distributes it further but never down south.

Agricultural production is highly dependent upon rain and when it arrives too late or there is a shortage at the end of the season, maize production, which is widespread in the region, will not be as successful. According to different oral sources as well as the interviewed farmers, the rain is usually enough except for the particular year of study. It should be noted that also too much rain can be destructive for agricultural production harvests, for example like the devastating floods and heavy rains of 2000 that swept in over large parts of the country.

Such massive floods are not surprisingly enough also destructive to roads and bridges, but in the case of Niassa the roads are different from the rest of the country in a negative sense, making them vulnerable even to normal rains which come every year. Both field observations and farmer interviews gave examples of water assaulted roads. The classification system presented in section 5.2.3 revealed a large negative road influence of water related characteristics such as potholes and water erosion tracks, making these very frequent on the worst road and also somewhat on the bad road, but non-existent on the good road.

Because of the bad roads, especially during the rainy periods, most of the buying and selling of products takes place during the not so complicated dry season. Even still, the farmers sell when they need and the need is normally not limited to a certain time of year. What happens is that the farmers always try to pass and because of the difficulties, this takes a much longer time and involves many stops in order to rearrange things on the road, or maybe even carrying of the bicycle and maize past bad parts. Because of this, the farmers do not label the roads as impassable but just difficult, as in contrary from car drivers like buyers who get stuck if they try to pass. Since the farmers sell whenever they need money, and then no bad road conditions seem to stop them, they do not consider the roads affecting their ability to distribute and sell.

Different opinions and interpretations of the actual problem exist and even if not all farmers mentioned the roads as bad, the main differences appear to be between different social groups and not different farmers. For instance, since the farmers’ business is producing for subsistence they are in a way more vulnerable to unfavourable rains, while buyers’ main business is buying and so they need good roads to keep going. If there is no rain the farmer does not have any food, much less anything to transport and sell. If the roads are bad the buyer can not buy/transport. Also there are people who do not believe the roads to be a problem at all since the selling take place during the dry season. It should be noted that these people hardly are farmers, who of course are dependent on roads for other purposes as well, for instance when in need of urgent hospital care.
9. FACING THE FUTURE

The aim of this section is to provide an outlook for the future concerning Mozambique and Niassa/Cuamba, with respect to the three main components which have been covered in this paper: i.e. climate, road/transport and food security. Suggested solutions for a better, more efficient and sustainable transport situation and food security, and in the extent possible a better climate situation, will be presented.

The climate over southern Africa is highly variable, or to use the words of Tyson & Preston-Whyte (2004, p 305), “Periods of warmth and cold, drought and flood, famine and plenty have occurred repeatedly in the past.”, and it can be expected to change also in the future. Precipitation totals vary greatly from year to year in Africa as a whole and according to Leroux (2001, p 411) the least watered regions are the ones that experience the greatest ranges of variability year by year, while other regions have a more assured rainfall. Still, catastrophic events such as the recent floods and heavy rains, not to mention the many droughts throughout the history of Mozambique, occur and destroy even though the so called great Sahel drought represents a magnitude of this phenomenon in it is own class.

The vulnerability and costs of climate variability in developing countries can be enormous, due to a relatively high importance/dependence of climate-sensitive industries in the overall economy. According to Godwin (2002, p 15) the cost of damage in Mozambique caused by the flooding disaster in 2000 represented 11.6 % of GDP. Also the human costs are high because of poverty and the related lack of capacity to cope with climate shocks once they have occurred. Arndt et al. (2003, p 129) points out that even though agricultural production is closely dependent upon climatic factors, implications of climate variability for food systems extend well beyond the agricultural production.

Even if climate change scenarios for southern Africa is more difficult to model and predict reliably when it comes to precipitation as in contrary to temperature, there is said to be a general consensus for wetting in east Africa, drying in southeast Africa and a poorly specified outcome for the Sahel. A future annual warming is projected between 0.2 to more than 0.5 °C per decade (Godwin 2002, p 16) and this warming is not expected to be the greatest over Mozambique but more the interior of semi-arid margins of the Sahara and central southern Africa. Even though no future estimations based on historic precipitation data from Mozambique or Cuamba has been attempted in this paper, the interviewed farmers of Cuamba often expressed the climate being better before and that there is less rain now. If it could be that Mozambique is approaching dryer times, it can be argued that this might be preferable for the water vulnerable bad roads of Niassa. However, since most ferralsols are sensitive to drought (Driessen & Dudal 1991, p 163), the negative impact on the agriculture might be greater. Even if the climate is hard to change, efforts concerning mitigation and adaptation are important and one way of increasing the capacity to cope with climate variability is through reliable and accessible seasonal climate forecasts.

Since climate forecasts or projections both can be considered expensive and complicated as well as having difficulties in reaching out to the isolated farmers, other more simple solutions are also of importance. One rather easy strategy could be that farmers start focusing on producing more resistant or a variety of different crops. This I believe to be both a reasonable and possible adjustment, even though the interviewed farmers themselves did not seem to believe this to be a solution for coping with the climate, at least not of the same calibre as praying to God or performing ceremonies in which one also prays for favourable rains to come. Furthermore, an increased use of irrigation techniques could help precipitation rich
Niassa to cope with years of shortage, even if it should be noted that this often is expensive and difficult to attain. Also, if the figures are true implying a harvest possibility of 10 tons of maize per hectare in Niassa, as compared to the much lower figures in the country in general as well as in southern Africa, there should definitely be an increase in agricultural investments, and not only in infrastructure ones. For, as could be seen in section 4.2.3, not even animals appeared to be particularly available as a means of assistance!

Regional applied solutions are of importance, since the problems with bad roads might be bigger than climate variability in the north and so, it could be interpreted as Niassa region not being in as big a need of climate projections and warning systems as the more severely affected south. Also, it was more obvious to me that this region might have an even bigger problem to overcome when not even information from basic weather forecasts are taken advantage of in the road rehabilitation process, as Geilinger (oral communication 30th September 2005) explained. Instead of taking actions by making sure that the road is filled with new soil before it rains, and then being ready to compact after it has arrived, nothing is done except for proceeding as usual. Such kind of road work increases the efficiency and the quality and can save both money and time.

However, it is of great importance to aim for a reduced vulnerability also of the roads for instance by the construction of new (paved) roads and aqueducts/bridges but also by maintaining and repairing existent ones properly and on a more frequent and serious basis, including small ones. Even though the focus on this appears to have increased lately, some investments can still be subject to questioning like the paved road being constructed by Sida from Lichinga and out to the east. It might be considered more necessary to place the only paved road of the province in a slightly more populated and economically important area so that as many people as possible can take advantage of the development. Also, it would be shorter and more efficient to take it to Nampula where also the roads are better.

The static routine maintenance involves the bad road receiving maintenance twice a year, once before and once after the rainy season, even though the need might be bigger than this because of the traffic intensity. Maintenance is only executed in order to be executed, not to mention bigger works which only seem to be executed when can be afforded or when extreme events have called for acute interventions. The farmers along the worst road complain about their area’s richness in clay which causes their road to turn into mud each rainy season, and so one small solution might be to take advantage of the clay conditions by either introducing other income activities such as producing and selling bricks or as Geilinger revealed about clay rich Bangladesh, to solve problems with road material by manufacturing bricks and then breaking them into pieces in order to get small rocks and harder material to mix with the clay.

According to Manuel (oral communication 22nd September 2005) it is difficult to attain a sustainable transport system since one of the country’s problems is that foreign companies are being invited to rehabilitate the roads and when they are finished and leave, so also does the competence. Since Niassa also education wise is an impoverished province relative to the country, it is stated that even people from the Zambézia province are preferred over people from Niassa when it comes to experience and knowledge about road work. According to Geilinger (oral communication 30th September 2005) the low competence often have the unwanted results of postponing what needs to be done, to a point where it is not really enough with maintenance any more and so machines are preferred instead of local man power, which in turn accentuates and emphasizes the problem.
In addition, even though it is important that this next suggestion does not replace any attention given to roads which is extremely important for rural development, investments in extending the railway network would probably have a positive influence, even though Europa Publications (2003, p 752) already describes Mozambique as being railway-dominated. Even if it can be assumed to be expensive in the short-term, it probably is cheaper in the long-term perspective. One reason for this is that railways are normally not as vulnerable to rains (Gouveia oral communication 8th September 2005), even if there were also railway lines which suffered considerable damage during the floods of 2000. Also an increase of the shipping transport could be in place for distribution within the country, longer distances.

Even though a big problem is the bad quality of the roads, it should be noted that the solutions do not only lie in the roads being improved if the transports still are expensive. This corresponds with what interviews, oral communications as well as literary sources revealed, about it being too expensive to transport longer distances, for instance from the north to the south of Mozambique. On a more local level, for the farmers and buyers of Cuamba, the high costs do not only refer to renting or buying of motor vehicles but also for diesel needed to operate them. Another problem necessary to overcome also is the fact that the diesel availability often is unpredictable.

As mentioned in the discussion (section 7), it may be wise to have the possibility to distribute domestically even if this not replaces the importing-exporting business. One problem related to this issue is the exporting of products needing to be processed. I believe it to be crucial for Mozambique to take more advantage of its resources by investing in processing its raw material instead of exporting it to countries that instead perform this and later sell it back to Mozambique, naturally at higher prices. This causes economic losses and is not what can be considered a sustainable development. In order to develop it is imperative to try to first use the advantage one has and then climb upwards in the production chain by developing competence to deal with as many different stages as possible, in order not to be trapped in the lowest raw material stage, as are too many developing countries. The cashew nut industry represents a striking example of this problem as well as emphasizes the responsibility of also international donors to invest in the right areas and that no universal recipe for development exists. This is not surprising since it has never been considered an economically healthy strategy for a country to stop processing its raw material. It is necessary to improve the inefficient and not so modern industries and hence, some kind of protectionism should be applied at least when the industry is being built up (Öhrn 1999, p 170). The recipe from the World Bank can be considered to have had a de-industrializing effect, instead of an industrializing and developing one, which the bank says to be aiming for. According to New Agriculturalist (2004), the cashew industry in Mozambique used to be one of the largest in the world.

Since the physically given agricultural conditions can be considered better in Niassa than in the rest of the country, there is a potential for increased production (Maloa, oral communication 13th September 2005). The more negative agricultural conditions such as low productivity and low population can however imply reasons for why this potential is not used and why there have not been more investments in more production in Niassa. However, low productivity seems not to be a problem for Niassa exclusively and so the bigger reason probably is the low population and its remoteness/isolation. However, in spite of this, it is my opinion that more should be invested in developing this region which is not as exposed to climatic extremes as the south, where most of the country’s economic activity is concentrated.
Of course the bad infrastructure can be considered as having a discouraging effect on farmers wanting to produce more but important investments in roads etc. would probably occur if the population was higher. On the other hand, a better transport situation and a breaking of the isolation of course can be viewed as an attraction for potential movers. It is a question of cause and effect for a bad infrastructure may be just as discouraging for potential movers as a low population is for investments in this. An increased production would however need an improved infrastructure (and an increased population) for if the roads are still bad, how will the surpluses get transported? Bigger roads also break the isolation and in the meeting with other peoples, trade can begin. Means of communication is what glues different activities performed at different locations, by the transport of people, material and messages (Hansson 2003, p 14). If the government were to invest more in this less vulnerable region (climate wise), it could as a whole stand stronger against devastating events such as the floods of 2000. To attract a larger population might be one of the thoughts behind the location of the major improvement on the Lichinga-road out to the east. For, it is otherwise strange to invest in this relatively unpopulated and economically less important region as compared to Cuamba. Or it might have to do with spreading the development in which case it is good, since the cultivation conditions, as mentioned, are slightly better in the Lichinga region.
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