Access to transport for the base of the pyramid

Measuring the Impact of Bicycles in Burkina Faso

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Management Summary

This study is an attempt to determine the role and impact of the bicycle on people's lives in the rural areas of Burkina Faso. The aim is to understand the importance of the bicycle as a means to make routine tasks easier and, furthermore, to better understand how it contributes to the improvement of the prevailing living conditions in the longer term.

The bicycle in part gains its importance from the fact that the population of rural Burkina Faso is strongly affected by a widespread lack of infrastructure. As a result, people most often face large distances separating them from the places they have to reach. Therefore, an adequate means of transport is required by them not only to avoid wasting long hours walking on a daily basis but also to prevent them having to suffer from transporting heavy loads by foot. It can be said that people having no choice but to walk are prevented from taking full advantage of their potential.

Taking the prevailing conditions in rural Burkina Faso into consideration, the findings in this study showed that the use of the bicycle resulted in an extensive amount of time being saved. As such, it is not only possible for people to accomplish tasks more efficiently but also to enlarge the number of activities being done. Furthermore, people have been able to diversify the range of their activities by having gained the possibility to overcome further distances providing access to more remote places. In addition, the usage of a bicycle proved to relieve its users while walking or while carrying heavy loads and enabled them to increase the amount of goods they were able to carry at one time.

As a result of these advantages, the study has been able to illustrate that people using a bicycle have been able to create less arduous working conditions for themselves. This has also empowered women to take on varied tasks. Moreover, the use of bicycles has led to a strong increase in earnings and savings. Since the resulting additional funds would generally either be reinvested in further income generating activities or for the purpose of an overall improvement of the living conditions, the bicycle has offered its users the possibility to slowly overcome poverty. The study therefore concludes that the bicycle has proven to have a paramount role in enabling people in rural Burkina Faso to improve their living conditions by their own efforts in the longer term.

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Abbreviations

AGRA	Alliance for a Green Revolution in Africa
ANOVA	Analysis of Variance-Method
CFCA	Franc de la Communauté Financière d'Afrique
CIA	Central Intelligence Agency
CSPS	Centres of Health and Social Promotion
CONFEMEN	Conférence des ministres de l'Éducation des pays ayant le Français en partage
DFID	Department for International Development
FEWS NET	Femine early warning systems network
FAO	Food and Agriculture Organisation of the United Nations
GOBF	Government of Burkina Faso
GOBF INSD	Government of Burkina Faso Organisation de l'Institut National de la Statistique et de la Démographie
GOBF MARHASA	Gouvernement of Burkina Faso Ministère de l'Agriculture des Ressources Hydrauliques de l'Assainissement et de la Sécurité Alimentaire
GOBF MJ	Gouvernement of Burkina Faso Ministère de la Justice
GOBF MS	Government of Burkina Faso Ministère de la Santé
GLOPP	Globalisation and Livelihood Options of People living in Poverty
IMT	Intermediate Means of Transport
LDC	Least developed Countries
MIT	Massachusetts Institute of Technology
NGO	Non-governmental organization
NMT	Non-motorised Transport
OECD	Organisation for Economic Co-operation and Development
PHAC	Public Health Agency of Canada

SLA	Sustainable Livelihood Approach
SLF	Sustainable Livelihood Framework
UN OHRLLS	United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and the Small Island Developing States
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USD	United States Dollar
WHO	World Health Organisation

1. Introduction

Throughout developing countries a large number of people are affected by poor, even extreme, living conditions. In 2010, the United Nations counted 700 million people living with less than 1.25 USD a day and from 2011-2013 about 842 million people – or about every eighth person in the world – who were suffering from chronic hunger. Numbers from 2012 indicate that 748 million people had no safe access to drinking water. In addition, 58 million children were out of school in 2012 and about 35.3 million people worldwide were HIV infected. The conditions proved to be particularly adverse for the millions of people living in the least developed countries located in sub-Saharan Africa (The Millennium Development Goals Report 2014).

Numerous projects and initiatives have been launched throughout the history of development aid while following different approaches to overcome the severe conditions the poor have to face. Despite tremendous efforts being made for almost six decades, development aid as such has recurrently been criticised for a huge number of failures. While regarding unsuccessful past attempts, Easterly (20) claims that a large number of these failures have been caused by disregarding local conditions from the outset. Animated by large "master-plans" on how to overcome the problems of the poor, the larger context in which the aid projects would be applied has not been understood (cf. Munz 194-203). Easterly accordingly differentiates between *planners* and *searchers* to characterise two different attitudes of how to conduct development aid (11-43). Accordingly, he blames past failures on *planners* who proved to be incapable of acknowledging the actual needs of the poor while imposing on them their help. On the other side, he attributes the *searchers* with the willingness to understand the existing correlations in the field in which he is about to engage and, therefore, identifies problems and possibilities which puts him in the position to elaborate conceived measures to be applied.

Following the same vein celebrated MIT-Researchers Otto Scharmer (38-47) profoundly affected organisational learning by refining the concept of the *searcher* while advising leaders to move away from applying solutions from outside the actual problem, to instead join forces with the affected individuals while going as far as to create a shared inner awareness of the problem subsequently to be solved in an encompassing way.

Accompanying the Swiss NGO *Velafrica* (formerly known as *Bicycle for Africa*) in its attempt to improve the lives of people in Africa through the distribution of second-hand bicycles, the present study tries to provide the necessary understanding of the living conditions in the rural areas of sub-Saharan Burkina Faso and the impact of the bicycle within the local environment. Basing its finding on data gathered in the field, the study attempts not only to overcome the lack of accurate awareness of the local environment often missed, but also to provide *Velafrica* with the additional chance to raise the understanding of the impact being achieved by its engagement.

1.1. The role of enhanced mobility in developing countries

As the lack of infrastructure and services is a predominant problem in many developing countries, access becomes a pivotal issue. Especially among the poorest of the poor, the lack of mobility and transport capability is of particular concern leaving those people most often forced "just simply to walk" (Heierli 3).

Mobility for the poor – especially in the rural areas – is a topic which for itself deserves to be acknowledged. First, due to the large amount of people being affected by the lack of access throughout the world and second, because of the severe personal consequences and restrictions following from the lack of mobility and transport capacity for each affected individual.

It is therefore not much of a surprise to find Navarro, Heierli and Beck (3) describing the existence of what they call an "informal transport system" being predominant in developing countries encompassing the movement of the poor who are forced to rely on any form of *non-motorised transport* (NMT) including walking. However, the outlined "informal transport system" is being widely neglected by any official planning as it lies far away from the "formal transport system" being maintained by the state.

Nevertheless, the attention upon NMT increased – especially for developing countries' rural areas – as mobility and transportation became regarded as a mean of development. Räber (14-15) is able to show development policies moving away from the promotion of motorisation towards the attempt to first identify the actual mobility needs of households particularly in rural locations. This change in perspective resulted in the recognition and the

high estimation of the bicycle as a driver for improvement, especially in the rural areas of sub-Saharan Africa.

It is on this ground that the Swiss NGO *Velafrica* has been engaged making a contribution providing Swiss second-hand bicycles of high quality to the countries of Ghana, Gambia, Eritrea, Madagaskar, Tansania and Burkina Faso in order to support the local population. Having said so, it is the task of this study to provide the necessary understanding of the bicycle's impact in rural Burkina Faso and by doing so to describe the contribution achieved by *Velafrica's* engagement.

1.2. Research Question

The present study surveys the environment and the living conditions of the population of the rural areas in Burkina Faso while thereby especially focusing on the use of the bicycle in the daily conduct of life.

While doing so, the study tries to provide a broad understanding of the impact of the bicycle in daily life of the people surveyed as well as the importance of its availability for the living conditions of its users.

It is thereby the aim of this study to emphasise the importance of the bicycle's contribution to the attempt of the people in rural Burkina Faso to improve their living conditions while trying to overcome their poverty.

1.3. Applied Methods

While examining the impact and the importance of the bicycle upon the population in rural Burkina Faso, qualitative as well as quantitative methods have been applied. The qualitative approach has been used to create an understanding of the living conditions and to provide the foundations for following quantitative measures. Subsequently, quantitative methods have been applied to underline the qualitative findings while broadening the understanding of the extent in which the bicycle affects the life of the people surveyed.

The qualitative methods applied resulted in the use of open interviews conducted with the intent of leaving the structuring effort to the research field while trying to discover values and priorities prevalent in the area surveyed. The analysis of the qualitative data resulted in the extensive methodological attempt of interpreting the given statements while reconstructing the prevailing environment and its determining conditions. The research process has thereby been guided by the hermeneutic approach.

The quantitative approach resulted in the collection of large amount of data sets which have been gathered at a number of sites of public interest. The evaluation of the quantitative data has been based on a number of *empirical* and *positive methods* whereby the choice of the respective method has been determined by the nature of the data examined.

1.4. The thesis structure

In order to develop an understanding of how the bicycle affects the situation of the rural population in Burkina Faso, this study will proceed in the following way. Chapter 2 will first describe the different qualitative and quantitative research methods applied within the different stages of the present study. Chapter 3 will outline the conceptual framework containing the S*ustainable Livelihood Approach (SLA)* and the notion of the *Rural Transport System*. By doing so, the chapter provides the theoretical context needed to associate the findings of the survey. Chapter 4 provides the background information of the living conditions predominant in rural Burkina Faso which are necessary to understand when looking at the findings of the survey being presented in Chapter 5. The findings are divided into the numerous subtopics describing the different activities within which the bicycle has been found to be used. Chapter 6 looks at the findings by first regarding the impacts of the advantages resulting from the use of the bicycle and secondly consider the bicycle's contribution within poverty alleviation from the perspective of the Sustainable Livelihood Approach. Chapter 7 finalises the study by concluding the findings of the survey.

2. Methods

In order to examine the impact of the bicycle in the rural areas of Burkina Faso it has been decided to apply both qualitative and quantitative methods throughout the research process. The aim has been to use quantitative interviews in a first step – while thereby widely following the methods outlined by Froschauer and Lueger (2003) and described by Peier (22-29) in its application in the field – in order to provide an inclusive understanding of people's living condition and to comprehend how the bicycle means to make a difference in their lives. In a second phase, quantitative measures were applied specifically to illustrate and to underline the findings resulting from the interviews. The purpose has thereby been to create an understanding of the extent of the impact generated by the availability of bicycles.

2.1. Data collection

The findings presented in this study are based on empirical data gathered in several locations in Burkina Faso during the time period between November 2013 and January 2014. During this process 59 interviews were conducted namely in the surroundings of *Saganako* in the province of *Les Cascades*, in and around *Douroula* in the province *Boucle du Mouhoun* and in the region of *Sapaga* in the province of *Centre-Est*. The sites have been chosen primarily to allow the researcher to establish a profound access to the environment. While doing so, it has been decisive to involve individuals and institutions that have the capability to function as entry points to the local community. Secondly, the choice of the different locations has been tried to be broadly selected in order to obtain a balanced insight for the living conditions within the whole rural area of the country.

Picture 1: Geographical overview of the three areas (*Saganako*, *Douroula* and *Sapaga*) surveyed (Image: Google).

2.1.1. Qualitative approach

Following the qualitative social research methods upheld by Froschauer and Lueger (2003), the interviews have been conducted in an open and informal manner. The main focus has been the question of how the bicycle has affected the living conditions of the interviewee. The interviews have been recorded in order to maintain the given information in a precise manner.

The decision to conduct the survey by choosing informal interviews has been taken out of the conviction to avoid narrowing the examination of the research topic by a closer interview approach, possibly affected by the sociocultural imprint of the outside observer while regarding the researched environment (Froschauer and Lueger 185, 216). In order to overcome the limitation of a cultural bias it has been attempted to hand over the task of structuralising and weighting the examined topic as much as possible to the research field (61), while searching to grasp the issues being regarded as significant within the surveyed society. In order to do so, the interview partners have been given the maximum amount of freedom to express themselves while being regarded as experts in their own field (*field-*

internal behavioural experts). The researcher, on the contrary, has explicitly been taking up the role of student throughout the whole survey (Froschauer and Lueger 52, 59; cf. Peier 22). The aim of the qualitative interview has been to reveal what the interviewee regards to be of importance from his or her own perspective. This approach was followed early on in the research process to attempt to facilitate insight through a local worldview (Froschauer and Lueger 16) while avoiding any premature conclusions which would have affected the understanding necessary to comprehend the surveyed life world.

To ensure the quality of the gathered data, the interviews have been held while maintaining an active awareness of the inability to understand any deeper meaning of a social interaction without an extensive examination of the circumstances (cf. Peier 22). Furthermore, the findings in the field have been steadily discussed with the people engaged in the translation of the interviews. Nevertheless, it has to be stressed that the mere fact of being obliged to work through a translator while conducting the interviews has restricted the depth of the information gathered. As such, the following analysis had to rely on rough translations or on summaries of the given answers.

2.1.2. Quantitative approach

The kind of quantitative data being gathered has been chosen based on the first conclusions of the qualitative findings resulting from the survey phase in the field. As such, it was attempted to proceed from a broader understanding of the prevailing living conditions while starting to plan the collection of a larger amount of statistical data (cf. Acton et al. 2). Following the emerging understanding of the circumstances in the field, an attempt was made to designate adequate locations to gather a larger amount of quantitative data. Therefore, it has been tried to identify sites which on the one hand are highly frequented due to their importance in the daily life of the people surveyed, while on the other hand would allow gathering the required amount of data in an adequate amount of time. Following the evaluation, a number of 13 places emerged including; market places, schools, mills, hospitals or social gatherings offering the possibility to collect a total of 999 datasets measuring the impact of the bicycle at a variety of occasions in daily life.

It remains, however, to be emphasised that the gathering of quantitative data offering the possibility to measure the positive impact of a bicycle proved to be challenging. On the one

hand, the local population relies on the use of different measurement systems such as tins, boxes or bags to measure quantities transported which proved to be rather inconvenient to compare to the metric system. On the other hand, time and distances use to be conceived differently within the local culture, due to the given circumstances in their lives. Accordingly, the concepts of time and distance are not valuated in the same way within rural Burkina Faso as they are for example the Western Europe. Aims, such as gaining a modest amount of money to meet the most basic requirements, have often been considered to be more important than the amount of time required or the distances overcome to do so.

As a result, an attempt of gathering as much data as possible in categories which are familiar to the local population and would allow them to provide accurate figures, such as the amount of income or their production measured in units they were familiar with, was made. Wherever possible, it has been tried to double check the information given on a number of different occasions while trying to ensure the accuracy of the information given or to verify information with own means available.

2.2. Preparing Data

In order to analyse the qualitative data, all the interviews recorded have been transcribed and made accessible through the analysis program MAXQDA. While preparing all the information for an extensive analysis, the different segments of all the interviews have been split and catalogued before and after every round of the analysing process in accordance with the topic they touch upon (cf. Froschauer and Lueger 86, 95). In addition, further quantitative information collected within the interviews have been sorted out and made available for separate quantitative analysis.

By transcribing all the interviews it has been intended to meet a number of prerequisites necessary to fulfil while securing the quality of the results of the qualitative research. First and foremost it has been regarded crucial to provide the entire information possibly available since the research process – while being guided by the hermeneutic approach (192) – is likely to bring up a large amount of unpredictable questions leading into all directions not yet predictable at the begin of the analysis. Second, the full transcript has been regarded to be important due to the possible threat of losing important data. This is particularly important since it has not been foreseen to have the usually recommended personnel

separation between the process of data gathering and the subsequent analysis in this study, which could lead to the prioritisation of some data over the other by a possible prejudice of the researcher (cf. Froschauer and Lueger 167-168; Jäger and Reinecke 58-59). Therefore, the availability of all the interviews conducted is to ensure that none of the data has been neglected due to a possible prejudice of the author (cf. Peier 24). As such, it has been ensured that all the information gathered has been made accessible within the research process while trying to avoid the results of the survey being misled due to missing data.

The quantitative data gathered either by questionnaires or as an additional by-product of the interviews have been digitised in its raw form (cf. Acton at al. 29) and as such been made available for examination by the methods provided by the statistical program SPSS. While doing so, much emphasis has been put into establishment of the capability to distinguish the datasets according to a variety of characteristics of every individual case. An attempt was made to ensure that the statistical results would be based on the most accurate data with respect to every issue examined.

2.3. Analysis

The conduct of the qualitative research has been characterised by the underlying hermeneutic approach which led to an ongoing development of the actual research focus in accordance with the current degree of comprehension reached about the research field (cf. Froschauer and Lueger 192; Peier 24). While advancing the analysis in accordance with the emerging findings, no specific focus – other than the impact of the bicycle – has been determined at the beginning (cf. Froschauer and Lueger 216). While proceeding in this way it has been intended not to exclude any of the different ways of how the bicycle affects the conditions of the rural population.

In order to create a first broad comprehension about the role of the bicycle within the surveyed area, the entire qualitative data has been examined by using the procedure of *Invivo Coding* (cf. Jäger and Reinecke 58-59; Baumgarth and Koch 147). While doing so, all the statements given within the survey have been amalgamated into a “collective awareness” directed towards the answering of the first number of questions (*codes*) defined to be fundamental while trying to understand the impact of the bicycle.

The questions first being analysed while using the Invivo Coding were:

a) How has the bicycle been used to improve the living environment?
b) How does the bicycle change the possibilities of the population?
c) How do the new possibilities change the living conditions of the population?
d) Which meaning does the bicycle have for the population?
e) To what extent is the bicycle the right means to accomplish daily tasks?

As such, it has been possible to create a starting point providing a first general awareness about the use and the advantages of the bicycle in rural Burkina Faso.

This first overview revealed several areas of application for the bicycle (such as going to the field or the market, etc.) which were to be examined more closely. In order to do so, all the statements being made about each of these activities have been sifted through and selected in accordance to their weighting to be analysed more closely by applying Froschauer and Lueger's *System Analysis* (142-158). By doing so, the aim has been to examine the situation of a household before and after the presence of a bicycle. At the same time, it has been attempted to find differences between households and regions surveyed in order to check the validity of the results and to further discover preconditions leading to specific circumstances.

In a next step the quantitative data has been used to prove and highlight the results gained by the qualitative analysis. By first conducting the qualitative analysis an effort was made to make sure that the quantitative data would be properly understood and regarded in the appropriate way (cf. Acton at al. 2). In order to examine the quantitative data, the program SPSS has been used to apply a variety of statistical methods in accordance to the nature of the data collected.

Having analysed the impact of the bicycle on single activities, it was further attempted to learn about the effect of the bicycle within the superordinate level of the household. In order to do so, two additional aspects were looked at. On the one side, an attempt at understanding how the different activities affect each other once members of a household are able to take advantage of the bicycle was made. On the other side, it was analysed how the bicycle affects the overall condition and development of a household. In order to do so, specific households have been selected in accordance to their development status for closer examination by again using the *System Analysis*-Method.

2.3.1. Selection of the qualitative analysis tools

While deciding upon the analytical tools, the nature of the data, the necessary depth of the analysis, as well as the kind of intended results have been taken into consideration. The following of a qualitative approach involves the application of adequate analytical methods capable not only of handling the extensive amount of data available (Froschauer and Lueger 52), but also capable of overcoming the subjectivity of the answers given in the interviews (cf. 107-108).

While basing on the principles of *constructivism,* the *System Analysis* method introduced by Froschauer and Lueger (142-157) reaches the necessary level of abstraction by deducing the objective meaning of the given statements as hypothetical construction (11). As such, the *System Analysis* provides the necessary means to open up the intersubjective reality created within the surveyed society. By doing so, the analysis provides the possibility to derive the individual acting motivation from the perceived living environment (Froschauer and Lueger 183; cf. Berger and Luckmann 36-48; Peier 26-27).

While the System Analysis allows a deeper understanding of the behavioural motivation, the additionally applied *Invivo Coding* tries to create awareness about the overarching collective consciousness while seeking to find and to understand coherence and significance within the highly aggregated amalgam of all the different aspects brought up while describing the living environment (Jäger und Reineke 58; Baumgarth and Koch 135-136). By first using the *Invivo Coding* it has been attempted to approach the research field in a more comprehensive way in order to identify all the aspects to be regarded in more detail later on. Therefore, using both approaches offers the chance to regard the research field upon different levels.

2.3.2. Selection of qualitative analysis tools

By intending to illustrate the qualitative results, a large number of quantitative data has been gathered throughout the survey. In order to be able to generate findings, a variety of statistical methods provided by the analytical program SPSS have been applied. While doing so, use has been made of *empirical* as well as *positivist* methods (cf. Acton and al. 2-5) in order to either visualise the data or to calculate the probability of correlations assumed. The

decision upon the use of the methods – as shown in the table below – has largely depended upon the given *level of measurement* of the *variables* recording the data gathered in the field.

Independent Variable	Dependent variable: Level of measurements	Dependent variable: Scale
	Nominal	*ANOVA,* *T-Test,* *Box Plot,* *Histogram*
	Scale	*Scattergram,* *Pearson's Product Moment Correlation Coefficient (Bi-variat correlation),* *Linear Regression,* *paired-sample T-Test*

Table 1: Statistical methods and formats applied within the study according to the *levels of measurements* of the independent and dependent variables resulting from the survey (cf. Caramani 4; Acton et al.).

3. Conceptual Framework

The following chapter gives an overview of the concepts which provide the survey with a theoretical framework. By doing so, the intent is to give an understanding of how the detailed impact of the bicycle can be regarded and classified in the broader context of development aid and poverty alleviation. As a result, the chapter will focus on the *Sustainable Livelihood Approach* (*SLA*) and give an understanding of Rural Transport Systems.

3.1. Sustainable Livelihood Approach

As a result of the difficulties faced while trying to overcome poverty, the *Sustainable Livelihood Approach* (*SLA*) has been developed in an attempt to have a broader and more comprehensive understanding of the prevailing living conditions of those who were to be supported with development aid (cf. Kranz 1). It has been the aim to be able to adapt the aid provided in the best possible way to the prevailing circumstances and capabilities. This follows in particular the recognition that the poor themselves "often know their situation and needs best and must therefore be involved in the design of policies and project intended to better their lot" (2). In order to do so, several theoretical frameworks have been developed based on the concept of livelihood.

3.1.1. Livelihood

Chambers and Conway (5-6) have been leading in describing the concept of livelihood first and foremost as "a means of gaining a living" based on the availability of assets and capability as well as on the opportunity to apply them on self-maintaining activities.

According to their definition a livelihood as such can be regarded to be sustainable once it "can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation" (6).

Capability as such is regarded by Chambers and Conway (4) as the ability to make use of opportunities to improve the own livelihood condition as well as being able to deal with shocks and stresses that affect the own circumstances.

Assets are described by them (8) as all the means available to "construct and contrive a living". As such, assets are divided into: stores (food, stocks, savings etc.), resources (land, trees, livestock, etc.), claims (demands and appeals for support or access) and access (access to services and information based on the use of transportation, school, health, markets, etc.).

It is not uncommon for people to be born into a specific environment which already determines the way in which they will make their future living. However, people widely adapt their livelihood strategy either by having the chances to improve the own conditions or as a result of desperation which forces them to adapt to a worsening environment.

3.1.2. Sustainable Livelihood Framework

Amongst a number of frameworks building on the livelihood concept (cf. FAO, Livelihoods approaches compared) the *Sustainable Livelihood Framework* (*SLF*) brought up by the British Department for International Development (DFID) is regarded as "one of the most widely used livelihoods frameworks in development practice" (GLOPP 1).

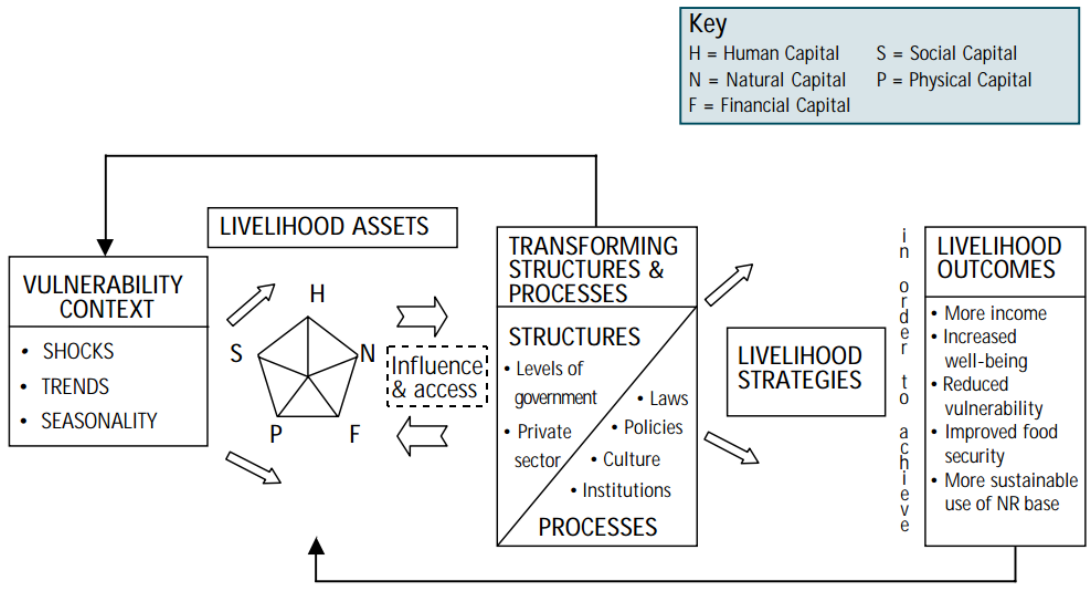


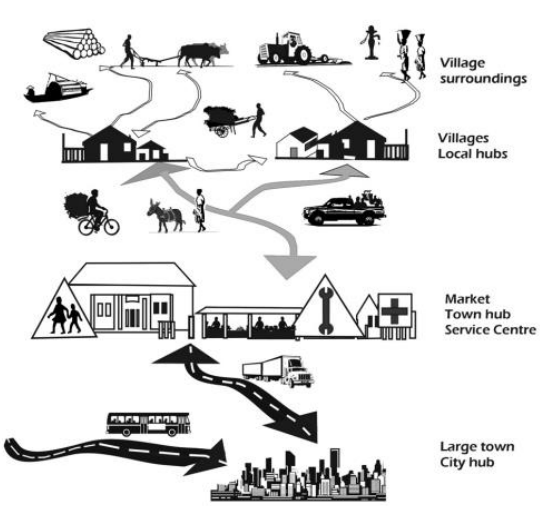
Figure 1: The *Sustainable Livelihood Framework* (*SLF*) developed by the British Department for International Development (DFID, Section 2 1).

By introducing its Framework DFID – as well as a large number of other Organisations (cf. FAO, Livelihoods approaches compared) – focuses first and foremost on the individual's assets (Section 2 5) which in this case are divided into five categories (human-, natural-, financial-, social- and physical capital) portrayed as a pentagram. The form and size of the pentagram indicates a person's accessibility to a variety of assets used to develop a livelihood strategy while trying to uphold a living in a given environment. As a result, the SLF not only helps to provide aid in accordance with the identified assets but also to monitor the development of the assets available (Section 1 5) and how they are being used to improve the livelihood outcome.

The advantage of applying the SLF lies in focussing primarily on the assets available before developing any development aid strategy. Being aware of the people's assets as well as of the conditions they are facing provides the necessary prerequisites to develop an adjusted aid strategy as promoted by Easterly (s. Introduction).

3.2. Rural transport systems

Rural transport systems can be described to consist of the required infrastructure (paths, roads, bridges etc.) and the means of transport available (Starkey et al. 9). Other than transport systems within or between larger urban areas, rural transport systems have a distinct character due to the specific requirements prevailing from engagement in agriculture, fishery, forestry and livelihood production. In addition, the population in the rural areas will focus in particular upon their regional marketplaces which therefore become a focal point for rural trade. Villages functioning as marketplaces will develop into "local transport hubs" and, as a result thereof, often be used to allocate services for the population in the surrounding area (cf. Starkey, Rapid Assessment 12).



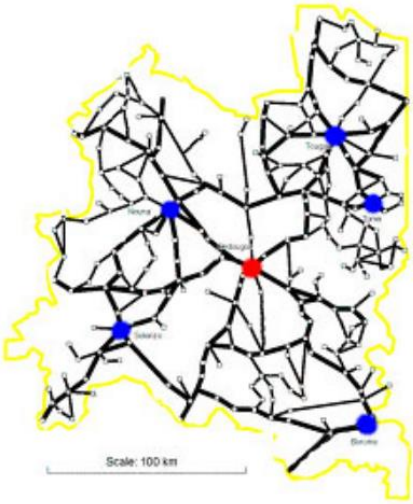


Figure 2 (left): National transport system with a hierarchy of hubs (Starkey, Rapid Assessment 11).

Figure 3 (right): Schematic map of the road system in the *Boucle du Mouhoun* region showing the regional hubs (Starkey, Rapid Assessment 13).

As a result of the centralised allocation and concentration of marketplaces, schools for primary and secondary education, social activities, health services or public administrations, rural transport becomes structured in a hub system in which smaller villages will be connected to the next larger town (or hub). The catchment area of hubs will depend upon the amount of "supplies, services, facilities, and opportunities" provided to the surrounding villages (Starkey, Rapid Assessment 17; Starkey et al. 9).

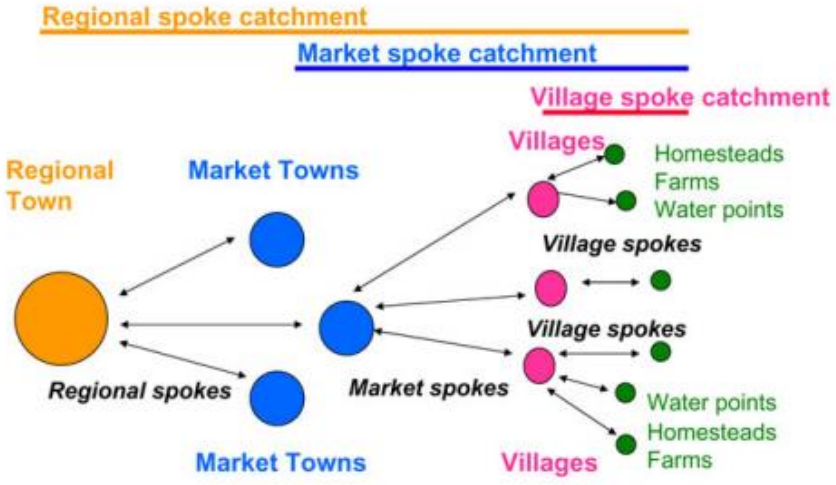


Figure 4: Conceptual model of a segment from a regional transport hub system (Starkey, Rapid Assessment 13).

3.2.1. Means of Transport

People living in the rural areas of developing countries might have different means of transport available spanning from walking to the use of busses or trucks. In between lays the possibility to rely on what is referred to as *Intermediate Means of Transport* (IMT) including animal carts, wheelbarrows or bicycles (Starkey et al. 9). The use of one of the different means of transport is dependent upon a number of factors such as the prevailing infrastructure, the purpose of travel, the means available, cultural restrictions, gender or age (cf. Räber 18). The availability of transportation is pivotal in overcoming a number of limitations. Räber (19) divides those restrictions up into four levels including spatial restriction referring to the inability to reach a place; temporal restriction which hampers the possibility to reach a place in time; financial restriction which results in the inability to reach a place; and personal restriction meaning the personal inability to use a specific means of transport. According to the nature of the outlined restrictions it becomes evident that mobility as such is not an end in itself but an important factor in order to implement further objectives.

4. Description Environment

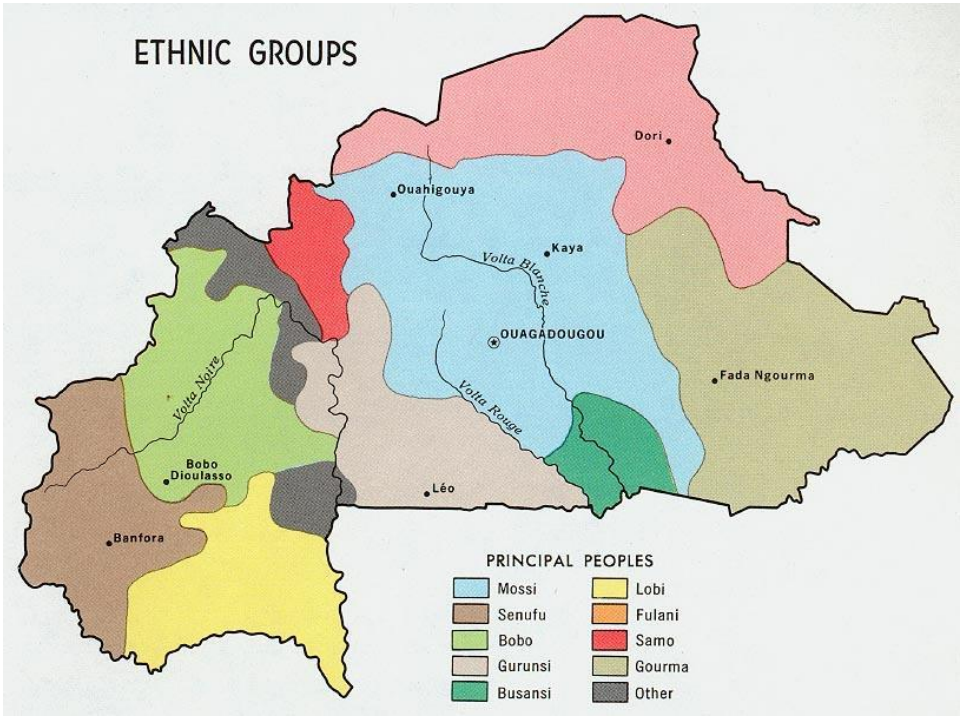
4.1. Country

Burkina Faso is located in western Africa that is landlocked and surrounded by its neighbouring countries Mali, Niger, Benin, Togo, Ghana and Cote d'Ivoire. The country, formerly known as the Republic of Upper Volta, gained its independence from France in 1960. In 1984, the country was renamed to "Burkina Faso" which can be translated as "Land of the upright People".

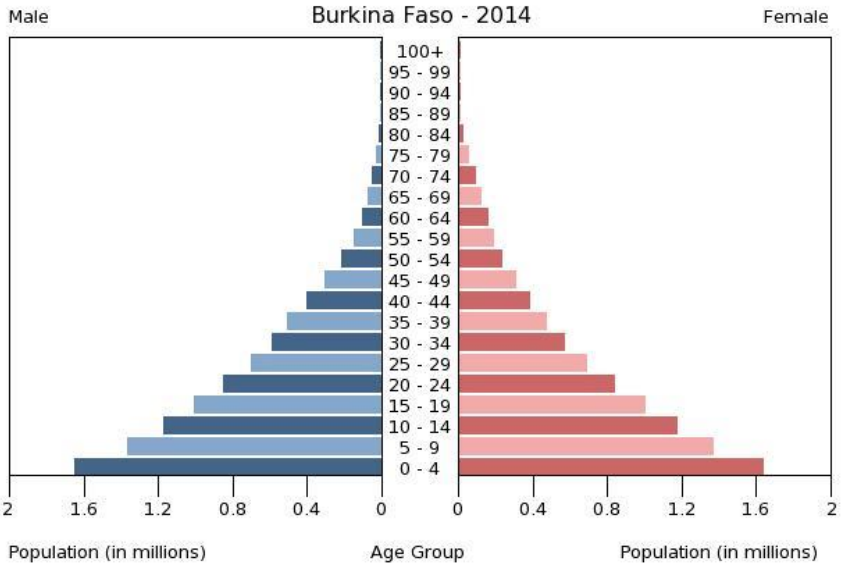
The total population of the country is 18 million (CIA) which consists of approximately 60 different ethnic groups (Fahrenhorst 338) whereby the Mossi, making up over 40% of the population, is the largest amongst them. The population is divided into several religious groups with Islam (60.5%), Christianity (23.2%) and Animism (15.3%) being the largest among them (CONFEMEN 17). As much as 73% of the population live in the rural areas, mostly in small villages. The country shows an age demographic which can be described as being typical for developing countries showing as much as 45.4% of the people under the age of 15 while having an overall life expectancy of approximately 55 years (CIA).

Size of Village measured by inhabitants	Number of Villages	Resident population	Percentage of the Population
Less than 200	585	76 281	0.5%
200 to 500	1 563	543 021	3.9%
500 to 1 000	2 373	1 758 842	12.5%
From 1 000 to 2 000	2 369	3 341 215	23.8%
From 2 000 to 5 000	1464	4 329 291	30.9%
5 000 and more	324	3 968 612	28.3%
Total	8 678	14 017 262	100%

Table 2: Number of villages in Burkina Faso according to their size (GOBF INSD, Population).



Picture 2: Burkina Faso, including the distribution of their ethnic groups (University of Texas Libraries).



Picture 3: Age distribution in Burkina Faso (CIA).

Being amongst the group of *least developed Countries (LDC),* Burkina Faso is one of the poorest countries in the world (UN OHRLLS) listed as 181 out of 187 countries measured by the UNDP's Human Development Index in 2014. As much as 90% of the population is engaged in the agricultural sector and mainly live from subsistence. While Burkina Faso's

GDP per capita was 1 500 USD in 2013 (CIA, Economy Overview), the World Bank (Poverty headcount ration) estimated that as much as 72.4% of the population lived with less than 2 USD a day in 2013. As a result, Burkina Faso is one of the main recipients of development aid, receiving 1 196 billion USD from the international community (OECD, Development aid at a glance 8).

4.2. Living environment

The population in the surveyed region lives in village communities where the inhabitants live in two "general types of residence patterns" (West 275). On the one hand, there are extended families which live in large compounds "composed of several courtyards" (cf. Waibel 46; von Moos 18-19). On the other hand, there are nuclear families that live amongst themselves in a smaller "independent household". Both kinds of residence forms have been encountered throughout the surveyed regions.

The term "household" in the rural areas of Burkina Faso has been described by West (219) as being a "genealogical structure" and, also can be characterised by "their socioeconomic function". By doing so, she considers a household consisting of one or several nuclear families while functionally defining it as "a unit of consumption, production, and reproduction".

Following the genealogical perspective, a household is described as being led by a head of family which is most often also its oldest male member (cf. Ayad, Barrère and Otto 13-27; West 279). Other nuclear families forming part of the household belong to the sons or brothers of the family head. Women, on the contrary, settle at their husbands living place once married. Polygamy is allowed in Burkina Faso (GOBF MJ Art. 232; Waibel 44) and depends on the local religious understanding and general customs. As such, it is common to have up to four wives in the region of *Saganako*, while men around *Douroula* and *Sapaga* tend to have only one wife.

Picture 4: Mossi household in the Area of *Saganako*, *Les Cascades*.

With regards to its socioeconomic functioning, a household can be described to work collectively in order to maintain its members while cultivating a larger field (West 279). Being numerous helps to organise and fulfil the pending tasks on the everyday life with fewer difficulties and offers the capacity of intensifying agricultural work more easily (West 281)[1].

However, when it comes to income generating activities, the member within a household will – according to own observations – rather be working for themselves. Since husbands and wives face different responsibilities which the society expects them to fulfil, men and women will try to acquire the necessary funds to do so by themselves (cf. Thorsen 141-143).

Province	Average Household Size
Boucle du Mouhoun	8
Les Cascades	8
Region de l'Est	7

Table 3: Average household size in provinces *Boucle du Mouhoun*, *Les Cascades* and *Region de l'Est* (AGRA 35).

[1] People in *Saganako* give the example of the woman who has been pushing her husband to marry another woman in order to share the burden of work amongst more people.

4.3. Income and self-subsistence

4.3.1. Subsistence Agriculture

Burkinans living in the rural areas generally sustain their family from their agricultural subsistence activity, which provides them with the necessary foodstuff such as sorghum, millet, maize or beans amongst others. In order to do so, every household cultivates its own field as productively as possible in order produce sufficient stocks of food. It is common, that all the members of a household are engaged in the fieldwork on a daily basis to produce the necessary amount of crop needed. While doing so, the family will store its harvest in the granaries attached to their yard (cf. Thorsen 139-141).

It is crucial to highlight that the farmland usually lies at a distance of several kilometres from the household (Waibel 68), which forces people to overcome large distances while conducting their fieldwork. In covering these distances, it is often required to transport numerous goods and items (Sieber 208), such as work tools, seed, fertilizer, the harvest or the amount of water and food required during the working day. Often women carry their little children with them, since they cannot leave them at home[2]. Not being able to rely on bicycles, members of a household have to either walk or, if available, rely on a donkey cart – in order to reach the field and transporting goods.

Province	Average Land Size (ha)		
	Mean	Lower Bound	Upper Bound
Boucle du Mouhoun	5.58	5.6	5.8
Les Cascades	6.14	6.1	6.5
Region de l'Est	4.47	4.5	4.8

Table 4: Average land size ownership in the province of Boucle du *Mouhoun*, *Les Cascades* and *Region de l'Est* (AGRA 41).

[2] 59.4% of women working outside their house take their children under the age of five years with them (Kishor and Neitzel 57).

	Boucle du Mouhoun			Les Cascades			Region de l'Est		
Staples	Av. land size (ha)	Total Production (kg)	Yield per Hectare (kg/ha)	Av. land size (ha)	Total Production (kg)	Yield per Hectare (kg/ha)	Av. land size (ha)	Total Production (kg)	Yield per Hectare (kg/ha)
Maize	1.09	47 339	43 430.3	1.49	11 610	7 791.9	1.02	18 652	18 286.3
Beans	0.77	7 300	9 480.5	0.37	2 342	6 329.7	1.87	1 800	962.6
Sorghum	1.47	126 793	86 253.7	1.1	4 365	3 968.2	1.4	15 630	11 164.3
Millet	1.39	119 584	86 031.7	1.11	6 230	5 612.6	1.12	9 067	8 095.5
Cowpeas	0.76	18 699	24 603.9	-	-	-	089	2 250	2 528.1
G-Nuts	0.7	17 477	24 967.1	0.95	3 851	4 053.7	0.93	2 898	3 116.1
Sesame	0.91	15 000	16 483.5	0.33	370	1 121.2	0.78	2 180	2 794.9
Rice	0.57	4 877	8 556.1	0.74	3 450	4 662.2	0.73	1 260	1 726
Cashew nuts	-	-	-	1.86	1 180	634.4	-	-	-
Sweet Potatoes	-	-	-	-	-	-	2	3 000	1 500

Table 5: Agricultural Productivity in the province of Boucle du *Mouhoun*, *Les Cascades* and *Region de l'Est* (AGRA 68-69).

4.3.2. Money Income Activities

Although being largely self-sustainable when it comes to maintaining the own food security, the necessity remains for every family in the rural areas to generate a financial income in order to cope with a large number of requirements for goods and services, such as medical treatment or the payment of school fees. Accordingly, it has been possible to observe a number of different income activities within the surveyed areas.

4.3.3. Income activities related to farming

The most obvious and widespread possibility to obtain financial means consists of the selling of agricultural products at the local market. The easiest way of doing so is by selling a certain amount of the proper food stock stored in the own granaries. People in the surveyed regions usually proceeded in this way once they aimed to make a bigger acquisition or if they needed a larger amount of money due to an emergency. However, people have not been found to be selling their food stock just for the sake of having money available, especially

since they depend on having sufficient food stocked to nourish their own household until the next harvest.

On a more advanced level, people would start to cultivate additional crops specifically dedicated to be sold. Once they would be able to produce a certain amount of additional crops, they would start to visit the market on a regular basis in order to achieve frequent income.

Marketed produce	Boucle du Mouhoun	Les Cascades	Region de l'Est
Maize	109.38 kg	131.97 kg	171.3 kg
Beans	13.97 kg	69.83 kg	21.3 kg
Sorghum	130.42 kg	16.83 kg	14.28 kg
Millet	1 812.6 kg	39.52 kg	36.35 kg
Rice	4.47 kg	16.85 kg	8.65 kg
G. Nuts	27.78 kg	207.81 kg	67.4 kg
Sweet potatoes	6.98 kg	41.13 kg	9.62 kg
Sesame	159.5 kg	77.04 kg	31.92 kg
Cassava	-	17.74 kg	-
Total	2 265.1 kg	618.72 kg	360.82 kg

Table 6: Volumes of Staples sold in the province of Boucle du *Mouhoun*, *Les Cascades* and *Region de l'Est* over the last 12 months (AGRA 81-82).

4.3.4. Non-farming income activities

Until the early 1980s, it has been widely understood that people living in rural Africa were mainly and foremost engaged in farming and, therefore, undertook only little off-farm activities (Reardon 735). Starting in the late 1970s studies however showed that people in rural areas are not only engaged in agricultural self-subsistence but also widely self-employed in all kind of small enterprises. Most of them even uphold several nonfarm activities simultaneously (Waibel 58, 64ff; Reardon 738).

Quite significantly, Reardon, Delgado and Matlon (267) explicitly proved the necessity of households to mitigate the risk posed by shortfalls in cropping by diverting their income by turning to non-farming activities. In effect, it could be proven that it has been largely due to a diverse range of non-farm activity that most of the households in Burkina Faso could cope with the drought shock in the mid-1980s (Barrett et al. 322). However, Reardon, Delgado and Matlon (291) highlight that non-farm activity would not substitute "cash cropping", but would rather have to be seen as complementary to farming for the rural population.

While being engaged in the non-farming work field, people draw on a large variety of income generating activities. People possessing a specific ability would engage in smaller artisanal handicraft which would provide them with an additional income. During the survey workers were encountered that were active in the trades of spinning threads, colorizing leather, sewing cloths, the production of calligraphy artwork and the repair bicycles amongst others. People owning a bicycle would, however, not only engage in the agricultural or artisanal productivity, but furthermore try to use the possibility to engage in trade which requires the ability to overcome large distances while acquiring goods to be sold at the local markets[3].

Farmers disposing of the larger amounts of funds are, moreover, in the position to engage in the cotton production. While having to overcome a substantial hurdle to start producing cotton (cf. Ingram et al. 345), the revenues achieved are considerably high as well. However, farmers surveyed in this study widely expressed their inability to engage in the cotton production since they either did not possess the amount of money needed or were not in the position to obtain any loan in order to start cotton production.

When it comes to income generating activities, labour migration plays a crucial role within Burkina Faso. Not having sufficient labour demand within the own country, people have been known to migrate in large numbers. It is assumed that 20% of the Burkinans live abroad whereby two third of them have migrated to neighbouring Cote d'Ivoire (Brücker and Gemenne 39; cf. Riester). In accordance with these numbers, migration has proven to be of specific importance for people surveyed in this field study. Especially young men have been found to migrate while trying to find a substantial income for themselves and their families which remain at home (cf. Wouterse and Taylor 625).

While expanding the variety of their activities, people in rural Burkina Faso increase the ability of gaining revenues (cf. Reardon, Delgado and Malton 291) which they intend to use in order to save or invest. While doing so, people in the surveyed areas have their money invested by keeping an animal livestock that could possibly consist of chickens, goats, donkeys and cows. Investing into animals has not only the advantage of maintaining the value of the funds invested, but offers the chance to gain additional profits resulting from the breeding of animals.

[3] West, Roncoli and Ouattara (295) prove that a closer access to roads and markets increases the engagement in trade while villages facing "relative isolation" are limited in their opportunities for off-farm income.

When looking at non-agricultural income it remains important to also highlight the existence of a large number of people excluded from those kinds of activities. Reardon (737) and Barrett et al. (325) emphasised having found serious "entry barriers" for poorer households to start non-farming activities and that the lesser privileged part of the population would therefore have to largely depend on farming income[4]. In accordance with Reardon, Delgado and Matlon's previously described findings (291) it has to be assumed that the income possibilities amongst those households will have to remain limited due to the lack of varying income possibilities.

Source of household annual Income USD	Boucle du Mouhoun	Les Cascades	Region de l'Est
Crop production	3 320	6 043	212
Off-farm activities	656	521	249
Fresh Cow milk	258	229	263
Income from other Livestock	117	66	578
Mean annual Income (USD)	1 091	1 718	328

Table 7: Sources of income in the province of *Boucle du Mouhoun*, *Les Cascades* and *Region de l'Est* (AGRA 45).

4.4. Infrastructure

The infrastructure in rural Burkina Faso has to be described as being in poor condition. Facilities, such as market places, schools or hospitals, might not be available in smaller villages. Instead larger villages function as hubs while providing services to all its surrounding settlements. As a result, people are forced to overcome large distances while trying to obtain any kind of services provided in more populated areas. The upcoming section aims to give an overview of the infrastructural situation.

[4] Similar findings have been made by Dercon and Krishnan (869), Dercon (32), Carter and May (16) and Barrett et al. (Heterogeneous Constraints, Incentives and Income Diversification Strategies in Rural Africa 7).

4.4.1. Street Conditions and access to markets

Street conditions cause a particular problem throughout rural Africa. Accordingly, the FAO claims that it is problematic for a large proportion of people to reach their nearest market (Msusa). In the case of Burkina Faso the World Bank (Africa Infrastructure Country Diagnostic 14) concludes that only 25% of the rural population lives within two kilometres of an all-season road. In addition, people might not necessarily tend to follow the main roads delineated on the map in order to reach their destination, but would rather follow their mental maps consisting of 'invisible' paths through the bushes. This is especially the case with markets which do not necessarily have to be located in larger towns but can take place in smaller villages "not obvious from the regional road map" (Starkey, Rural transport services 28). Accordingly, Debat (67) highlights that in 2011 only 6% of the markets in the province of *Boucle of Mouhoun* were accessible on bituminized or cobbled roads, whereas 26.5% of the markets where reachable on maintained dirt roads and, even worse, 13% only on unmaintained dirt roads.

Picture 5: Overview of the market sites in the province of *Boucle du Mouhoun* (Dabat 27).

Especially the ability to reach the market is of pivotal importance for the population in rural Burkina Faso as it is the place where people will sell products, such as their harvest, animals or handcrafts in order to gain financial means to improve their living conditions. Bigman at al. (183) were able to highlight that villages that could rely on an all-weather road to access the closest market (or further non-agricultural work offers) were able to increase their consumption by 10% due to their improved access (cf. also Anderson and Leiserson 238; Dabat 9). It is due to these circumstances that the OECD (Policy Framework for Investment in Agriculture in Burkina Faso, 84) demands the improvement of the road conditions to enable access to markets while trying to increase the agricultural output of local farmers (cf. also Raballand, Macchi and Petracco 4).

Mode of transport to the point of sale	Boucle du Mouhoun	Les Cascades	Region de l'Est
Vehicle	8.3%	32.9%	20.4%
Human	34.2%	21.6%	15.3%
Animal (e.g. Donkey, Oxen)	26.8%	25.9%	37.8%
Bicycle	27.4%	32.9%	21.4%
Motorcycle	3.2%	7.5%	-
Others	0.2%	0.4%	5.1%

Table 8: Transportation to the point of sale in the province of *Boucle du Mouhoun*, *Les Cascades* and *Region de l'Est* (AGRA 83).

4.4.2. Hospital

To meet the needs of the population the health system in Burkina Faso is structured in three tiers, where the first tier is based on the local level with 1606 Centres of Health and Social Promotion (*Centre de Santé et de Promotion Sociale* (CSPS)) all over the country in 2013. (GOBF MS x). Accordingly the CSPS has been mentioned as the main point of reference for all the people interviewed within the survey when it came to medical treatment. Nevertheless, the CSPS facilities are usually only available in larger communities throughout the rural areas of the country.

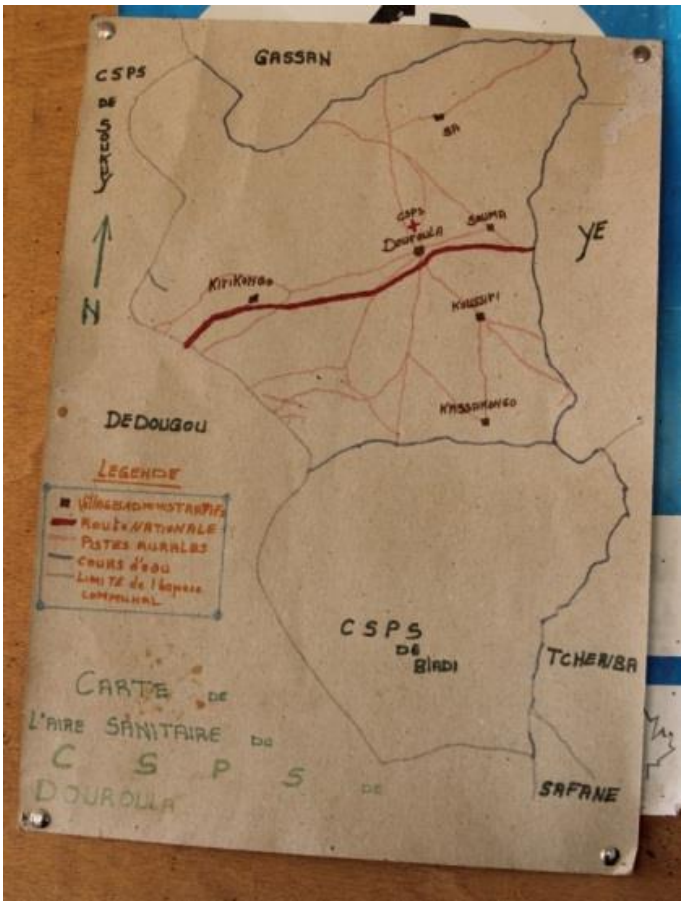
The fact that a significant amount of people live at a considerable distance from any medical facility can be proven to have a negative impact on the health condition of that part of the population. Sanou et al. (1481) and Müller et al. (294) highlight that limited accessibility turns out to be one of the major problems for people in Burkina Faso searching medical

treatment while Schoeps et al. (494) could demonstrate that child mortality in Burkina Faso doubled once it takes a household more than six hours to reach the next medical facility.

The situation is aggravated by the fact that the number of medical personnel is not sufficient to suit the needs of the population. In 2010, The World Health Organisation (WHO) tallied a number of eight doctors, nurses and midwifes per 10 000 people, while stressing that the critical amount of medical personnel for the same amount of people would have to be as many as 23. As such, people not only have to overcome large distances to reach a medical facility but are also likely find insufficient medical assistance once there.

District	Total Population	Percentage of People living within 0-4 km of CSPS	Percentage of People living within 5-9 km of CSPS	Percentage of People living over 10 km away from CSPS	CSPS/Inhabitants
Banfora	337 242	57.1	15.5	27.5	8 875
Dedougou	358 239	52.1	26.2	21.7	9 682
Pouytenga	186 452	59.7	30.9	9.3	10 968

Table 9: Medical situation in the surveyed districts of *Banfora*, *Dedougou* and *Pouytenga* (GOBF MS 63).



Picture 6: Area of responsibility of the CSPS *Douroula*.

4.4.3. Schools

Burkina Faso has one of the lowest school enrolment rates within Africa (CONFEMEN 8). As recently as 1995 the rate of children attending school was as low as 19% throughout the country. Although education has been made compulsory in 1996 (UNICEF 43), the number of school attendants could only be increased up to 27.5% by 2001 (Kouraogo 14). In order to cope with the situation, the Government started a major initiative in 2002 to improve the educational system in Burkina Faso (CONFEMEN 13). Its aim was to solve "the problems of access, quality and management of the educational system in order to reach the Millennium Development Goals and fight against poverty" (Kouragaogo 15). Accordingly, the educational law established in 2007 stipulates that children from the age from 6 to 16 have to attend school (GOBF INSD, Portant loi d'orientation de l'education 5).

In an effort to build large numbers of additional schools in especially the rural areas, the enrolment rate could be lifted gradually up to 74.8% by 2010. However, access and the number of schools remain a problem. In addition, the student teacher ratio throughout Burkina Faso remains as high as 54.2 in 2010 although the number of teachers has been increased substantially over the last 10 years (cf. GOBF INSD, Education - Evolution du ratio élèves/maître; CONFEMEN 25).

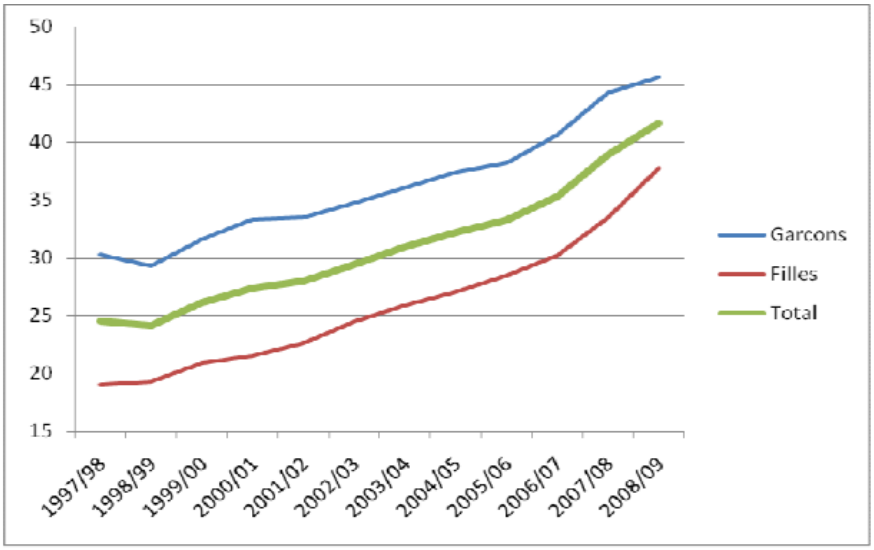


Figure 5: Primary School enrolment in Burkina Faso from 1998/99 to 2008/9 (UNICEF, Analyse de la situation de la pauvreté de l'enfant 22).

Province	Boys	Girls	Total
Boucle du Mouhoun	74.9%	70.1%	72.6%
Cascades	76.4%	67.3%	71.9%
Centre Est	77.1%	67.8%	72.6%
Burkina Faso (Total)	78.3%	71.2%	74.8%

Table 10: School attendance on the primary level in 2009/10 in the surveyed provinces (GOBF INSD, Evolution du taux brut de scolarisation).

Province	Population in 2006	Number of Schools in 2006	Ratio School / Inhabitants
Boucle du Mouhoun	1 478 392	866	1 707
Cascades	430 677	299	1 440
Centre Est	1 054 955	553	1 908
Burkina Faso	13 117 147	8 182	1 603

Table 11: Number of Schools per Inhabitants per surveyed province (UNICEF, Analyse de la situation de la pauvreté de l'enfant 23).

4.5. Household

In the areas surveyed, any kind of household activity, such as cocking, washing or gathering water and firewood is distinctively assigned to women (cf. Allenbach von Moos 39; Waibel 66; Fahrenhorst 338). Men are typically not engaged in household activities. It is due to this additional field of activity that Nasrin (89) emphasises working hours of women to exceed the labouring hours of their male counterparts by as much as 27%.

Children, however, can be engaged in household activities as well. De Hoop and Rosati (82) estimated that as much as 70% of the children between the ages of 5 to 12 are working in their family household at an average of 15 hours per week. The same study revealed that the mere fact of attending school did not diminish the number of hours a child has to work at home. On the contrary, children attending school seem to be even more engaged in household work (93).

4.5.1. Water

As is widely the case in Burkina Faso, all the villages surveyed proved to be constrained in their access to drinking water. In order to be able to retrieve water for their domestic needs, the people have to depend on either boreholes or on wells in the surroundings of their villages. In doing so, the distances to the water sources tend to differ from region to region surveyed.

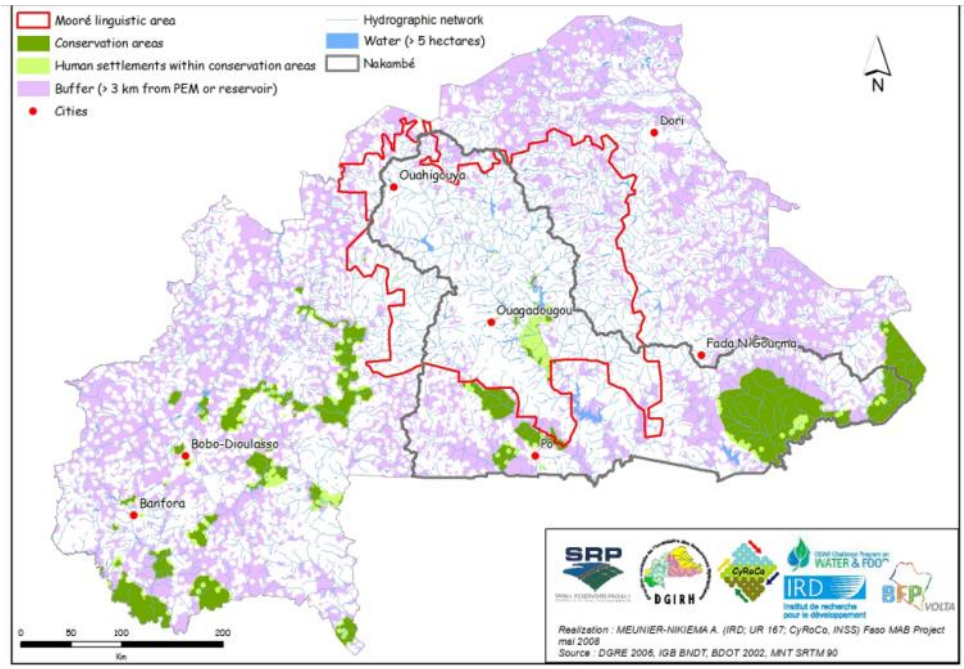
As a result, women – also supported by their children (Kishor and Neitzel 57) – have to undertake considerable efforts on a daily basis in order to gather the necessary amount of water required by their families. To do so, they transport large quantities of water in canisters of 25 litres either while walking, using a donkey cart (if available) or by transporting them on a bicycle.

Region	Bottles or sachets of mineral water	Running tap water	Spring	Boreholes	Improved wells	Traditional wells	Marigot, river, stream, rain	Total number
Boucle du Mouhoun	0.2%	1%	4%	32.7%	34.4%	27.8%	0%	920
Cascades	0%	6.3%	14.4%	55.4%	10.3%	10%	3.6%	941
Centre-Est	0.2%	3.4%	11.1%	69.6%	6.5%	6.2%	3%	913

Table 12: Distribution of households (in percentage) across the principal source of drinking water by region (USAID 65).

Municipal	2006	2007	2008	2009	2010	2011
Banfora	63.32	63.61	64.59	63.83	60.09	64.71
Douroula	75.19	74.33	77.98	76.22	72.03	77.97
Pouytenga	84.40	84.32	85.91	86.96	87.05	87.48

Table 13: Access to safe drinking water in rural areas: Proportion of rural population with access to safe drinking water according to standards and criteria of the Government of Burkina Faso in relation to the total rural population (GOBF MARHASA, Annuaire statistique 2011 de l'eau potable 166-168).



Picture 7: Areas with a distance of more than 3 km to the closest source of water (Cecchi et al. 16).

4.5.2. Firewood

Due to a lack of other resources, it is assumed that as much as 98% of the population in Burkina Faso has to rely on firewood for cooking (AGRA 51). As is the case with the supply of drinking water, it is the women's responsibility to provide the household with the required amount of firewood. In order to do so, a woman has mostly to overcome larger distances to the nearest forest. The acquisition of wood is increasingly affected by the progressing deforestation caused by the extensive use of firewood. Hence, women are forced to cover longer distances while gathering the required firewood over time (Waibel 66). It is thereby not unusual that a woman has to overcome several kilometres while gathering wood. Similar to the transportation of water, women will rely on donkey carts or bicycles if available. Alternatively, women will carry the firewood on their heads.

Main Cooking Fuel	Boucle Du Mouhoun	Les Cascades	Region de l'Est
Electricity	0.00%	0.48%	0.48%
Paraffin	0.16%	1.92%	0.96%
Firewood	98.72%	96.63%	97.60%
Gas	0.00%	0.48%	0.48%
Charcoal	0.96%	0.48%	0.48%
Solar power	0.16%	0.00%	0.00%

Table 14: Main cooking fuel in the province of *Boucle du Mouhoun*, *Les Cascades* and *Region de l'Est* (AGRA 51).

4.6. The Bicycle in Burkina Faso

Burkina Faso is widely regarded as the Land of the Bicycles. First introduced in the early years of the 20th century (cf. Fodouop and Bidi 141; Noaga) the bicycle became widespread over the following decades to later become known as "means of transportation for the poor". Unforgotten amongst the Burkinans is their former President Thomas Sankara who himself rode a bicycle and promoted it as the first means of transport for his population. Although the bicycle has partially been replaced by motor scooters in the larger cities nowadays, it still remains pivotal throughout the country by being the primary means of transport in the rural areas (Starkey, Rural transport services 29). Accordingly, the national consensus in 2007 showed that 82% of the households nationwide possess at least one bicycle (GOBF INSD, Pourcentage des ménages disposant de certains biens). Within the regions of *Boulce du Mouhoun* and *Les Cascades* which have been surveyed during this study the percentage where even as high as 87.98% and 89.45% respectively in 2010 (AGRA 44).

The most widespread kind of bicycle within the areas surveyed is of Indian or Chinese origin. In the area of *Saganako* however, large number of Swiss recycled bicycles have been made available by the wholesaler Gebana located in *Bobo-Dioulasso*. Since prices for a bicycle are approximately at 75 USD (35 000 – 40 000 CFCA) it is still regarded as being relatively expensive for people living from their agricultural production. Not being able to attain large incomes, the acquisition of an additional bicycle is often combined with a yearlong effort to gain the required means.

5. Findings

5.1. Agricultural Self Supply

As has been outlined, the population in rural Burkina Faso largely depends on subsistence agriculture as its main source of income to sustain its livelihood. Therefore, fieldwork has been defined by all the interviewed persons as one of their most crucial activities within their daily routine. In order to produce sufficient amounts of crops to maintain the household it is common that the entire extended family is engaged on the fields on a daily basis. Throughout all interviews, fieldwork has been described as being exhausting if it would have to be done without having the chance to make use of a bicycle. Accessibility has thereby been mentioned as being the most pressing problem since the fields of most families are some distance from their domicile.

"The bicycle is very beneficial for us. In the morning we can reach the field very very fast. In the evening we can return very fast as well. […] If there is no bicycle available I have to walk to the field. This is very tiring. To return I have to walk too and that is again tiring. Because we have the bicycle it has become easier for us to go and to return." (03.12.13-1)

Data collected in the survey illustrates that the farmland of the interviewed households lies at an average distance of 5.6 km. Accordingly, all the interviewees expressed how important the use of a bicycle was in order to reach their fields. Taking all the gathered data into consideration it can be emphasised, that it takes a farmer on average 30 minutes to reach his field by bicycle, while on average it would take one hour and 30 minutes to walk the same distance. By using the *paired-samples t-test* (which compares the development of every case taken into account in the survey) the time difference if driving a bicycle ($M = 0.5$, $SD = 0.84$) or walking ($M = 1.45$, $SD = 0.26$) has been proven to be statistically significant conditions; $t(19) = 5.91$, $p < .000$).

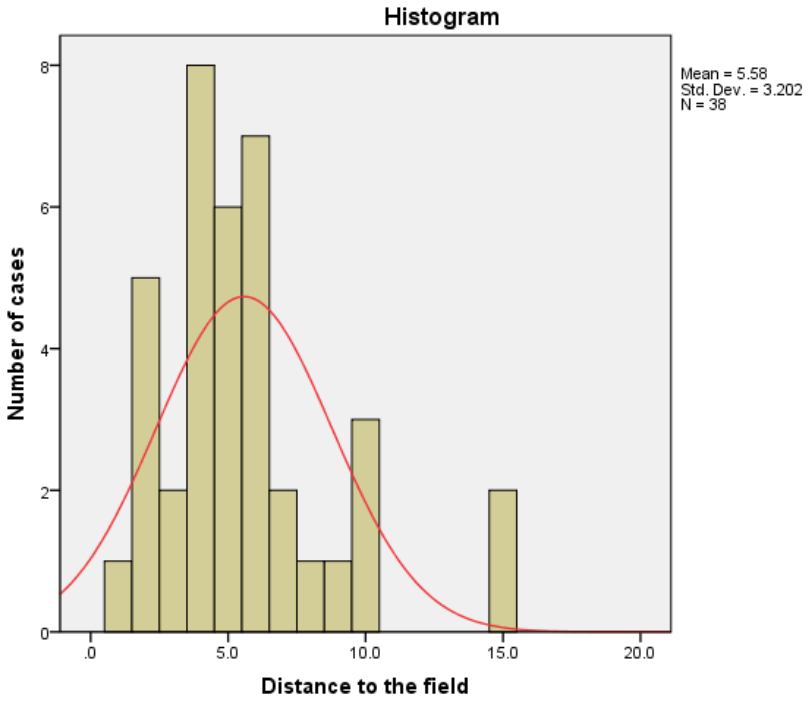


Figure 6: Distance to the own field according to the households surveyed.

Picture 8: A farmer living in *Douroula* forced to walk to his field due to the defect of his bicycle. *"Thanks to the conversation we realised that those without bicycle are more tired and work less compared to those having a bicycle. Both have the same expenditures but those who have to walk do not have the same chance to work."* (18.12.12-3)

Using a bicycle to access the field bears a number of advantages. Of the interviewed parties, 88% explicitly mentioned that they themselves or other members of their family were suffering from pain and discomfort caused by walking long distances. Especially women expressed that the distances caused them considerable difficulties. Therefore, people forced to walk require additional recovery time before being able to take up another working task. Their situation becomes worse when being required to carry heavy goods, such as equipment for their fieldwork, seeds or their harvest. Women with small children may additionally be required to carry their infants with them, since they would not be able to leave them unattended at home (cf. Kishor and Neitzel 57). By having a bicycle at their disposal, people obtain the chance to save their strength in order to fully engage in their fieldwork.

"To ride a bicycle or to walk is not the same thing. If you have to walk the whole body feels hot. The feet hurt. But with a bicycle you will not feel this pain. Hence, there is a big difference. If you walk you will have problems with your feet. You will arrive but you will not be able to do anything anymore. You cannot even work. By bicycle this is totally different." (04.12.13-2)

It has been widely emphasised throughout the survey results that having to walk to and from the field costs large amounts of time which could be used to intensify the fieldwork or be invested in other tasks. As a result 96% of the interviewees emphasised having gained additional time while having a bicycle at their disposal which leaves them the satisfaction of investing more time into their fieldwork. By doing so 90% of the interviewed persons expressed their ability to increase their productivity and, therefore, to raise the amount of crops produced. The collected statistical data supports this findings by showing the amount of crop harvested having increased by a factor of approximately 2.5 once a family could rely on the use of bicycles.

"There where years when people had only a small harvest. People had to walk to reach their fields. When the bicycles arrived people could arrive much faster on their fields. They worked during longer time and managed to have a rich harvest." (13.12.13-2)

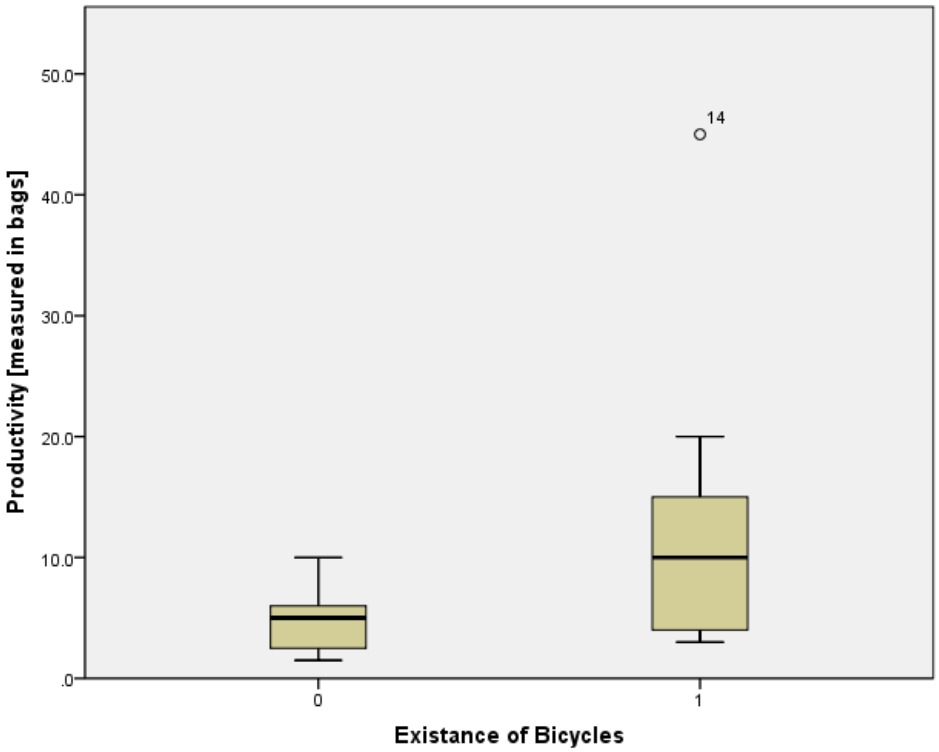


Figure 7: Correlation between the availability of bicycles and the amount of crop produced on the field per household (measured in bags).

While proving a positive correlation between the use of bicycles in general and the increase of crop production, further data gathered indicate that the number of bicycles available have a measurable impact on the agricultural productivity. Using the statistical method of a *Pearson Correlation* the data gathered in the survey significantly prove a positive correlation between the number of bicycle available and the amount of crops harvested, r = .609, n = 17, p = 0.005).

"I saw that not everybody could take a bicycle to get to the field and that they were tired after having to walk. The production was not that big so I decided to buy more bicycles to increase the productivity." (19.12.13-3)

"After getting two additional bicycles we noticed that the production increased indeed. Before, all the seven children had to walk to the field and lost a lot of time which for sure affected the productivity which meant that we would produce less." (18.12.13-3)

Despite of the statistical significance of the findings the bicycle can only be regarded as being one of several aspects influencing the harvest. Throughout the survey several factors became apparent, such as the number of family members – especially of the younger generation – involved with and without bicycles, the number of years every bicycle has been

available, the size of the farmland or the distance to the field. Nonetheless, the bicycle remains a pivotal factor, which enables a household to mobilise its available workforce in the most efficient way and hence contributes essentially to the increase of productivity. Following the qualitative and quantitative findings it can furthermore be stated that the number of bicycles available has a positive impact on the amount of crops produced.

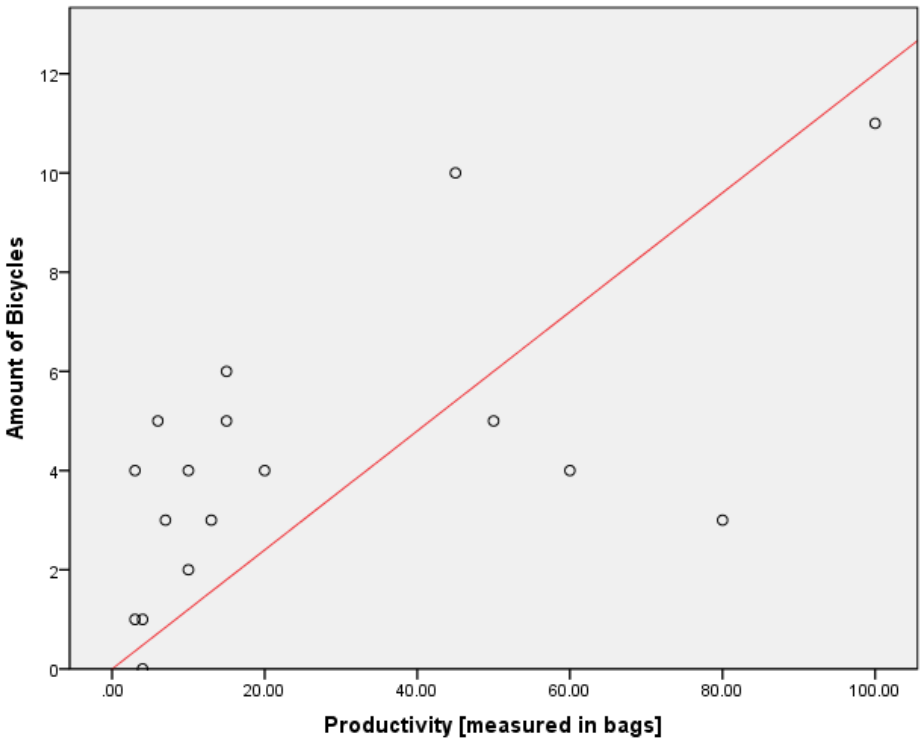


Figure 8: Correlation between the number of bicycles available and the amount of crop produced on the field per household (measured in bags).

Being able to produce larger amounts of crops due to the advantages of their bicycles, people expressed their ability to augment their food supply and therefore to improve their self-sustainability. As a result, families in the surveyed regions now have to buy fewer foodstuffs than in the past. In addition, people have become able to even sell some of their surplus crops and to reduce the previous persistent pressure to generate income due to the new degree of self-supply. Being furthermore able to cover large distances much faster, people have benefited of gaining additional time which they can now invest in other activities – such as, for example, starting trading – designed to increase their personal income.

Picture 9: A farmer from *Douroula* returning from his field.

5.2. Income generation from agricultural commodities

Being able to use a bicycle to access their field, people in rural Burkina Faso do not only increase individual spare time but are also able to reduce the fatigue caused while by walking. Accordingly, individuals having recently acquired a bicycle often experience the unprecedented situation of having the possibility to engage in further occupations. Throughout the survey, people were shown to use this circumstance to engage in additional income generating activities.

Moreover, 80% of all the interviewed households stated that they were able to start maintaining an additional vegetable garden due to the time gained from riding a bicycle to and from their field. Especially women are shown to make use of their extra time by cultivating vegetables to be sold. In doing so, they would be in the position to earn some additional money on their own. Since many husbands appeared to be unable to support their wives with financial means, women widely depend on having a bicycle at their disposal in order to be able to acquire goods for themselves or their children. Thereby, a bicycle would

not only help them to gain time to increase their production, but also access to local markets to bring their goods for sale.

Picture 10: A woman from *Sapaga* on the way to the market of *Pouytenga*.

"Before 2005 I did not have a bicycle. I couldn't do any saving. But after I have received the bicycle, I could start to save money. So I bought Beans and Peanuts which I later resold. By doing so, I could increase the amount of money saved. That is a big difference to the previous situation." (04.12.13-3)

Visiting markets throughout the examined regions of Burkina Faso it is common to encounter large numbers of women selling home-grown vegetables. Hence, not surprisingly 96% of all the households surveyed stated that they use their bicycle to reach the local market.

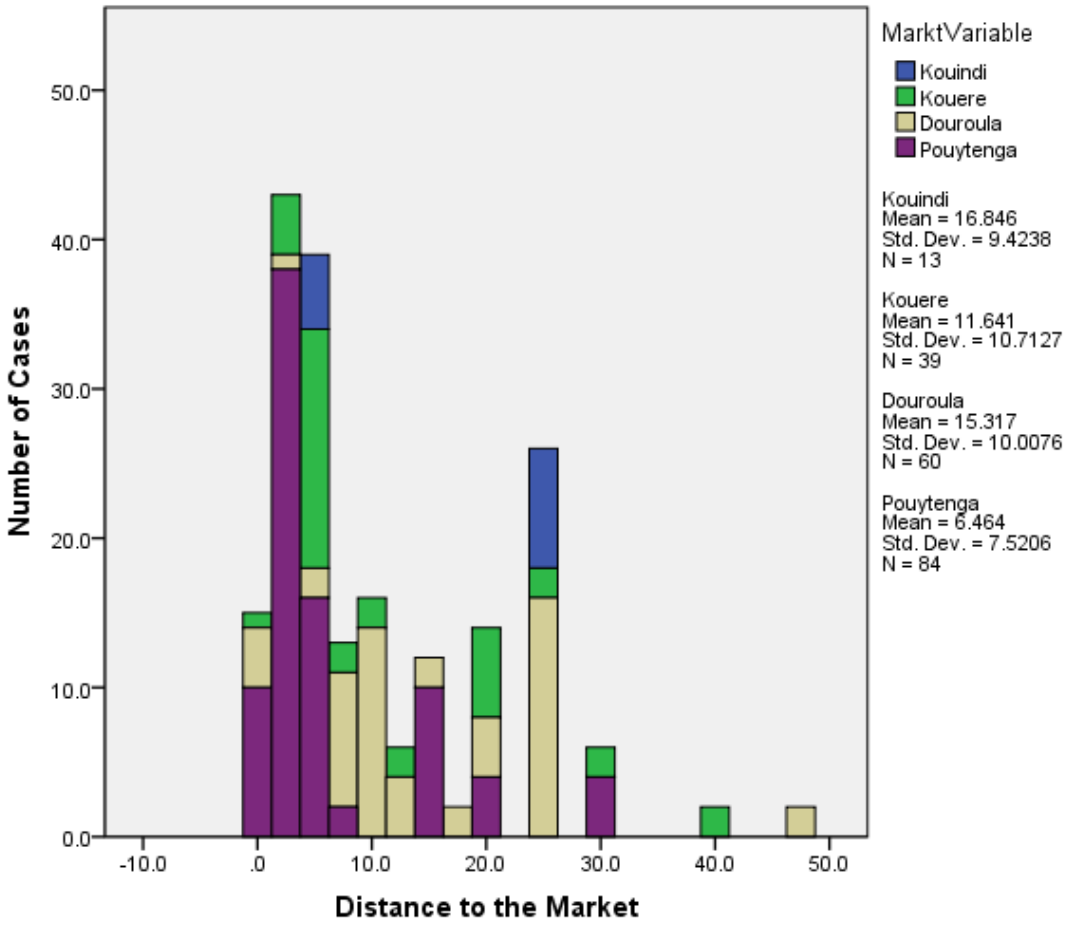


Figure 9: Distance to the market according to the households surveyed.

In order to reach marketplaces, vendors often have to overcome large distances while carrying a heavy payload. Much like the aforementioned field workers, individuals being engaged as vendors emphasised being able to access the marketspace much faster by using a bicycle. Arriving early at the market is decisive for the vendors since the first morning hours promise a high demand and hence result in good sales. Vendors carrying their goods by foot would often arrive at the marketplace just to see other vendors riding a bicycle just having finished their sales and preparing to head back home. Since prices fluctuate between the markets, vendors owning a bicycle furthermore enjoy the possibility of choosing between different market places if they feel unsatisfied with the prices at a particular location.

Vendors who must get to the market by walking will have to carry their goods on their head. The bicycle proved to be of great benefit since it allows for greater loads while offering the chance of conveying such loads in a more comfortable manner. According to the surveys conducted at several marketplaces throughout the examined regions, a salesperson moving goods by bicycle is able to carry approximately five times more weight than somebody who

has to walk to the market. In addition, as many as 84% of the interviewed households mentioned having been able to increase their income due to the use of the bicycle.

Market	Transport capacity		Income in USD	
	by walking	by bicycle	by walking	by bicycle
Kouere	8.95 kg	41.58 kg	5.63	26.53
Kuindi	13.33 kg	66.67 kg	-	-
Douroula	4.94 kg	57.50 kg	3.68	20.34

Table 15: Increase in transport capacity and sales income measured at markets in the surveyed regions.

As a result it can be shown, that vendors able to rely on a bicycle are capable of achieving higher revenues while being able to carry more goods than before. The amount of income is thereby correlated with the greater amount of goods carried. According to this circumstance, vendors at the market of *Kouere* claimed to have increasing their incomes by a factor of 4.7 due to using a bicycle while vendors in *Douroula* reported increasing their incomes by a factor of 5.5 since they started to use a bicycle. In order to test the statistical significance of the findings, the data has been checked by using *Pearson Correlation Coefficient* ($r = .661$, $n = 39$, $p < .000$) as well as a *regression* ($F(1, 37) = 28.666$, $p < .000$) with an R^2 of .437. Both tests demonstrated that the difference in income is statistically significant once a vendor can rely on a bicycle to carry a larger amount of goods to the market.

The ability to increase income is particularly essential in regard to the continued intention of further developing the individual living conditions in a sustainable manner. Not being able to increase revenues, a vendor restricted to walk faces severe difficulties to being able to improve living conditions and his hard-earned money would often be spent in the same market in order to meet the most pressing needs. As a result of this reality it becomes difficult for vendors carrying their goods by foot to save any funds. Vendors able to grow and transport significantly more crops by bicycle will in contrast start to economise a part of their income and hence have the chance to start saving larger amounts of money. By doing so, they obtain the chance of investing their savings into further income generating activities and start to gradually further improve their overall situation.

However, it is crucial to highlight the importance of having one's own bicycle at disposal at an individual level when it comes to an attempt to achieve an increased savings rate. By directly comparing the situation of numerous women within group discussions it has been possible to measure a three times higher visiting-rate at the local market amongst those

women owning their own bicycle when compared to those depending on somebody else's bicycle. In addition, and more crucial, the possession of one's own bicycle can be regarded – as shown above – to be a precondition to produce the vegetables later to be sold at the market. Therefore, not having one's own bicycle not only affects the access to the markets but also limits the possibilities of producing any goods to be sold.

Taking everything into consideration it can be said that a bicycle, being at the disposal of a single person, provides a significant added value when it comes to the production of crops destined to be sold at market. As became evident, the bicycle provides the necessary preconditions to augment the amount of crops produced. In addition, it facilitates the accessibility to the market and, therefore, increases the average number of market visits. Finally, the bicycle enhances the amount of goods that can be transported. As a result, the bicycle offers the chance for many people in rural Burkina Faso to put some money aside which could be reinvested later on in order to improve living conditions.

Picture 11: *Saganako* – Market of *Kunidi*: Not being able to rely on a bicycle the woman is only able to sell whatever she is able to carry on her head.

Picture 12: *Saganako*: Two men riding a bicycle on the way to the market of *Kouere*.

5.3. Commerce

Different to the selling of one's own agricultural products, a considerable number of people use their bicycles to increase trade. Taking the step from being a farmer to become a merchant can be regarded as a considerable one while trying to improve one's own living conditions. To establish oneself as a merchant, however, requires a significant investment which is not necessarily easy to obtain. Therefore, future merchants would usually have to save money prior to any trading activity.

Number of households within the survey engaged in commerce (per region)	
Saganako	35.7%
Douroula	76.9%
Sapaga	69.2%

Table 16: Number of households within the survey engaged in commerce.

The availability of a bicycle is perceived as a precondition to significantly engage in commerce. Merchants often have to cover large distances in order to acquire their merchandise. Most merchants surveyed in the study travel abroad to do so. Goods thereby typically traded are vegetables, animals, cloths, shoes, toiletries, perfumes and jewellery, amongst others. Decisive is, however, that it is only through the capacity of the bicycle that a merchant is able to carry the required amount of goods.

As the vendors of agricultural products described above, the merchants are able to enjoy the same benefits of the bicycle concerning velocity and lifting capacity. Furthermore, it is important to note that the selling of merchandise opens up the possibility to realise a larger income than is possible through selling one's own agricultural products. This greater income accordingly allows for greater savings.

It is, therefore, essential to emphasise the role of the bicycle in opening up possibilities to continuously increase the amount of money that may be saved. As a result thereof, people are subsequently being put into positions where they have the chance to increase the amount of money dedicated to further income generating activities or the subsequent improvement of their living conditions. Clearly, a newly acquired bicycle often enables its owner to improve living conditions step by step by for the first time.

Picture 13: Market of *Kouere*: A merchant selling his goods.

Picture 14: *Sapaga*: A women on the way to the market in order to sell her goods.

5.4. Stockbreeding

Throughout the examined regions of Burkina Faso, it can be considered common practice to invest savings into further income-generating activities such as stockbreeding. The data gathered indicates that 53.1% of the households surveyed re-invest money by purchasing animals. Stockbreeding as such offers the possibility to deposit funds and securing them until further need. In addition, breeding offers the possibility to increase the value of the funds invested as the livestock grows over time.

However, the bicycle has often to be regarded as a precondition while trying to invest into livestock. Moreover, the bicycle becomes of crucial importance when it comes to chicken breeding.

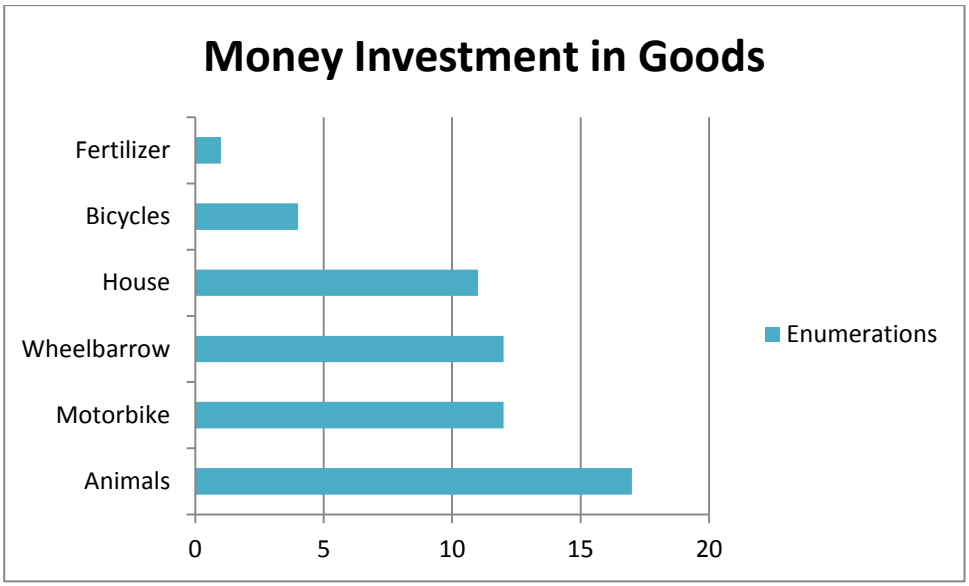


Figure 10: Items mentioned to be bought by 32 Households throughout all the surveyed areas thanks to the money gained due to the additional bicycle.

Picture 15: *Saganako*: Farmers on the way to the market of *Kouere* ready to sell their goats.

5.4.1. Chicken breeding

Unlike other animals, breeding chickens is widely perceived to require the availability of a bicycle in order to maintain them. Throughout the surveyed areas it proved to be current practice to feed poultry with termites which have to be gathered on a daily basis in the wider surroundings of the household. People thereby often have to cover several kilometres in

order to find a termite nest in the forest. Therefore, it would become impractical to keep chickens without having a bicycle at one's disposable. Not only would the gathering become far more time consuming while walking; the detached part of the termite nest that is requires has been described as being too heavy and too impractical to be carried by foot. Having to feed their poultry with their harvest instead would leave their family with either less food or less income and is therefore rather difficult to implement. Since chicken breeding is a particularly economical form of investing savings into animals, it might be particularly useful for households with few savings. In light of this, the bicycle remains an essential element in improving one's personal economic situation.

5.5. Household activities

In Burkina Faso, household activities are typically done by women. To fulfil their tasks – such as gathering water or firewood – they increasingly draw on the bicycle which has been available in greater numbers. As a result, women are able to reduce the time and the energy needed to fulfil their tasks. As a result, they particularly expressed their gratitude for being able to invest additional time and energy into other activities such as the maintenance of their own vegetable garden.

"If I would have a bicycle life would become very easy. Now I have to carry all the things on my head. Even to carry water. All this would have an end. I will become very fast. Hence I could even go to the market and I would have time to work at home and do some other things as well." (04.12.13-2)

Picture 16: A woman able to produce traditional local beer in *Sapaga* and hence capable to reach an income thanks to the availability of a bicycle.

5.5.1. Water

Throughout the surveyed regions, it is mainly the task of the women to provide the water needed within the household. The source of water often lies at a considerable distance. In some cases it can take up to some kilometres. The distance, however, can vary depending on the season, since some sources might be dried-out.

Average distance to the water source per household in the surveyed regions	
Saganako	0.95 km
Douroula	0.3 km
Sapaga	2.375 km

Table 17: Average distance to the water source per household in the surveyed regions.

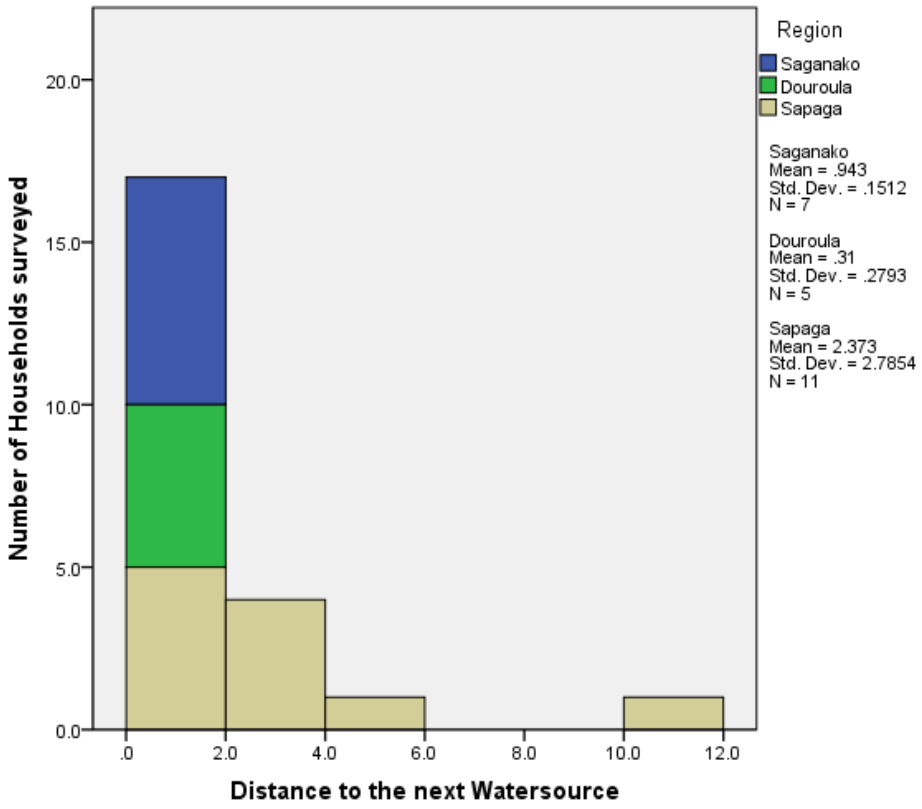


Figure 11: Distance to the closest source of water in km per household surveyed.

The amount of water consumed depends on the size of the household as well as on the varying activities of the current day. On average, a household has been found to use 330 litres daily which equals 13 water canisters. Due to the heavy weight and the considerable amount of time required, women take advantage of bicycles as often as possible to go to the nearest welll. Out of all the interviewed households, 82% stressed the importance of the bicycle when it came to the transportation of water. While doing so, the bicycle provides the women with considerable advantages. First and foremost, it offers the possibility to carry three canisters at one time whereas it would only be possible to transport one canister while walking. Additionally, a woman will no longer have to carry a 25 litres canister on her head but rather can deposit them on the bicycle rack. Furthermore, she will be able to move much faster than before.

"I feel very bad. You scoop water, you carry the water on your head, and you deposit the water at your place. Afterward, you feel bad. Your body hurts. This is how I feel. There is a big difference [between walking and riding a bicycle]." (04.12.13-2)

With an increase of velocity by the factor of two to three compared to walking, riding a bicycle it can be said that a woman is capable of obtaining the required amount of water approximately six to nine times faster than before. As a result, women will not only be able to gain considerable amounts of time, but will also be able to feel the enormous relief of no longer having to carry the heavy canister on their head.

Picture 17: *Saganako*: A Woman taking advantage of the bicycle to carry three canister of water at the time from the well behind her.

5.5.2. Firewood

As with the supply of water, the provision of firewood is a task usually done by women. Similar to the previous case, 70% of all the examined households highlighted the crucial role of the bicycle in collecting firewood for their daily needs. Compared with the distance of the water springs, however, the places frequented to gather wood are usually further away. Due to continuing deforestation, the distances are lengthened every year.

Average distance to collect firewood per household measured within the survey	
Saganako	4 km
Douroula	7 km
Sapaga	4 km

Table 18: Average distance to collect firewood per household in the surveyed regions.

Depending on the habits of the individual household, the required firewood will be gathered during the working hours on the field or on a different occasion. Usually, a household will be storing wood for one to two weeks. Having a bicycle at her disposal, a woman will not only reduce the time required for transport, but also increase the amount of wood transported. As a consequence she is able to become more efficient while gathering a larger amount of fire wood in a shorter time.

Picture 18: Two women just about to arrive back home in *Saganako* after having gathered firewood for their household.

5.5.3. Corn mill

In large parts of the areas visited during the survey, Tô – the traditional Burkinabe maize porridge – makes up an important part of peoples everyday basic nourishment. In order to produce the required quantities women have to grind maize in large quantities. Not having a mill within reach, they must mill maize by hand with the help of a grindstone. However, larger villages might have engine-powered mills available which are widely used by women to have their maize flour produced. Again, the availability of a bicycle directly impacts the quantity of maize a woman will be able to transport to the mill.

Measuring the usage of the mills in the example of the village of *Douroula* it can be concluded that women with bicycles at their disposal carry an average of 5.3 tins of maize

while women having to walk were only carrying an average of 1.5 tins. Running the *Analysis of Variance*-Method *(ANOVA)* in order to test the data gathered at the mill, it can be stated that the differences in the carrying capacity with and without bicycle is of statistical significance, $F(1, 46) = 24.33$, $p < .000$. Therefore, one can conclude that a woman taking advantage of a bicycle is able to carry on average 3.5 times more maize to the mill than those having to walk. Furthermore, it might be concluded that women relying on a bicycle have to frequent the mill less often while having the chance to produce more flour during each visit.

In accordance with previous findings, it has additionally been measured that women using a bicycle are quicker while heading to the mill and back home. Despite the short distances, it can be said that the use of a bicycle reduces the time required by factor three – a finding which has been tested as well to be of statistical significance, $F(1, 17) = 23.76$, $p < .000$.

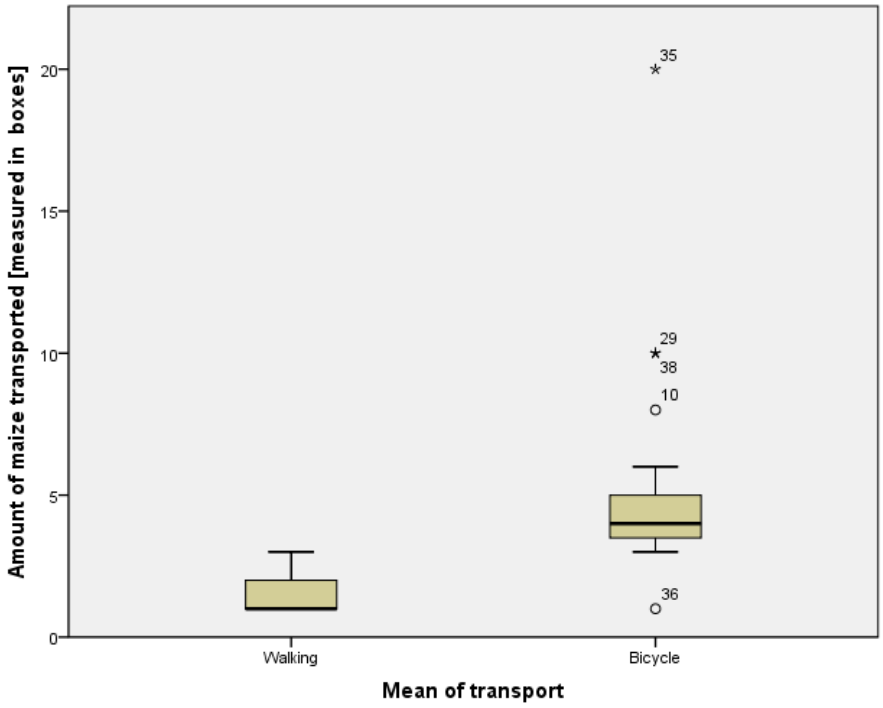


Figure 12: Box-Plot indicating the different quantities of maize having been measured to be carried to the mill in *Douroula* by walking and by bicycle.

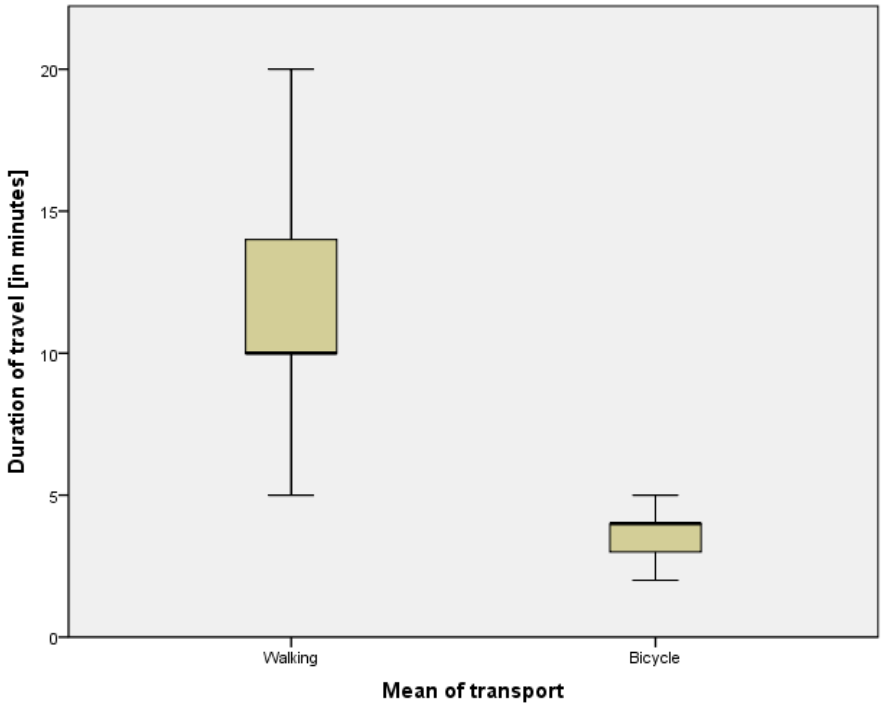


Figure 13: Box-Plot indicating the different amount of time being used while walking or riding a bicycle to reach the mills in *Douroula*.

Picture 19: Women in *Douroula* leaving the mill carrying maize flour back home.

5.6. School

Throughout the survey the question of how children reach their school has been of particular interest. Due to poor infrastructure, students of all grades have to overcome long distances to arrive at their schools.

Average distance to School	
Sapaga	6.75 km
Douroula	13.10 km
Kouere	1.49 km

Table 19: Average distance to the school measured in the three surveyed regions of *Sapaga*, *Douroula* and *Kouere*.

Since families tend to have a large number of children it is most often not possible to provide each one of them with a bicycle. Therefore, it is not uncommon that younger pupils in particular have to walk long distances to attend their lessons. Accordingly, only 50% of all the families surveyed emphasized that at least one of their children is able to reach school by bicycle. As might be reasonably expected, students riding a bicycle reach a higher average velocity which has been measured to be about 7.1 km/h while their walking classmates are as fast as 4.3 km/h on average. These differences in speed have been proven to be of statistical significance, $F(1, 62) = 14.29$, $p < .000$.

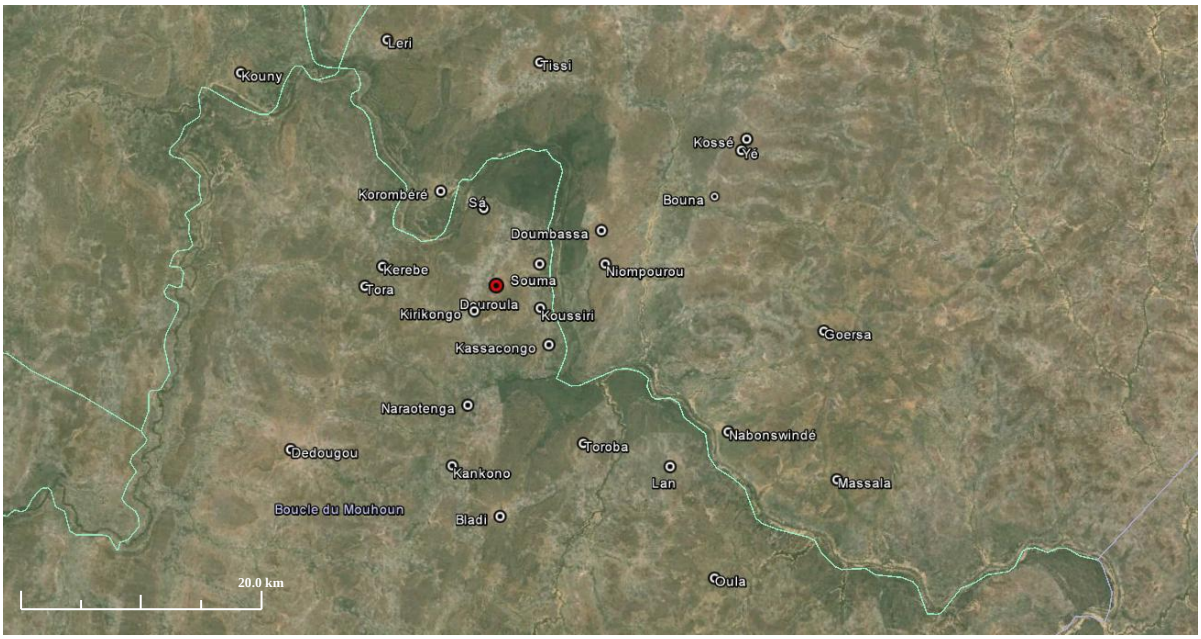
"To reach school I had to walk 5 km which took me one and a half hours so I had to leave at five o'clock in the morning. I had to walk for five years. In any case the situation improved thanks to the bicycle because I could reach school within half an hour. Like that I have won an additional hour of time." (02.01.14-1)

Being disadvantaged in reaching school by not having a bicycle available is a topic of concern amongst students. Children not able to bike to school have been widely described as being exhausted and less attentive at school. In more extreme cases pupils have been falling asleep regularly during classes due to their fatigue.

"Without a bicycle I had to walk to school. I often arrived late and quite tired" (03.01.14-2)

Aggravating the circumstances, the examined schools often followed the practice of excluding students from the current lesson if they were arriving late. As a result, students without a bicycle are under additional pressure to avoid tardiness. Nonetheless, it is

important to highlight that no correlation has been found through quantitative means between having to walk and the problem of arriving late at class.



Picture 20: The map indicates the villages in the outreach of the secondary school in *Douroula* (Image: Google).

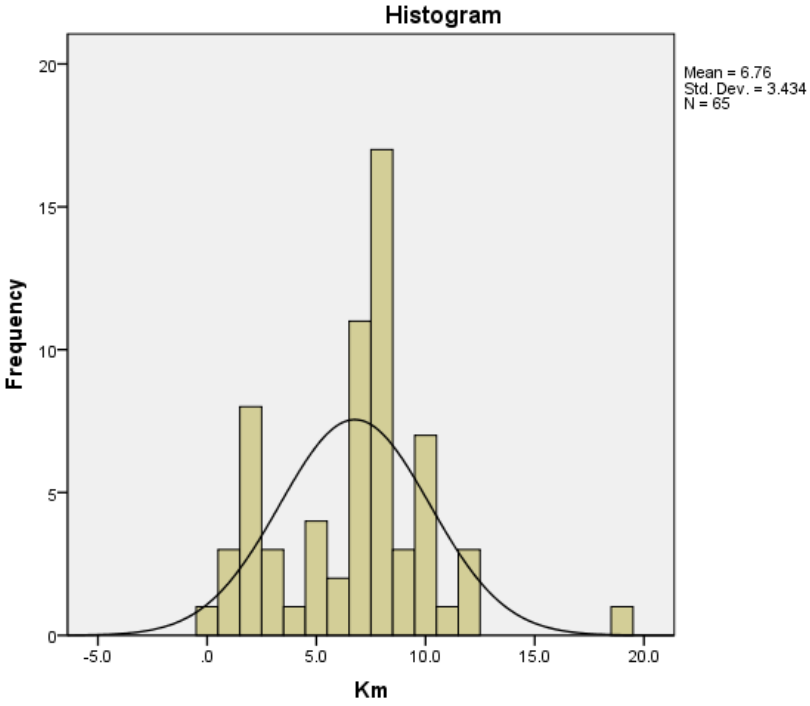


Figure 14: Distance to the school in *Sapaga* per pupil.

Looking at the children's entire day it is essential to see them not only as pupils or students, but also within their wider role as members of a household. By doing so, it has to be taken

into consideration that every member of a household has his duties to fulfil in order to support the family. As such, children are generally in charge of the animals and might have to support their mother with the transport of water or firewood whereas adolescents will already be fully engaged in fieldwork. This means that often children have to fulfil their educational tasks and their work duties simultaneously.

Arriving home after school, children and adolescents generally have been described as first fulfilling their work within the household before finding time to do their homework. Therefore, a student without a bicycle at disposal will not only arrive home later, but will also only be able to fulfil domestic tasks at a later time of day. As a result, children without a bicycle will be obliged to pick up their homework at a later point of time while being more exhausted. Some of the children surveyed emphasised that they have gained additional sleeping time due to the presence of a bicycle and that they were less tired during classes.

"At that time I finished school at 17 o'clock. Due to the distance I arrived at 18:30 o'clock at home. First I had to search water for the animals before I would eat. Afterwards I would do my homework very late. With the bicycle the path became shorter but I still have to look after the animals once I arrive at home. […] Thanks to the bicycle I was able to gain an additional hour of sleep." (02.01.14-1)

While requiring less time to get to school, being less exhausted and having more time available to recover, pupils widely expressed that it became easier for them to excel at school. It is due to these circumstances that parents throughout the survey expressed their eagerness to supply their children with bicycles when possible.

Picture 21: Student living in *Sapaga* ready to depart for school.

5.7. Social activities

The bicycle plays a crucial role when it comes to maintaining social activities. People use bicycles to visit their families, friends as well as a broad variety of social events. Distances are often too far to be overcome by walking without having to face considerable difficulties. Especially when it comes to family visits, distances of up to 100 kilometres or more are not uncommon. This is particularly the case for women, who usually leave their birth family to join their husband's household. As a result, people not having the chance to rely on a bicycle are often forced to undertake trips of several days in order to visit their relatives.

"I will go to Sideradougou four times a year to see my family. To go there I have to walk for two days which is quite hard. During the rainy season it is time to grow the crops. Hence, I cannot rely on the bicycle since my husband needs it to work on the field. Otherwise I would be able to go and to return on the same day. But if I wanted to go there for two or three days with my husband's bicycle… this would also not be very good [to leave him without a bicycle]." (05.12.13-3)

Since it is a custom to provide the visited family with a present, visits are usually connected with additional costs. Accordingly, it becomes more difficult to bring up extra money to pay for bus tickets or fuel for a motorcycle while conducting a visit. As a consequence, the bicycle remains highly popular to undertake visits, even if the trip in question is a distance of several dozen kilometres.

People also expressed the importance of the bicycle to be able to attend widespread social activities such as traditional celebrations for a new born children (called "Batem") or funerals that often take place in one of the surrounding villages. While not as far away as the village of their relatives, it still takes several kilometres of travel to reach the neighbouring places where the activities are taking place. The same is true for adolescents who tend to use the bicycle to meet their friends in the nearby villages or men who are starting to look for a future wife.

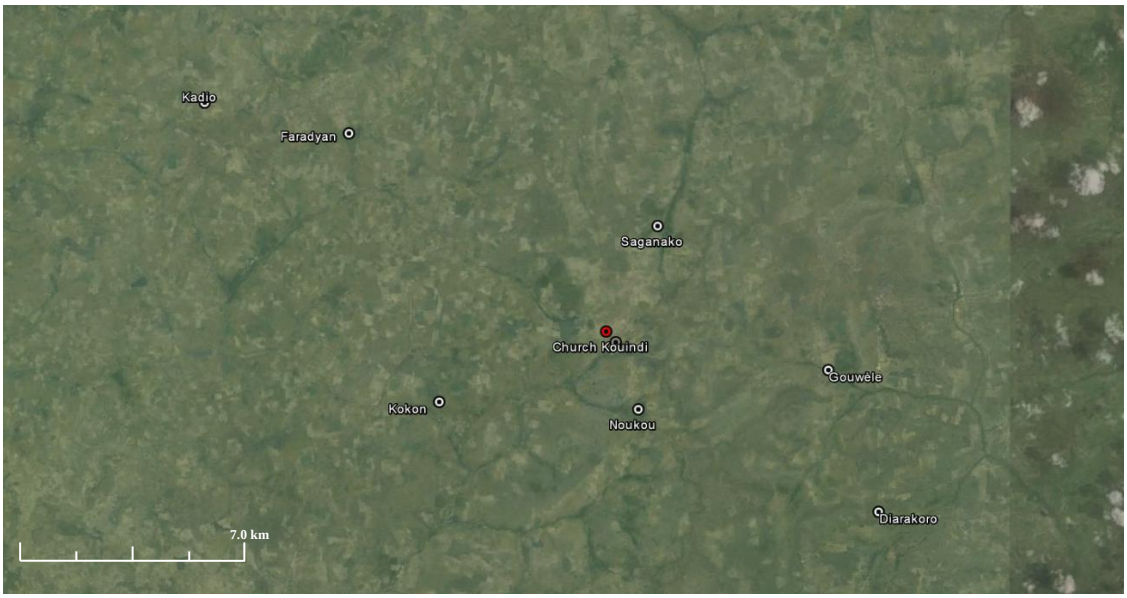
Picture 22: A boy carrying food just arriving at Batem-festivities in *Kuindi* near *Saganako.*

Many Christians in the examined regions mentioned their strong desire to attend the Sunday mass taking place in one of the few churches in the surrounding area of their village. Similar to their other social activities people heavily depend on the availability of bicycles to attend the mass.

"For five years, every Sunday I walked to the church in Kouere. I had to leave at four o'clock in the morning. Sometimes I arrived when the mass had already finished. But not always. Sometimes I arrived on time. Sometimes I arrived late. After having received a bicycle I did not miss any mass anymore. On the way home it was the same. When I did not have a bicycle I arrived back at night. Since I have the bicycle I arrive back home around one or two o'clock in the afternoon. Hence, there is a big difference!" (04.12.13-2)

Data collected amongst people visiting the mass in *Kuindi* highlighted that people going to church by bicycle are approximately 2.6 times faster than those who have to walk. This difference could be proven to be of statistical significance while having tested the respective data through the ANOVA-Method, $F(1, 52) = 49.69$, $p < .000$.

Picture 23: The Church of *Kuindi* near *Saganako*: The churchgoer left their Bicycles outside the Church during the mass.



Picture 24: The outreach of the Church of *Kuindi* according to its visitors (Image: Google).

5.8. Hospital

Due to the lack of infrastructure in rural Burkina Faso, most people living on the countryside are forced to overcome large distances in order to reach the closest hospital. Distances up to 20 km (as in the community of *Saganako*) remain possible. As a result of these distances, cases of emergency present a serious problem to those living in remote areas. Having the need to reach a hospital within a short amount of time in cases of severe accidents or an

imminent childbirth is one of the most pressing reasons to buy a bicycle, as mentioned by 70% of all the people surveyed. Here again the bicycle has proved itself in practice. Every family has its own story to recall of how they had to rely on a bicycle while in need of transporting somebody urgently to the hospital.

"While I did not have a bicycle I had to do the same tasks by foot. Once I even had to go to the hospital with my child. Though, I had to get up at 6 o'clock in the morning, mount my child on my back and then walk [10km] to Douroulà to the hospital." (17.12.13-4)

Since most bicycles are being used during the day it is unfortunately common that people happen to be lacking a means of transport in case of an emergency. Therefore, it is not unusual that people in urgent need reach out to their neighbours while trying to find somebody able to lend them a bicycle.

"The children often climb about in the trees and if one of them falls down it has to be brought by bicycle. If there is no bicycle available the situation becomes very difficult. A child has fallen down once and because there were no means of transport available to bring it quickly to the hospital the child has remained with a damaged leg until the present day. There are just too many [4] kilometres until Boangtenga." (01.01.14-1)

Moreover, the bicycle is often being used by medical personnel from regional hospitals in order to reach remote villages to carry out information and vaccination campaigns. Often these crucial services could not be offered without the presence of bicycles privately owned by the health-workers.

Picture 25: Although having received considerable help, people in Burkina Faso are most often suffering from the most basic ailments. The Ambulance of *Douroula* has not been in services for months since the community was not able to repair a flat tire.

5.9. Acquisition of bicycles

The price of a bicycle in Burkina Faso is about 30 000 – 40 000 CFA Francs (about 75 USD). Due to the comparatively high price, the acquisition of bicycles comes at great hardship for the poor population living on the countryside. As a result, an average family in the rural area is unable to provide all its members with an own bicycle. Families owning less than three bicycles are generally considered to be poor by the wider population in the surveyed areas.

Average number of bicycles by household surveyed	
Saganako	5.2
Douroula	7
Sapaga	3.5

Table 20: Average number of bicycle per household found in the surveyed regions.

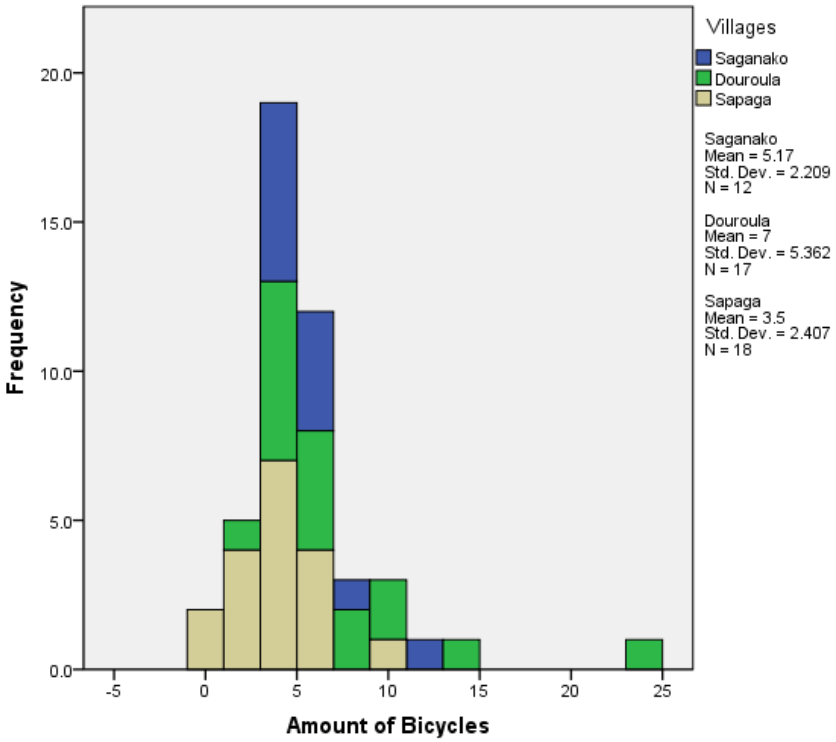


Figure 15: Number of bicycles measured per household in the surveyed regions.

A low number of available bicycles constrain a family's ability to improve its financial situation. Its limited mobility makes it hard for its members to increase productivity and thereby to generate a higher income and greater savings. As a consequence, the purchase of additional bicycles, which would be much needed to improve the economic situation, becomes very difficult. The advantages of the bicycle therefore remain inaccessible for the poorest of the poor until they make considerable efforts in order to gain the money required.

"I have been saving during two years to buy the bicycle. First I have maintained a separate field of peanuts only for this purpose. After having produced peanuts for one year I have used the resulting income to buy goats in order to raise them. The second year I continued to produce peanuts which I sold as well. In addition I had to sell four goats to gather all the money required to buy our first bicycle." (19.12.13-3)

Poor families throughout the surveyed regions proved to be persistent while undertaking an often yearlong effort to gather the demanded amount of money to purchase their bicycle. The importance of owning at least one bicycle cannot be underestimated. Moreover, families owning only a small number of bicycles experience a comparatively high marginal benefit with every additional bicycle. The larger the number of bicycles, the broader the possibilities

to increase the income and to make savings or to invest money into further income-generating activities.

5.10. Bicycle shortage

Although most of the prior described activities used to be done by foot some years ago, people in the surveyed regions nowadays draw on the bicycle as much as possible. Families unable to provide all their members with bicycles repeatedly face situations in which their members would argue about who would benefit from a bicycle more. It is normal to find a head of family forced to decide on who might be entitled to use the available bicycles. To do so means also to have to decide which activity is more important. The survey has shown that it is often to the disadvantage of the women that this selection occurs and, therefore, would have to conduct their tasks either by foot or be forced to postpone them to another day.

A household only having few bicycles available will arrange its daily routine in a way which allows them to make the best use of those bicycles. In such cases, the course of the day has been found to be organised in an unprecedented mixed form in which the "scarce resource bicycle" is used in the most efficient way. Families in such situations will conduct less highly prioritised activities on foot, as they have been doing before, and quite often an additional person will be riding on the back of the bicycle whenever possible. Women might tend to receive the bicycle to fetch water during the later evening hours when no other urgent activity has to be done. On the other side, new activities – such as selling agricultural products or merchandise on the market – which promise to improve the general situation of the family might be picked up earlier in the day. Nevertheless, families having to come to terms with a small number of bicycles tend to be prone to tensions when it comes to their allocation.

"There are difficult situations which have resulted into conflicts. Especially if the kids have to go to school while the father or the mother have the necessity to use the bicycle at the same time. Even worse is the case in which the tree children have to go by bicycle to different locations at the same time and one of them has just taken the bicycle and leaving the others without any means of transport." (19.12.13-3)

Having only a small number of bicycles available will inevitably create the problem of a zero-sum game which cannot be overcome without the availability of further bicycles. The

result is that a household in such a situation will inevitably feel the need to increase the amount of bicycles it possesses. Looking at the issue from the angle of improving mobility, a family with a small number of bicycles can be described to be in a transitional phase. The initial availability of a few bicycles in itself proved to be used as a possibility to improve the situation of a household in a slow but continuous manner. This process of improvement goes along with the slow purchase of additional bicycles. Family-heads throughout all the surveyed regions expressed their aim to provide each member of their family with a bicycle allowing them to follow their daily routine – as well as new activities – without being restricted. This however, will remain a difficult requirement for the near future since families in rural Burkina Faso tend to have a large number of members. Unsurprisingly, 94% of the families surveyed stated that they were still lacking sufficient bicycles to equip all their members.

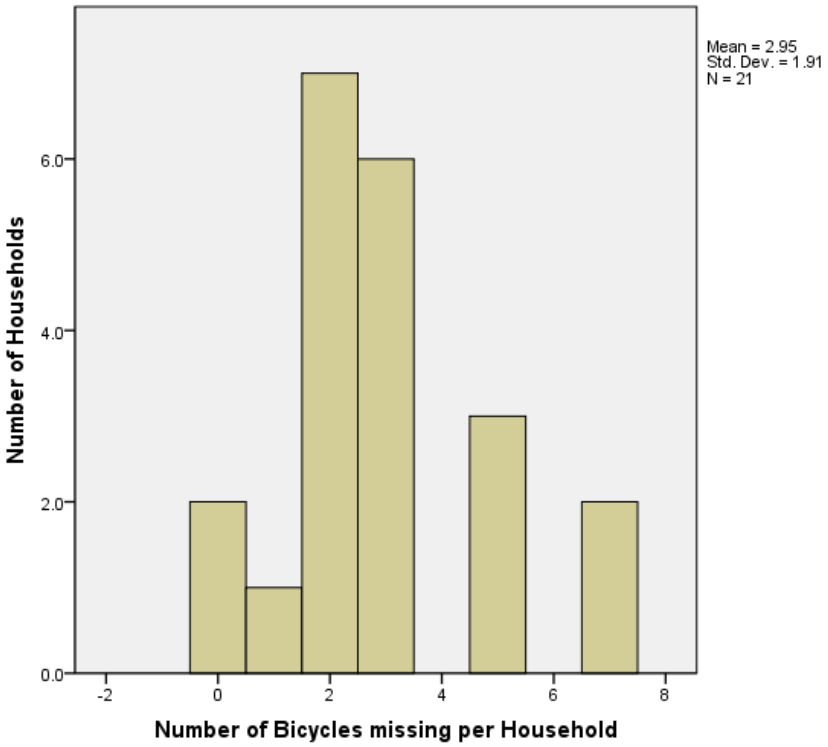


Figure 16: Number of bicycles yet required per household surveyed.

Picture 26: A Mother from *Sapaga* with her daughter expressing the difference between having a bicycle disposable or not.

"We have two women in our family. Both of them want to reach the field but there is only one bicycle available for them. Though, it is very likely to have problems between them because each of them wants to take the bicycle herself. Hence we face some difficulties. So in any case the upcoming year I will get the money to buy an additional bicycle for the wife." (13.12.13-2)

5.11. The critical mass of bicycle required

Due to the described circumstances it becomes apparent that the bicycle provides the possibility to improve the situation of a family in the longer term. However, it is not only important that every person obtains the possibility to use a bicycle, but also that the different activities can be scheduled well within a family if needed.

Certainly the most prominent example for this is the supply of food within a household. In some of the surveyed regions the family expects the women not only to prepare the meal but also to deliver it to the field to enable continuous work. When no bicycle is available, timing

becomes problematic because the women are being required to deliver the meals promptly. The situation becomes even worse when a woman has to set out on foot while having to retrieve water or firewood in advance. Accordingly, many of the interviewed families expressed their dissatisfaction of having to wait for the women delivering their food and being forced to take longer disruptions into account.

"I had the idea to buy a bicycle for my wife so that the work [on the field] could improve. If the wife does not have a bicycle the work becomes less. If you are hungry, you cannot work well. Hence, if the wife has to walk to bring the meal to the field the work cannot go on. Therefore, if the wife has a bicycle, she can prepare the food quickly and bring it to the field very fast. So we can eat well and then continue with our work." (05.12.13-1)

Similar scenarios arise where the work in the household depends on the support of several family members who have to coordinate their activities.

"To prepare dinner it takes fire wood and water which can be transported very quickly by bicycle. […] Without proving my mother with two canisters of water she cannot start to prepare food. Later I would also have to do my homework. Now I am able to transport two canisters of water by bicycle. Within one hour I am able to transport the entire amount of water needed for the day." (03.01.14-2)

As the given examples show, different activities are often related to each other and sometimes even result in an interrelated system. Since those activities depend upon each other, it is often essential to fulfil intertwined tasks at an equally high pace. It is therefore not sufficient that only some of the members within a family can enjoy the advantage of a faster ride. It is on the contrary indispensable for a family to reach a critical mass of bicycles which is necessary to allow a household to move ahead faster as a whole and not only as individuals. It is only then that a family can improve its living conditions while overcoming the difficulties caused by a shortage of bicycles. This has been described to be the case during the transition phase characterised by the presence of an insufficient number of bicycles. Being well aware of the need to have sufficient bicycles available, families in the surveyed areas undertook great efforts in order to provide all their members with a bicycle.

6. Results

6.1. The bicycle and its effect as capacitor

Following the activities of the population throughout the surveyed areas it becomes apparent that the role of the bicycle is a pivotal one. People without a bicycle will not be working less, but less effectively while being restrained from reaching bigger achievements. Nevertheless, they will be forced to bring up larger amounts of physical strength in order to make their living compared to those able to rely on a bicycle.

Having said so, it is crucial to understand that a bicycle being used by the rural population functions as tool providing its users the possibility to overcome their physical limitations. As such, the impact of the bicycle is not limited to the improvement of certain specific work, but provides the chance to accelerate all the activities it is being used with by advancing aspects like time efficiency, transport capacity, the required use of force, or the enhanced accessibility in an all-encompassing manner. In this way, starting to use a bicycle can be regarded as an initialisation enabling its users to overcome their restraints and, therefore, to reach an enhanced performance level leading to an improvement of their personal situation.

6.2. The impact of higher velocity

The positive impacts of the velocity of a bicycle in terms of time gained have been proven throughout the survey. Depending on the activity, the data collected in the field indicate a time efficiency increase of a factor two to three due to the higher speed when compared to walking. The positive impact of the additional time at disposal has been highlighted unanimously amongst all the interviewed partners in regard to all the activities done by bicycle.

The positive effect of being more time efficient cannot be underestimated. Taking farming as an example, the benefits of being faster – and therefore more time efficient – while using the bicycle become apparent. Regarding the gathered data; an average distance of 5.6 km to the

own field can be assumed which can be reached in 30 minutes by bicycle in contrast to 01:30 hours walking. By assuming an annual amount of 250 days of fieldwork[5] done by a measured average of six people per household we can assume a difference of 3 000 additional working hours available between a household which has no bicycle at all and one which has bicycles at everybody's disposal.

While taking into consideration that every additional bicycle is likely to be used by two persons[6], it can be estimated that the added value of one extra bicycle per household leads to 1 000 additional working hours per year on the field which can be translated into approximately 118 gained annual working days (at 8.5 hours per day).

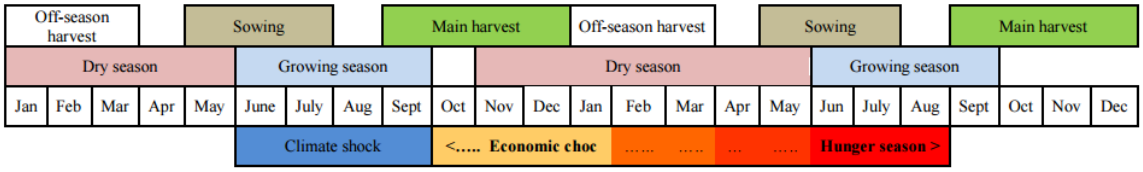


Figure 17: Annual agricultural activity calendar for rural Burkina Faso (Bonjean, Brunelin and Simonet 5).

As a result of the additional time gained through the use of bicycles, the rural population obtains the possibility to increase the amount of crops produced. Data gathered throughout the entire survey indeed show a positive correlation between the number of bicycles available and the amount of crops produced within a year. The relation between the actual size of the harvest and the number of bicycles available results on average in the linear function $y = 6{,}67x - 4.37$ which – *all things being equal* – indicates an annual increase of approximately 670 kg crop[7] produced per additional bicycle. Taking into consideration that

[5] Assuming an annual amount of ten months fieldwork (cf. Kusch 81-84; Waibel 70-71; FEWS NET; Bonjean, Brunelin and Simonet 5) while working on average 25 days per month.

[6] While heavy goods are used to be carried on the first few bicycles available additional bicycles are widely used to carry an additional person to the field.

[7] Lacking further adequate means, the amount of crop produced is widely measured in bags which are widely considered being equal 100 kg. Following the Ministry of Agriculture's measurement framework (GOBF MARHASA, Manuel de l'enqueteur 31) the actual weight of a bag can be regarded as lying approximately between 90 and 105 kg (cf. also FAO, Analyse des Incitations et Penalisations pour le Maïs au Burkina Faso 28).

the surveyed households produce an average of approximately 2 500 kg of crop per year[8], the impact of an additional bicycle has to be considered a significant benefit.

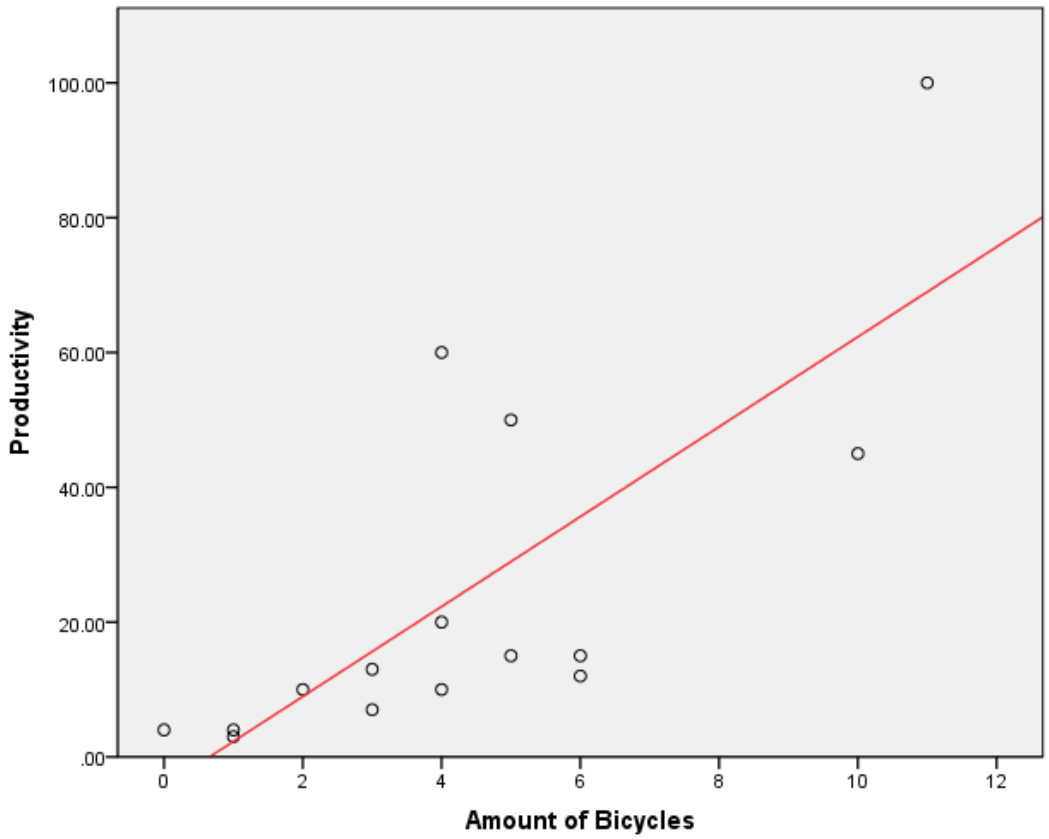


Figure 18: The evaluated impact of the bicycle upon productivity follows the function y = 6.670x - 4.370 indicating the annual production increase of about 670 kg of cash crop per additional bicycle.

The increase of crop due to additional bicycles will not only improve a family's food security but also its income. Regarding AGRAs bottom line survey (81-82) we can assume that a household in the province of *Boucle du Mouhoun* will sell 34% of its crop. A household in the province of *Les Cascades* even 52%. Making the calculations of adding an additional bicycle and therefore adding 670 kg of crops produced – while expecting the different crops being produced and sold in the same proportions – we can expect a household in *Boucle du Mouhoun* to increase its annual income from cash crop by 16.5%. A household in *Les Cascades* would be able to increase its annual gains by even 65%[9].

[8] Raballand, Macchi and Patracco (40) indicate that farmers in most rural areas in sub-Saharan Africa produce between one and five tons of crop annually. Savadogo (103-104) measures an amount of 2.9 to 3.2 tons annually for Burkina Faso.

[9] The price-niveau used for the calculation is based on data provided by *app.esoko.com* for the region of *Boucle du Mouhoun* and *Les Cascades* by the date of March 2015.

Staples	Boucle du Mouhoun	Les Cascades
Maize	109.38 kg	131.97 kg
Beans	13.97 kg	69.83 kg
Sorghum	130.42 kg	16.83 kg
Millet	1 812.6 kg	39.52 kg
Rice	4.47 kg	16.85 kg
Ground Nuts	27.78 kg	207.81 kg
Sweet potatoes	6.98 kg	41.13 kg
Sesame	159.5 kg	77.04 kg
Cassava	-	17.74 kg

Table 21: Volumes of Staples sold in *Boucle du Mouhoun* and *Les Cascades* (AGRA, 81-82).

Comparing the costs of increasing the amount of crops produced by the use of additional bicycles with the costs of the international food aid received by Burkina Faso, the advantage of the bicycle as a means to develop the living conditions becomes evident.

USAID's budget for 2013 (U.S. International Food Assistance Report 47) contains expenses of 4.646 Million USD needed to provide an assumed amount 359 600 people in Burkina Faso with 4 140 tons of foodstuff[10]. While regarding the estimated increase of 670 kg additional crop per bicycle produced, it can be assumed that the local farmers would have to acquire approximately 6 200 additional bicycles to produce the same amount of crop as donated by USAID in 2013. Paying about 75 USD per bicycle it can be said that it would cost the local population approximately 456 000 USD – less than 10% of USAIDs aid money – to obtain the necessary amount of bicycles to do so. Even if the impact of an additional bicycle is much less than assumed, the additionally gained work hours would still turn out to increase the amount of food available in a more cost effective manner than by simply donating large amounts of foodstuff.

It can be calculated that every additional bicycle will not only increase the harvest of the current year, but it will add to the quantity of crop produced in the subsequent seasons as well. This does not only make a bicycle a more sustainable choice to increase the amount of harvest produced in the long run but, moreover, it will further reduce the actual costs of producing additional crops according to the number of years a bicycle will be in use.

Taking the above mentioned examples into consideration, it can be said that the bicycle has a strong impact in the agricultural sector due to the higher velocity and the thereby resulting

[10] An additional 1 300 tons of foodstuff financed by USAID in 2013 (U.S. International Food Assistance Report 43) as measure of emergency relieve have been disregarded in this calculus due to the urgent needs.

increased time efficiency – a claim which has been recurrently stressed throughout all the interviews. However, the fact of becoming more time efficient not only increases productivity on the field but also allows one to gain additional free time which has been widely used by the people surveyed to engage in further income generating activities. While the bicycle's financial impact on the fieldwork can be estimated up to a certain degree, any additional income reached due to the use of the bicycle cannot be known without further research. Nevertheless, it becomes evident that gaining time while overcoming large distances much faster can be of crucial importance while trying to prevail over the poor financial situation facing most people in rural Burkina Faso.

6.3. The impact of the enhanced transport capacity

In addition to the higher speed, the use of a bicycle adds to the amount of weight which can be carried. The data gathered in the survey indicates that the transport capability can increase up to six times with regard to a number of activities, such as going to the field, visiting the market or transporting food, water or firewood.

Possibly the most persuasive way to highlight the impact of the bicycle's increased transport capacity is to look at the example of water gathering. In doing so, it has to be taken into consideration that the weight transported will be increased by a factor of three while carrying three canisters at the time instead of one. Having measured a daily consumption of 330 litres[11] on average per household, women – and often their children – are forced to make considerable efforts while carrying the required 13 canisters from the nearest source of water to their home. Due to the extensive effort, it is usually up to a larger number of people within a household to gather the required amount of water.

Depending on how fast a woman is able to ride on the natural paths it can be estimated that the use of a bicycle allows the required amount of water to be gathered approximately six to nine times faster. As a result, the amount of time used to do so can be drastically reduced. The figures below prove this to be true in particular for regions with difficult access to any water source such as in the case of the households surveyed in the surroundings of *Sapaga*.

[11] Gleick (88) estimates a daily need of 50 litres of water per person which would result in 350 to 400 litres daily according to the average household size of 7 to 8 people in the surveyed areas (cf. AGRA 35).

As a consequence, the availability of a bicycle strongly relieves women and children engaged in house work.

Making an example based on the moderate assumption that a person will be walking as fast as 4.5 km/h and driving a bicycle with 10 km/h while gathering a fixed amount of 330 litres of water it can be estimated that the bicycle provides the chance to save between 01:25 hours and 11:20 hours per day within the surveyed areas. Assuming a higher velocity for the bicycle the hours saved would turn out to be even higher.

Region	Average Distance	Time for one person to carry 330 litres	
		while walking (4.5 km/h)	while riding a bicycle (10 km/h)
Douroula	0.3 km	01:45 h	00:20 h
Saganako	0.95 km	05:30 h	01:00 h
Sapaga	2.37 km	13:45 h	02:25 h

Table 22: Amount of time required within surveyed areas to gather daily amount of water by walking and by riding a bicycle.

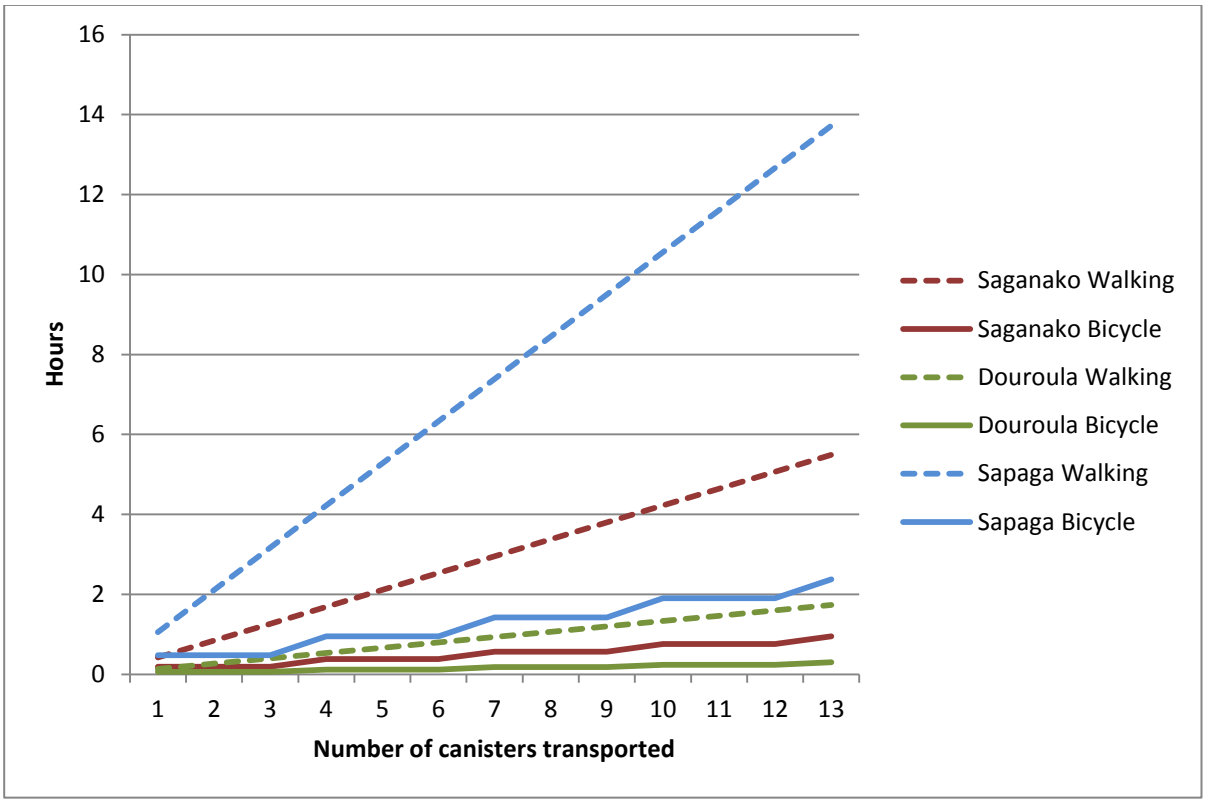


Figure 19: Amount of time required per number of canister transported for every surveyed area while walking at 4.5 km/h and while riding a bicycle at 10 km/h.

Since the impact of the bicycle's higher velocity has been previously shown, the figures can be adjusted in order to focus on the positive effects of the bicycle's increased transport capability. While doing so, it can be highlighted that the time being used to carry water by foot can already be reduced by 60% by taking advantage of the increased transport capability of the bicycle (in this case by the factor of three) without yet taking its enhanced velocity into consideration.

Taking note of the fact that the search for water is a recurrent task, women throughout Burkina Faso are engaged on a daily basis in order to provide their household with water. Adding together the time saved within a whole year, the impact of the usage of a bicycle can be shown at its full extent.

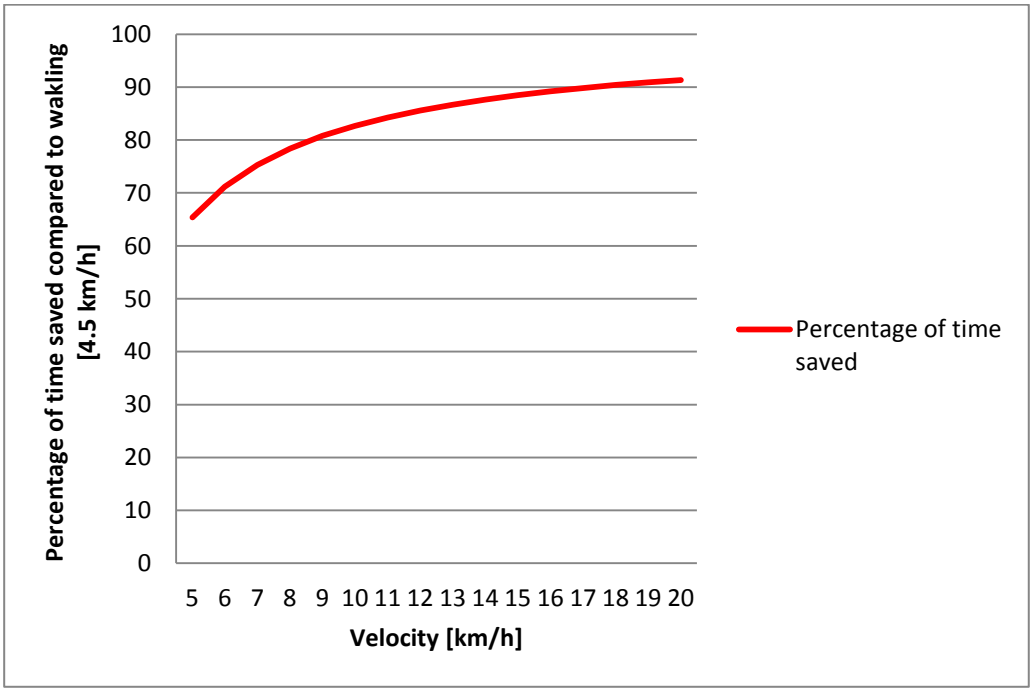


Figure 20: Percentage of time saved while using a bicycle (transport capability enhanced by factor of three) to transport any amount of water canisters at varying speeds compared to walking at the speed of 4.5 km/h.

	Hours required per day while searching 330 litres of water by walking	Time saved only due to the increased transport capability of bicycles while searching water			Time saved due to the use of bicycles at 10 km/h while searching for water		
		hours per day	hours per year	workdays per year	hours per day	hours per year	workdays per year
Saganako	05:30 h	03:20 h	1230 h	145	04:30 h	1656 h	195
Douroula	01:45 h	01:00 h	390 h	46	01:25 h	523 h	61
Sapaga	13:45 h	08:30 h	3082 h	362	11:20 h	4141 h	487

Table 23: Amount of time being saved due to the enhanced transport capability of the bicycle only and in total by using a bicycle in comparison to walking while gathering the daily required amount of 330 litres of water in the surveyed regions.

Although the impact of the larger transport capability and the higher velocity upon time efficiency vary from one bicycle user to another – depending on the actual speed and the weight of the goods transported – the impact of the enhanced transport capability cannot be underestimated. Regarding Figure 21, the differences between the impact of the higher speed and the larger transport capability becomes obvious. Although both factors will finally determine the benefits of the bicycle together, the impact of the higher load capacity prevails unless people are able to drive at a relatively high speed which proves to be rather difficult given the heavy weight of the goods transported and the poor conditions of the roads.

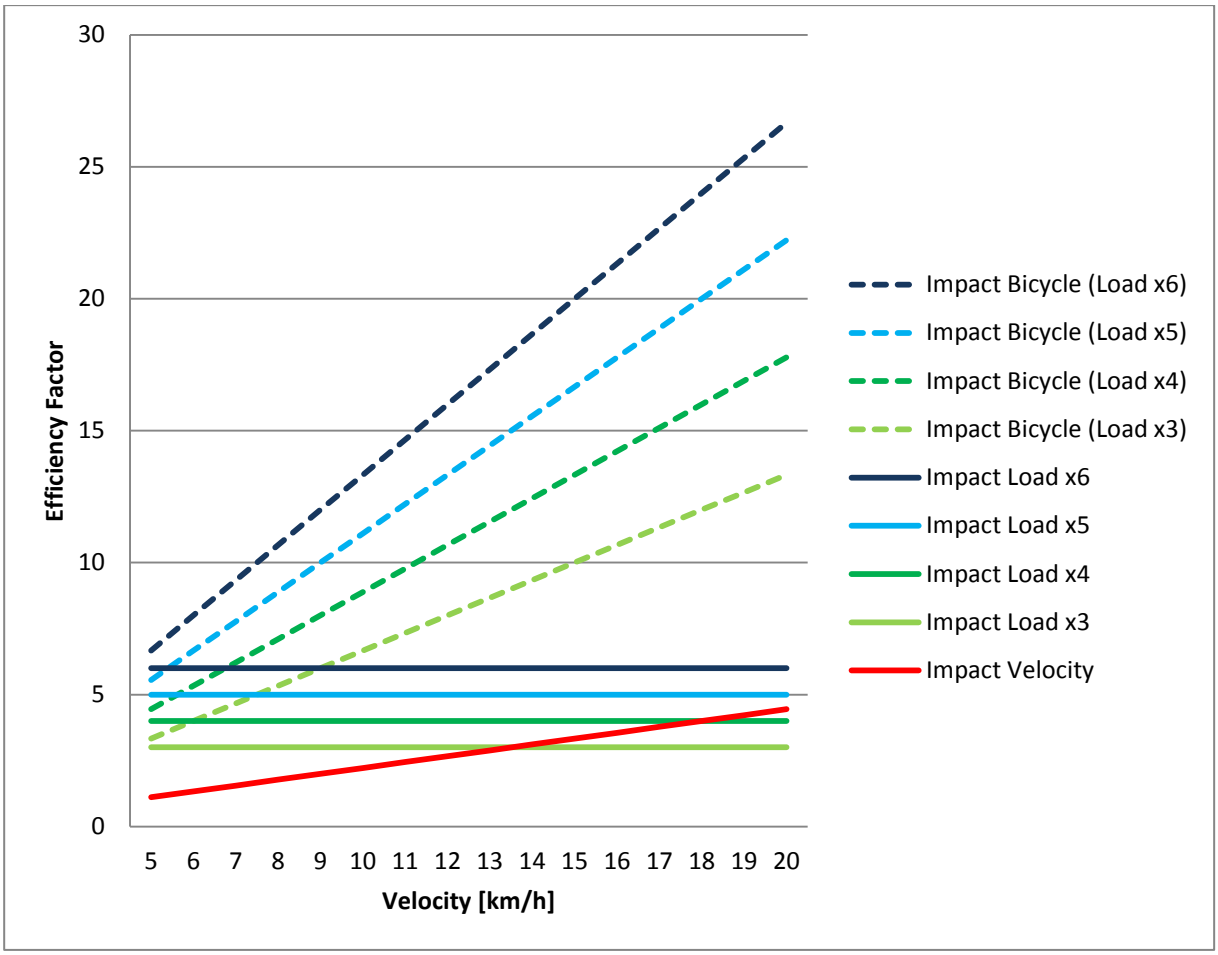


Figure 21: Both, the impact of the increased loading capability (factors of three to six) and the enhanced speed resulting in the overall factor of time being saved by the impact of the bicycle (again according the factors of the increased loading capability) compared to walking at the speed of 4.5 km/h.

The examples given emphasise the advantages of the bicycle for the transportation of two different kinds of goods.

On the one hand, predefined total amounts of goods to be carried from one place to another, such as a fix quantity of drinking water needed, or the total amount of crop harvested, can be transported much faster. Since the transportation of these goods cannot be neglected, the bicycle has become invaluable while reducing the time it takes to do so.

On the other hand there are a number of transport activities at which the amount of goods transferred is defined by the maximal weight being possibly carried at once. Examples are the sales at the market, the acquisition of merchandise or the transportation of maize to the mill. As the result of these activities is dependent upon the amount of goods transported, the

bicycle adds to the positive outcome mostly resulting in an increased amount of income achieved or a larger quantity of goods obtained.

In either case it is not only crucial to remark that the quantity of goods transported can be highly increased while the amount of time to do so is reduced, but also that the bicycle diminishes the required strength to do so. This can be considered a tremendous relief for those who have to carry considerable amounts of weight on their heads while covering large distances. Although not as easy measurable, this has been regarded as one of the bicycle's main benefit throughout the whole survey – particularly by women.

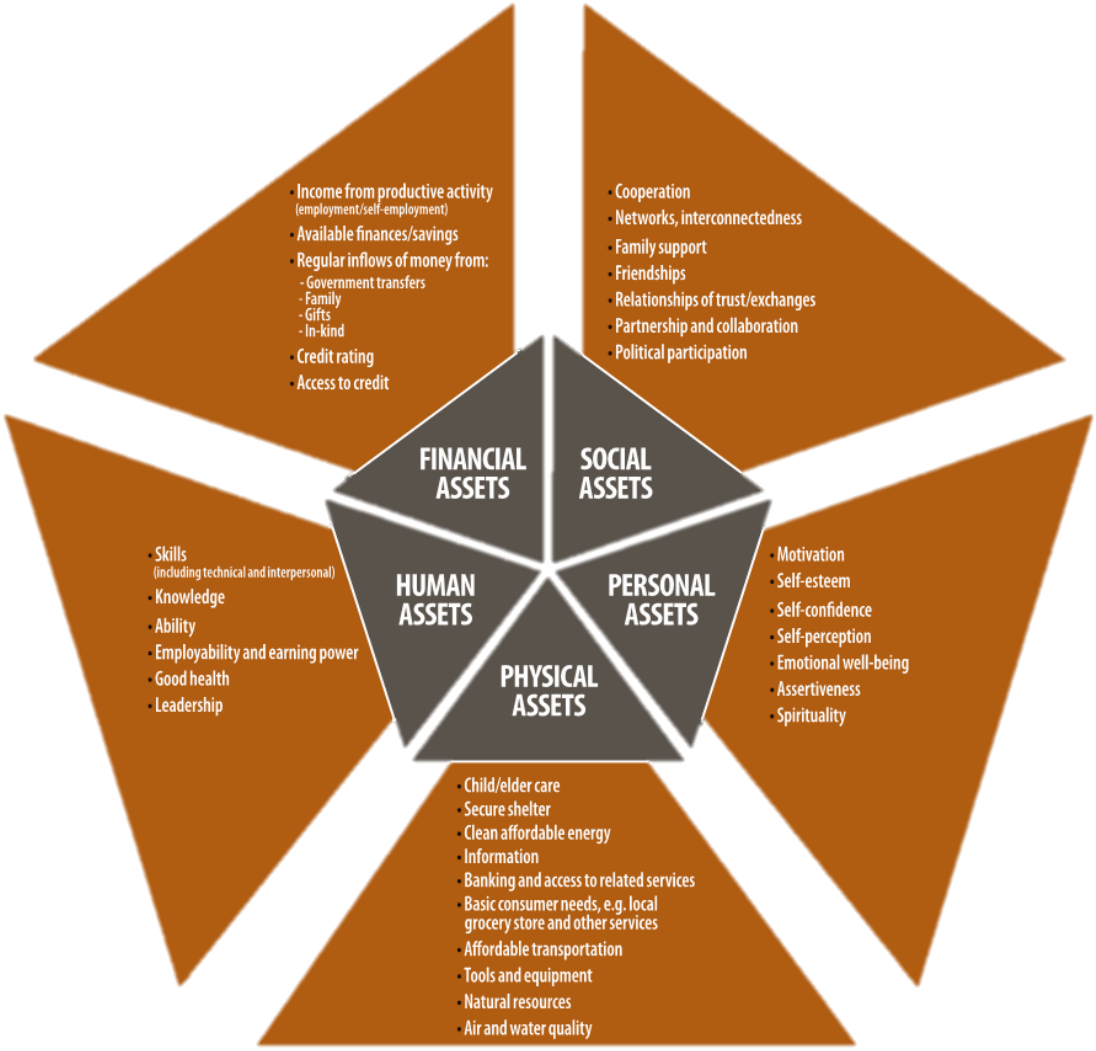
6.4. Overall Impact: The livelihood approach

In order to understand the impact of the bicycle in the broader context of poverty reduction, the findings of the survey will be regarded through the lens of the livelihood approach.

Taking Chambers and Conways (6) definition into consideration, which describes *livelihood* as comprising "capabilities, assets (stores, resources, claims and access) and activities required for a means of living", the central role of the bicycle in the life of people in rural Burkina Faso can already be realized. Being first and foremost an important *resource*, the bicycle evidently facilitates *access* to a considerable number of activities, services and institutions in the wider surrounding of the rural household and can therefore be described as amplifying the numbers of *assets* available. Furthermore, the findings of the study have been able to prove that the bicycle enhances people's *capabilities* to conduct their tasks by increasing their performance. As a result, the outlined advantages of the bicycle allow it to expand existing *activities required for means of living*, or allow one to engage in new activities that were before inaccessible. As such, it can be concluded that the bicycle touches upon the core of the three determining aspects emphasised and can, therefore, be described to have an integral impact upon livelihood as it is currently understood.

The full extent of the bicycle's importance while trying to reduce poverty becomes evident by taking the more specific *Sustainable livelihood Approach* (cf. DFID Section 1-2) into account. This approach looks closer at the assets at disposal as well as at their possible interconnectivity. While doing so, DFID (Section 2 5) requires the recalling of the possibility of having a multitude of benefits generated by a single physical asset and therefore encourages developing "an understanding of these complex relationships [while looking]

beyond the assets themselves". Having proved the pivotal role of the bicycle within a large number of activities it is important to emphasise its impact within the framework of *assets* which (within the SLA) describes people's endowments used while trying to overcome their difficult living conditions (*context of vulnerability*).



Picture 27: The five Asset building blocks of the *sustainable livelihood approach* (PHAC).

Being regarded as a physical asset insuring improved transportation it can be understood from the findings in the field that the bicycle affects a wide number of activities (see table 24) belonging to all of the five asset categories (see picture 27).

Impact of the bicycle encountered in the field	
Financial Assets	Improved income from several current and new income generating activities Ability to save due to increased income
Social Assets	Improved access to family and friends resulting in increased number of visits Improved access to social activities Improved ability to provide support of different kind to relatives and friends - provision of workforce - provision of food assistance
Personal Assets	Motivation to engage in work Increase in Self-esteem / Self-confidence Emotional wellbeing due to relief
Physical Assets	Improved access to services Improved access to basic needs Access to Health Care (particularly including child care) due to enhanced mobility and improved financial situation Access to information and public gatherings Enhanced transportation Improved food security Purchase of tools and equipment due to savings Improved housing due to savings
Human Assets	Increased ability due to higher performance Increased earning power due to larger and diversified income activities Improved conditions to participate at school Good health due to physical relief and the riding of a bicycle per se

Table 24: Activities found in the field enhancing the different assets of the sustainable livelihood approach.

While looking at the findings of the survey through the *sustainability livelihood approach* it becomes apparent that transportation and mobility is at the core of many activities building a livelihood. Therefore, the presence of the bicycle has been seen to improve the amount of *assets* disposable which leads to enhanced abilities to follow individual "*livelihood strategies*" designed to improve the own living conditions.

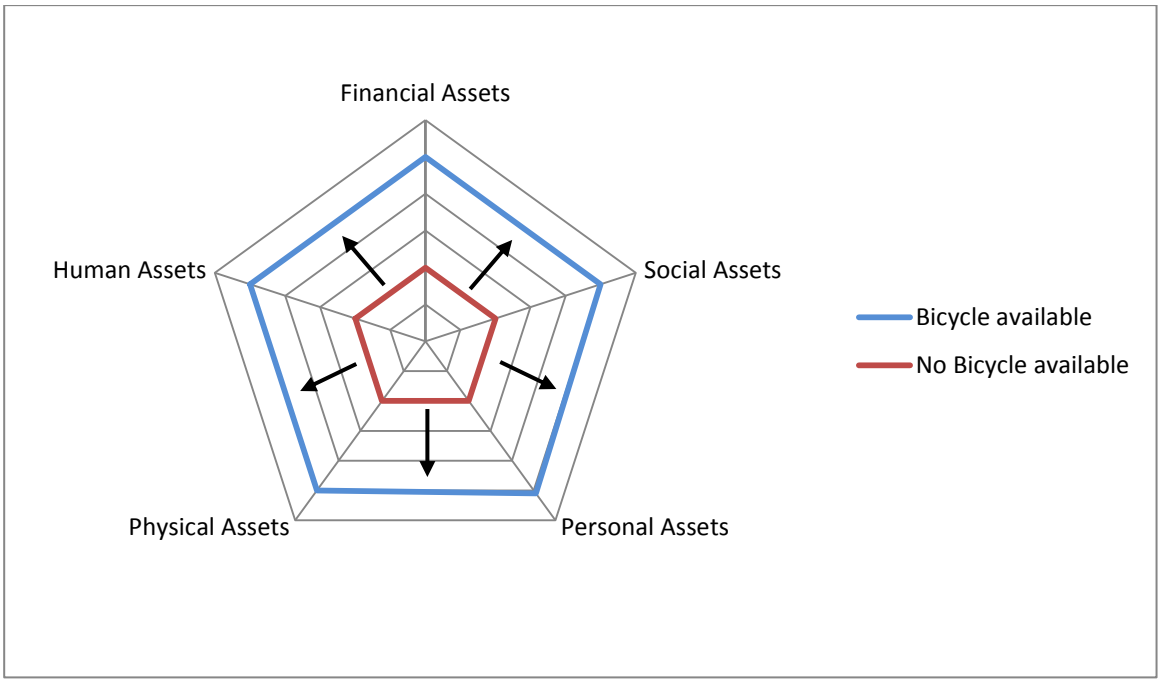


Figure 22: Schematic illustration indicating a possible increase in livelihood assets at disposal due to the availability of bicycles.

While regarding the circumstances it can be concluded that the large impact of the bicycle is based on the generally wide lack of any infrastructure throughout the rural areas. Not having the means to improve people's access to all their fields of activities through sufficient further infrastructural adjustments, the bicycle will maintain its crucial importance.

Over all it can be said that the usage of bicycles is not in and of itself intended to improve a particular aspect or to reach a specific predefined end state for the users, but to function as an enabler for people trying to improve their situation. Therefore, the bicycle can be regarded as being "person focussed" as it empowers the individual to apply personal assets while following their own strategy in order to overcome the circumstances of poverty predominant in Burkina Faso.

7. Conclusions

The aim of the current study has been to understand the impact of the bicycle in the daily life of people living in the rural areas of Burkina Faso. Thereby an attempt was made to focus on the importance of the bicycle as a means to address the difficult living condition prevailing in the areas surveyed. In order to do so, numerous qualitative and quantitative data have been gathered and analysed to provide an adequate answer to the question raised.

Following the findings presented, the bicycle can be described best in its function as a catalyst facilitating the activities for which it is being used. Depending on the kind of task for which it is being utilised, the bicycle provides a number of advantages such as a higher velocity of travel which results in saved time, the possibility to enhance the amount of goods transported while at the same time being less exhausted or the chance to enhancing the radius of movement.

As a result of these advantages the bicycle provides the chance to conduct a large number of activities in an enhanced way. As such, it is not only possible to accomplish tasks much faster but also to fulfil more tasks within a given time. As a consequence of this, the bicycle allowed its users to increase and broaden their productivity and therefore to enlarge their income. This higher amount of income received has widely been put into savings either to be invested in further income generating activities or been used to improve the overall living conditions.

Regarding the bicycle as a means to improve the situation of the people in rural Burkina Faso it has to be noted that the resulting enhancement of mobility is never an end in itself but is always used to facilitate a specific activity. Following the Sustainable Livelihood Approach the bicycle can therefore be understood as a means to augment the assets at disposal which are used to provide a living. Therefore, this empowers people to improve their livelihood while having the means to more easily follow their own initiative.

Taking everything into consideration, the impact of an enhanced mobility cannot be underestimated. As such, the results of the study emphasise that the bicycle is the very foundation for the population in the surveyed areas for development of their livelihood. It

can therefore be said that the bicycle is an indispensable means for people living in the rural areas of Burkina Faso to overcome their situation of poverty.

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10. List of Interviews

Nr.	Date / ID	Interview partner	Place	Coordinates
1	02.12.13-1	Household Village Chief	Saganako	-
2	02.12.13-2	Household	Saganako	-
3	02.12.13-3	Household	Saganako	N10 21 32.3 W4 05 35.2
4	03.12.13-1	Household	Saganako	N10 21 16.1 W4 05 35.2
5	03.12.13-2	Household	Saganako	N10 21 15.1 W4 05 36.2
6	03.12.13-3	Household	Saganako	N10 21 11.0 W4 05 41.8
7	03.12.13-4	Household	Saganako	-
8	04.12.13-1	Household	Outskirts of Saganako	10.337486 -4.128165
9	04.12.13-2	Group of Women	Outskirts of Saganako	10.337486 -4.128165
10	04.12.13-3	Household	Saganako	10.355065 -4.093115
11	04.12.13-4	Household	Saganako	-
12	05.12.13-1	Household	Dahoon	10.297976 -4.061944
13	05.12.13-2	Household	Dahoon	10.297433 -4.062112
14	05.12.13-3	Group of Women	Dahoon	10.297976 -4.061944
15	05.12.13-4	Household	Dahoon	N10 17 54.0 W4 3 45.6
16	08.12.13-1	Household	Saganako	10.306469 -4.115909
17	13.12.13-1	Household	Douroula	-
18	13.12.13-2	Household	Douroula	N12 35 10.9 W3 17 57.5
19	13.12.13-3	Household	Douroula	N12 34 43.3 W3 18 07.4
20	14.12.13-1	Household	Douroula	N12 34 49.8 W3 18 00.5
21	14.12.13-2	Household	Douroula	N12 34 46.7 W3 18 08.0
22	14.12.13-3	Household	Douroula	N12 34 49.8 W3 18 03.2
23	14.12.13-4	Household	Douroula	N12 34 43.0 W3 18 08.9
24	15.12.13-1	Household	Douroula	N12 34 58.6 W3 17 57.0
25	15.12.13-2	Household	Douroula	N12 35 09.7 W3 17 53.5
26	15.12.13-3	Household	Douroula	N12 34 54.8 W3 17 56.1
27	15.12.13-4	Household	Douroula	N12 34 45.7 W3 17 59.9
28	17.12.13-1	Household	Naraotenga	-
29	17.12.13-2	Health worker	Naraotenga	N12 29 10.6 W3 18 15.2
30	17.12.13-3	Household	Naraotenga	N12 29 05.2 W3 17 52.5

31	17.12.13-4	Household	Naraotenga	N12 29 32.1 W3 17 53.7
32	18.12.13-1	Household	Sá	N12 37 29.2 W3 18 24.3
33	18.12.13-2	Household	Sá	N12 37 26.9 W3 18 25.9
34	18.12.13-3	Household	Sá	N12 37 30.6 W3 18 22.3
35	18.12.13-4	Household	Sá	N12 37 30.2 W3 18 26.0
36	19.12.13-1	Household	Toroba	N12 27 40.2 W3 14 20.8
37	19.12.13-2	Household	Toroba	N12 27 39.2 W3 14 16.2
38	19.12.13-3	Household	Toroba	N12 27 42.0 W3 14 14.6
39	29.12.13-1	Household	Sapaga	N12 11 14.6 W0 25 46.1
40	29.12.13-2	Household	Sapaga	N12 11 10.5 W0 25 50.4
41	29.12.13-3	Household	Sapaga	N12 10 42.9 W0 25 25.9
42	29.12.13-4	Household	Sapaga	N12 10 40.2 W0 25 41.6
43	30.12.13-1	Household	Sapaga	N12 11 42.4 W0 26 00.5
44	30.12.13-2	Household	Sapaga	N12 11 56.3 W0 26 01.1
45	30.12.13-3	Household	Sapaga	N12 11 47.2 W0 26 00.9
46	30.12.13-4	Household	Sapaga	N12 11 46.3 W0 26 01.2
47	01.01.14-1	Household	Baka	N12 14 16.2 W0 24 29.1
48	01.01.14-2	Three Households	Baka	N12 14 16.0 W0 24 33.2
49	02.01.14-1	Household	Poessé	N12 14 45.5 W0 24 51.5
50	02.01.14-2	Household	Poessé	N12 14 42.3 W0 24 56.6
51	03.01.14-1	Household	Kolastenga	N12 11 07.7 W0 22 52.3
52	03.01.14-2	Household	Kolastenga	N12 11 21.1 W0 22 56.7
53	04.01.14-1	Household	Poessé	N12 14 23.8 W0 24 40.3
54	04.01.14-2	Household	Poessé	N12 15 03.5 W0 24 39.2
55	04.01.14-3	Household	Poessé	N12 15 05.4 W0 24 39.6
56	04.01.14-4	Household	Poessé	N12 14 22.5 W0 24 38.6
57	05.01.14-1	Household	Yargo	N12 14 47.8 W0 21 38.5
58	05.01.14-2	Household	Yargo	N12 14 51.4 W0 21 39.8
59	05.01.15-3	Household	Yargo	N12 14 33.1 W0 21 43.0

Annex I: Key figures

Given the results from the study and following all the assumptions, the impact of the bicycle in rural Burkina Faso can be highlighted by the following key figures:

- The availability of one additional bicycle for a family results in an additional 1 000 working hours on the crop field per year, which approximately equals 118 gained annual working days.

- The impact of an additional bicycle at a family's disposal has been measured to increase the amount of crop produced by 670 kg per year.

- Directing money into the acquisition of bicycles leads to an increase of crop produced up to ten times more cost efficiently then if the money for the bicycle would have been spent for the acquisition of food.

- Using a bicycle instead of walking allows the transportation of goods to become 7 to 20 times more efficient while saving about 80-90% of the time otherwise needed. In the case of women gathering water for their family at a distance of 1km – which is the furthest distance the Government of Burkina Faso is striving for (GOBF MARHASA, Annuaire statistique 2011 de l'eau potable 14) – the use of a bicycle leads to 1 745 hours (205 working days at 8.5 hours) gained per year.

Declaration of Authorship

"I hereby declare

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