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Migration driven by Electrification

The Impact of Electrification on
Growth Dynamics of Rural Areas
in Developing Countries

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Abbreviations and acronyms

EnDev	GIZ' Energising Development programme
FAO	Food and Agricultural Organisation
FDI	Foreign Direct Investment
FODIEN	<i>Fondo para el Desarrollo de la Industria Eléctrica Nacional</i> (National Fund for the Development of the Electricity Industry)
GDP	Gross Domestic Product
GIZ	<i>Gesellschaft für Internationale Zusammenarbeit</i> (German Development Cooperation)
GTZ	<i>Gesellschaft für Technische Zusammenarbeit</i> (German Technical Cooperation)
HDI	Human Development Index
ICS	Improved cooking stove
ICT	Information and communication technology
IDB	Inter-American Development Bank
IDS	UK's Institute of Development Studies
IFAD	International Fund for Agricultural Development
IMF	International Monetary Fund
MCH	<i>Micro central hidroeléctrica</i> (=micro-hydropower plant)
MDG	UN's Millennium Development Goals
MEM	<i>Ministerio de Energía y Minas</i> Ministry for Energy and Mining
mz	<i>Manzana</i> (=0.68ha)
PCH	<i>Pequeña central hidroeléctrica</i> (= mini-hydropower plant)
PRSP	IMF's Poverty Reduction Strategy Paper
PV	Photovoltaic
RAAN	<i>Región Autónoma del Atlántico Norte</i> Autonomous Region of the Northern Atlantic
SHS	Solar-Home-System
SL	Sustainable Livelihood
SLF	Sustainable Livelihood Framework
SIS	"Second income shop"
USAID	United States Agency for International Development

Abstract

Despite the fact that there have been many electrification projects in developing countries, little research has been done on their impacts on migration patterns. Most countries experience considerable rural-urban migration with controversial effects on rural communities. This study investigates whether electrification contributes to sustainable rural development and, thus, slows down the rural exodus. The study reports on research findings from three case studies in rural Nicaragua, two with access to electricity and one without. It aims to provide insight into the scope and depth of impacts of electrification on rural livelihoods and the links between electricity provision and rural migration. Structured and semi-structured interviews as well as participatory rural appraisal techniques allowed for the gathering of qualitative and quantitative data. The Sustainable Livelihood Framework provided a conceptual framework to evaluate the impacts. It was found, that lighting provided positive impacts on the rural poor's livelihood, but a higher one on the productive sector. All three case studies did not suffer from rural-urban migration, but have shown significant in-migration in the last years. However, the village without electricity supply attracted mostly farmers and day labourers from the nearby uplands, whereas the electrified communities attracted more businessmen and craftsmen. Thus, the study concludes that electrification is a key factor to incentivise skilled labour migration.

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1 Introduction

In our modern society energy is a ubiquitous resource: after work one drives home leaving the car in the lighted garage with its electrically opened door. Then (s)he gets a cold beer out of the fridge and relaxes in front of the TV while simultaneously checking eMails and facebook. It is hard to imagine a life without these amenities.

Nevertheless, worldwide 1.4 billion people still lack access to electricity and mostly rely on firewood or kerosene as their only energy source. While most cities have electricity, energy scarcity is mainly experienced in rural areas of developing countries: nine out of ten people without access to electricity live in these regions [OECD/IEA 2010].

Average living conditions in rural areas of developing countries are generally described as poor. However, the global community has decided to change this through the Millennium Development Goals (MDG) – a blueprint for international development agreed upon by the United Nations member states that aims to half the population living in poverty by 2015 while at the same time ensuring environmental sustainability.. The International Fund for Agricultural Development (IFAD), an UN agency, estimates that “at least 70% of the world’s very poor people” live in rural areas [IFAD 2010:16]. Therefore, access to clean energy technologies is seen as a key component of rural development and several governmental projects support this in order to improve living conditions and ensure sustainable rural livelihoods.

The higher living standard of many city dwellers obviously encourages people to move from poor rural areas to the countries supposedly richer urban counterparts. This process, known as rural exodus, was also seen in Europe during the 19th century industrialization and nowadays is observed in many developing countries. In particular, Latin America was affected by this trend when cities grew to megacities and many young, well educated people left rural areas. The proximity of the United States of America with its large labour market for immigrants further boosted this emigration.

How does electricity supply relate to this kind of migration? Does rural electrification significantly improve living standards and hence reduce rural-urban migration? Do rural villages with electricity supply become a “centre for development”? In order to investigate these questions I have selected three case studies in Nicaragua, a country were two out of

three households in rural areas lack electricity supply. However,, the current Sandinista government is making effort to improve the living standards of the rural poor. This study compares the economic and demographic development of three villages: one with a mini-hydropower plant (PCH, for its Spanish acronym), one with a micro-hydropower plant (MCH) and one without electricity supply.

Chapter 2 provides an outline of the problem and gives an overview of electrification and migration in developing countries. The importance of electricity supply in rural development is briefly discussed, as well as, the linkage between energy and poverty. A short overview on the state of electrification in the research area and programmes targeting electricity supply is also provided.

The sustainable livelihood framework is used to systemise information and compare the case studies. The framework and its adaptation to the study's needs are discussed in **chapter 3**. Furthermore, the section sets out the theoretical basics of migration and thus builds the foundation for further analysis.

On the basis of previous' chapter's discussion the research questions are defined and hypotheses are derived in **chapter 4**. Until today there are very few studies focussing on the impact of electrification on migration. Therefore, a mix of methods was used to investigate a broad range of livelihood aspects that need to be included in this study. The methods, as well as the scope and scale of the analysis are explained in depth in this section and the sequence of work is described. Last, a sketch of the Nicaraguan municipality of Waslala provides an overview of the study area and local circumstances

Chapter 5 is the core of the empirical work. An evaluation of dweller's livelihoods in three villages is provided to form a basis for the analysis. People's livelihood assets and strategies are assessed with regard to their migratory movements in the past years. A comparison of the three case studies completes this chapter.

Finally, in **chapter 6** the basic hypothesis are reviewed and the results are summarised. This section integrates the findings into the theoretical framework and seeks to enhance and further develop the approaches used.

2 Problem Statement

2.1 Energy and Poverty

Sustainable energy supply, electricity and cooking energy, is crucial to development. However, there are discussions on the importance of electricity supply and its link to development. Before reviewing the role of energy for poverty reduction the topic is introduced by discussing the political dimension and access to energy-policies.

Energy is one of the big cross-over topics of the 21st century since it is an important element of sustainable development. However, in the 1990s international organizations began to focus on economic reforms largely due to the strength of the Bretton-Woods institutions and relative weakness of the UN at the time. Energy and especially access to energy was not seen as a priority since there was little chance to create profit-making-businesses through basic energy supply [Lucas 2003]. Today, energy-issues are back on the agenda. After a superb development of European manufacturer of renewable energy equipment, new markets needed to be developed. The MDGs, as the leading targets in the field of international development, attaches importance to the elimination of poverty and, thereby, draws the donor's attention to rural issues. The "developed world" recognised that "[e]nergy plays a critical role in underpinning efforts to achieve the MDGs" [DFID 2002:7] and, finally, the World Bank and the International Monetary Fund (IMF) replaced their macroeconomic-focused *Structural Adjustment Programs* with more participatory and people-centred *Poverty Reduction Strategy Paper* (PRSP), thus giving more attention to rural peoples needs [IDA 2009; Modi et al. 2005; BMZ 2007].

There is no MDG goal specifically on energy; nonetheless, energy is crucial to many MDGs. But there is little doubt about that "[s]ustainable development will not become a reality unless close attention is paid to the services that energy provides" [Cherni/Hill 2009:646]. Table 1 summarises some contributions of modern energy supply to the MDGs. The term "modern energy" refers to both electricity supply and improved cooking stoves (ICS). Main advantages include lighting, refrigeration and improved information and communication technologies (ICT) on the electricity supply side and improved air quality and efficiency for the ICS.

Millennium Goal	Importance of energy
1: Extreme poverty and hunger	<ul style="list-style-type: none"> • Lighting: income generation in evening hours • Machines increase productivity • Staple foods need to be cooked
2: Universal primary education	<ul style="list-style-type: none"> • Electricity is needed for better schooling with ICTs • Lighting allows students to study in evening hours
3: Gender equality and women's empowerment	<ul style="list-style-type: none"> • Reduced indoor air pollution • Public lighting increases women's security • Efficient stoves may reduce women's workload, free time and thus increase income activities
4: Child mortality	<ul style="list-style-type: none"> • Less respiratory infections through better indoor air quality • Electricity permits water purification
5: Maternal health	<ul style="list-style-type: none"> • Better medical services including medicine refrigeration (e.g. vaccines) • Lower workload (less firewood is needed)
6: HIV/AIDS, malaria and other major diseases	<ul style="list-style-type: none"> • Lighting enables night availability of medical services • Access to ICT may provide better health information
7: Environmental sustainability	<ul style="list-style-type: none"> • Decreased demand for firewood results in lower rates of deforestation • Cleaner, more efficient fuels result in reduced greenhouse gas emissions

Table 1: Energy and the MDGs

Sources: DFID 2002:80/81; GTZ 2009

Studies confirm that there is a relation between economic, as well as, human development and energy. Figure 1 relates the countries per capita primary energy demand to its Human Development Index (HDI)-score. It seems that an HDI score of 0.7 can be achieved with a very low energy demand (below one ton of oil equivalent (toe) per capita). Scores beyond 0.75 almost always require a higher per capita energy demand. At the same time a maximum is achieved when the energy demand reaches four toe per capita. Beyond this point no increased welfare (according to the HDI) is measured. Furthermore, the figure shows the difference between OECD and non-OECD countries: the former generate higher well-being with the same energy inputs. Thus, low energy inputs are not the only obstacle to development. Nevertheless

energy efficiency is still significantly lower in non-OECD countries and efforts to improve this situation can be expected to produce some positive results.

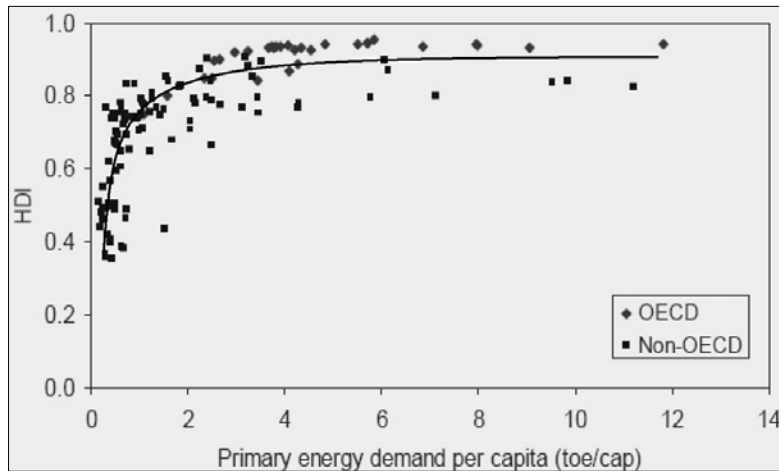


Figure 1: Primary energy demand and HDI

Source: adapted from Kumar, undated:6

2.2 Electrification as a Key Component of Rural Development

Electricity is the most versatile form of energy. It can easily be transformed into mechanical work (by an engine), heat (by an electric stove) or light (in a bulb). However, 1.4 billion people still do not have access to electricity [UNDP/WHO 2009]. This figure has hardly changed within the last 40 years although the regional distribution has. In the 1970s almost four in five electricity lacking people lived on the Asian continent. Today it is “only” every second (see Figure 2), but the situation in sub-Saharan Africa is worse than ever, although the electrification rate is slowly increasing [IEA 2002:380].

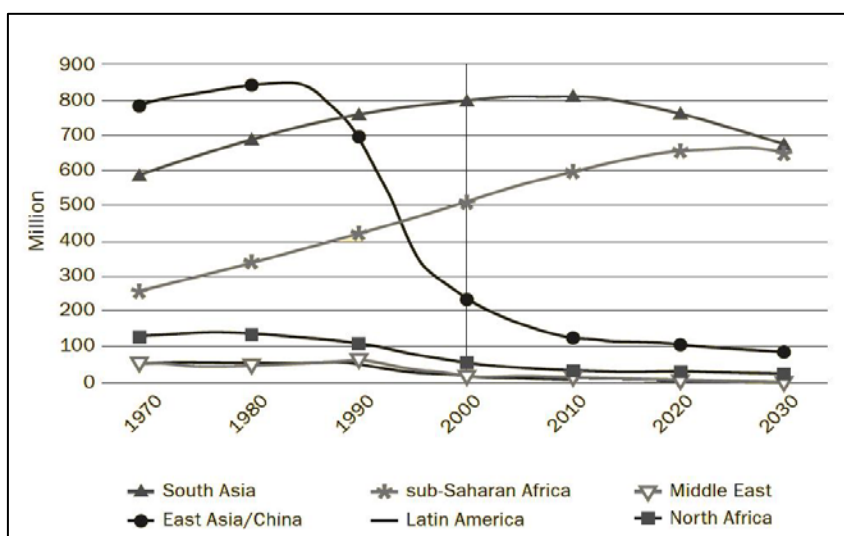


Figure 2: Number of people without access to electricity 1970 – 2030, by region (2000)

Source: adapted from IEA 2002 according to Modi et al. 2005:11

The relation between human development and energy consumption was discussed in the previous chapter. Similar relationships can be established between access to electricity and well-being. Figure 3 points out this linkage. However, in contrast to the exponential relationship between the HDI and the primary energy demand, this one is rather linear. This points out the importance of “access to energy”-programmes: regions without access hardly develop, while there is big range of development between countries with some energy consumption. Low electricity access rates mostly in sub-Saharan Africa (SSA) correlate with lower well-being and higher electrification rates usually align with higher levels of development. However, there are few in-depth evaluations of rural electrification programmes and their contribution to sustainable development [Ilskog 2008]

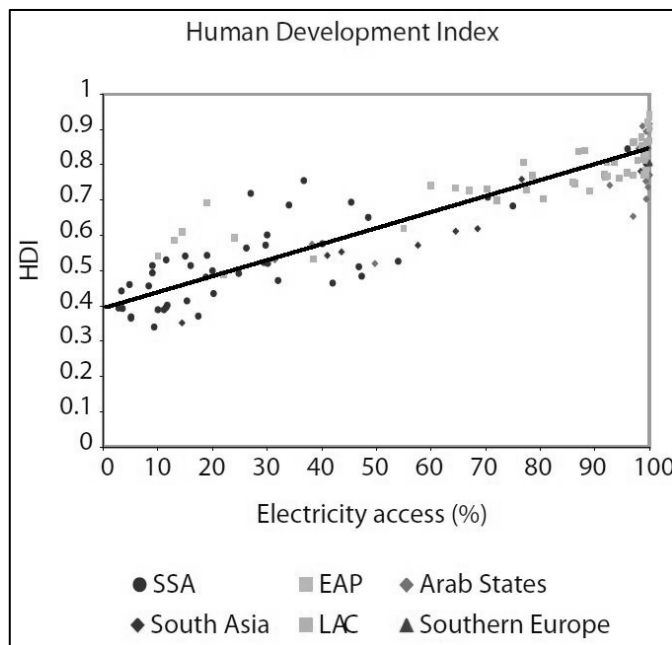


Figure 3: HDI and electricity access, 2007

Source: adapted from UNDP/WHO 2009:36

Looking at the micro-level, rural electrification has a high impact on development. In particular, the productive sector depends on electricity. The most obvious benefit of electrification, the light, has a huge impact on production: business hours are prolonged and production becomes more flexible, which allows individuals to pursue different livelihood activities [Kooijman-van Dijk / Clancy 2010]. Other benefits include the development of new businesses; and the availability of electric machines and fridges to establish carpenter’s shops and sell refrigerated beverages.

One study found that rural electrification with renewable energy technologies is not “considered to be directly pro-poor oriented” in any case [Kürschner et al. 2009:43]. Specifically, high costs of the technology itself (esp. if photovoltaics are used) and high complementary investments such as electric appliances exclude the very poor from profiting from the programmes [Valencia/Casparly 2008]. Yet, limited market for services and luxury goods limits the chances for poorer villages to benefit from the above stated advantages for the productive sector [Kojiman-van Dijk 2008].

However, Cherni and Hill (2009) argue that there are several methodological difficulties linking energy supply and impacts on the livelihood. Typical economic measures are good for analysis in developed economies, but are “ill-suited” for assessing impacts in countries where large informal economies dominate. Economic measures, such as gross domestic product (GDP) per capita, cannot evaluate rural areas since most income is generated in subsistence farming and not measured by the GDP. Furthermore, few businesses in these areas are registered and the informal sector is predominant. Cherni and Hill conclude that “conventional methods of wealth assessment are unhelpful [...] when applied to rural livelihoods” [ibid: 645]. Therefore, it is crucial to complement quantitative measures with qualitative data and enhance the quality of plus verify quantitative data. The methodology of this study is further elaborated in section 4.2.

Obstacles to Rural Electrification

Rural electrification is a prominent element of nearly all national development strategies. However, it is quite a challenging task since there are several obstacles to overcome. Kaygusuz, a Turkish energy scientist, nicely summarises the “dilemma of rural electrification” as follows:

“The crux of the rural electrification dilemma is that electricity is an expensive, high-quality energy source that practically all rural people want but only some can afford.” [Kaygusuz 2011:942]

Furthermore, electricity is labelled and seen as a basic need and, hence, people expect and claim cheap electricity services. Indeed maintaining a reliable, high-quality service is expensive and despite high governmental subsidies electricity usually is more expensive than other basic services, such as water and schooling [ibid.]. Electricity access by itself is of little use, if no additional investments are made in appliances to profit from services electricity provides for

the productive use; often such complementary investments are lacking and, hence, the impact of electrification programmes is rather small [Valencia/Caspary 2008].

Another obstacle which is not only observed in developing countries is a lack of information of policy maker. This includes technical knowledge as well as the mechanisms for promoting renewable energy technologies and developing appropriate financing structures. As a result the normative framework and national regulation is underdeveloped and does not provide incentives for investments in renewable energy technology [AMUNIC 2008]

2.3 Rural Electrification in Nicaragua

Lack of electricity supply is a significant problem in poor economies, particularly in South Asia and sub-Saharan Africa (see Figure 2). On a relative scale, Latin America is well-off. However, there are intra-regional differences: Figure 4 illustrates the share of people without access to electricity globally. Most notable is the disparity between sub-Saharan Africa and South America: all countries in South America have electrification rates above 75% compared to rates below 50% in SSA [UNDP/WHO 2009:11].

In Latin America only three countries have rates below 75%: Haiti, Honduras and Nicaragua. However, the situation in, for instance, Nicaragua is getting better: in 1971 only 30% of Nicaraguan households had access to electricity. This rate increased gradually to 65% in 2009 or 390.000 dwellings without access to electricity. The *Inter-American Development Bank* (IDB) estimates that 50.000 of these are connected illegally to the grid which leaves 340.000 households without access to electricity [IDB 2010:1]. The supply situation in rural areas in Nicaragua is worse: in 2008 only 42% of the households could count on electricity [UNDP/WHO2009].

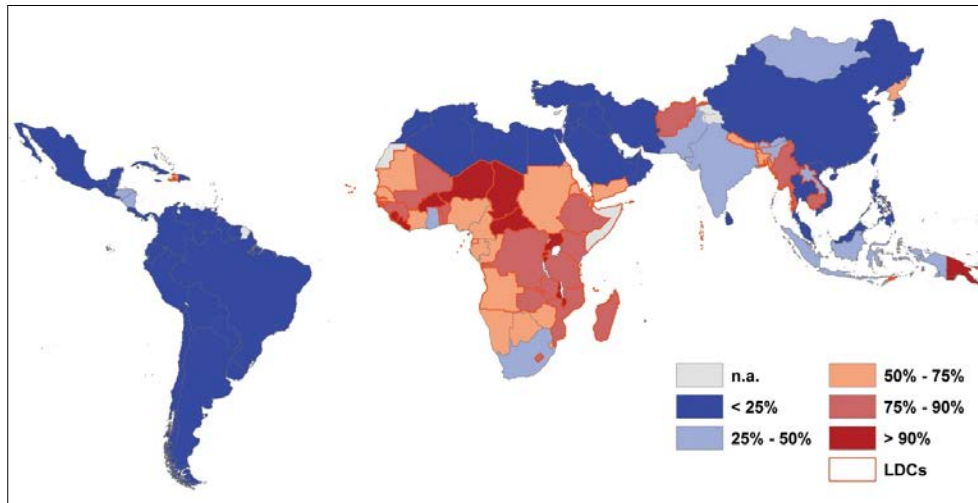


Figure 4: Share of people without electricity access for developing countries, 2008

Source: UNDP / WHO 2009:11

The Government of Nicaragua has set ambitious targets to accelerate electrification efforts. Central American countries agreed on a common goal: In 2020 nine in ten households should have access to electricity. In order to achieve this target, the government set a milestone of an electrification rate of 85% by 2014. At the same time, the power park fleet is to be changed: by 2020 renewable energy should account for 90% of the national electricity generation [IDB 2010:14]. Reaching this target will be a challenge: today's electricity mix is dominated by conventional thermal power plants. Renewable energy sources (mainly hydropower and geothermal) represent only 25% of the mix, but, according to the IDB, only 5.2% of their full potential has been developed [INE 2011; IDB 2010]. According to Humberto Reyes, the director of the national Fund for the Development of the Power Industry, the focus will be on the development of hydropower. Only communities without access to a river or wide-spread communities will be electrified with solar home systems [GIZ 2011]. The most challenging task concerns the disparities within the country. Figure 5 (on p. 10) shows the discrepancies between the relatively well developed west of the country and large parts of the Northeast and East. In many of these areas less than one in five households has access to electricity.

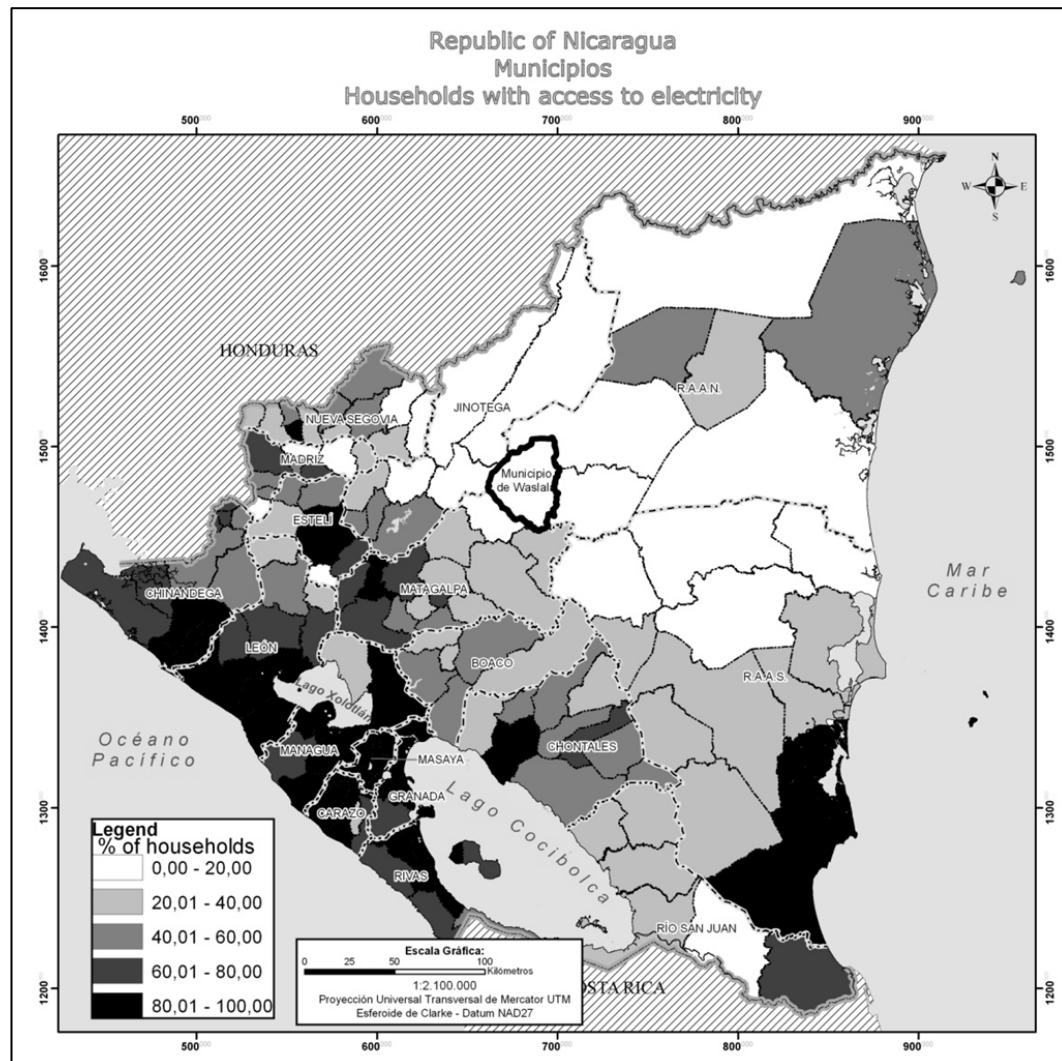


Figure 5: Map of Nicaragua: Electrification rate

Source: INIDE 2005c (adapted)

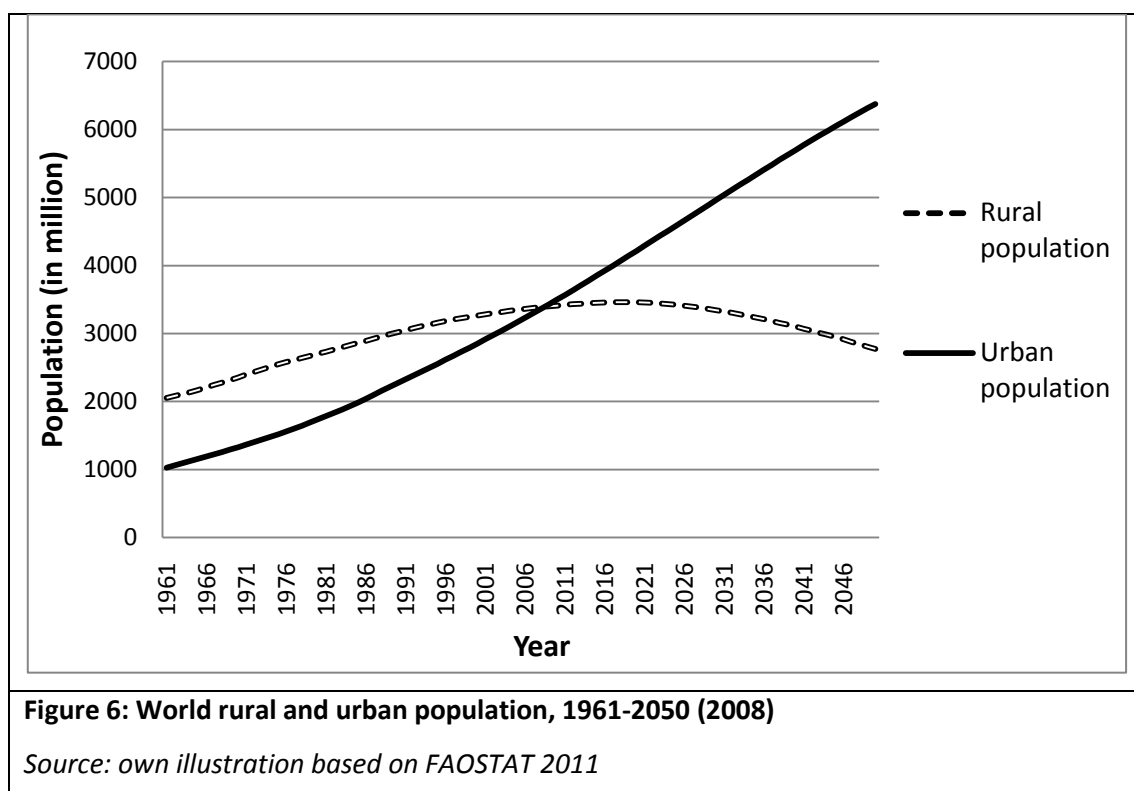
The biggest programme in the Nicaraguan electricity sector is the multi-donor *Programa Nacional de Electrificación Sostenible y Energía Renovable* (PNESER). The programme has a volume of US\$ 381 million of which US\$ 113 million is designated to rural electrification by grid extension. Within this project approximately 117.000 of the remaining 340.000 households will be connected to the electricity grid by 2014 [IDB 2010].

The *German Development Cooperation* (GIZ), formerly *German Technical Cooperation* (GTZ), carries out rural electrification projects through the Dutch-German Partnership *Energising Development* (EnDev). The programme is funded by the Dutch governmental development cooperation (DGIS) and the German counterpart (BMZ). EnDev develops projects of rural electrification in more 22 countries in Africa, Asia and Latin America. In Nicaragua the

programme has three different components: a) grid extension and densification, b) Photovoltaics (PV) for households and c) Micro hydro power plants. Through this program ten thousand households have been provided with electricity. Two hydropower plants co-financed by the GIZ are used as case studies in this paper.

2.4 Rural-urban Migration and its Assessment

The world's population is increasing and particularly towns and cities are growing. Fifty years ago two billion people lived in rural areas whereas only one billion people lived in their urban counterparts. However, intense urbanisation and rural exodus led to fast growing cities.



In 2009 the world's urban population (3.43 billion) exceeded the rural population (3.40 billion) for the first time in history. As shown in Figure 6 the Food and Agricultural Organisation (FAO), a UN body, estimates that the number of rural dwellers will start to shrink around the year 2020 while urban areas will continue to grow [FAOSTAT 2011]. Although the total rural population is still growing, people tend to leave these areas. According to a FAO study some 800 million people left the countryside in the past 50 years and moved to a city [FAO 2006].

The situation is the same all over the world: the share of people living in rural areas is decreasing. However, this trend started earlier in some countries and later in others; in Europe

the urbanization started along with the industrialization. Labour was needed in the new industrial towns and the industrialization of the farming industry decreased the need for workers in the countryside. Thus, people left the land in search of a better life in the city. In Latin America, colonization led to disparities in living standards with relatively developed central regions and poor peripheral regions. Trade and economic policy after independence (e.g. liberalization and imports substituting industrialization) favoured investment in central regions and thereby sharpened internal disparities. At the same time urgently needed land reforms were never undertaken and rural populations continued to be discriminated against. These and other factors caused significant rural-urban migration and increased the urbanization level from 25% (1925) to 41.4% (1950) and eventually to 80% in 2008 [Cerrutti/Bertoncello 2003, FAOSTAT 2011, Gans 2001a].

Today, Latin America is the second most urbanised region in the world after North America. This is largely due to development that has taken place in the past 50 years (see Figure 7). Latin American urbanization has outpaced European urbanization and the continent is getting close to being as urbanised as North America. Nowadays, only one in five people in Latin America live in the countryside. By 2050 it will be one in ten. Nevertheless, there are large differences between countries within the region -Argentina, Uruguay and Venezuela (among others) have already reached an urbanization level of more than 90%; whereas, in other countries such as Guyana and Guatemala, more than half of the population is rural [FAOSTAT 2011].

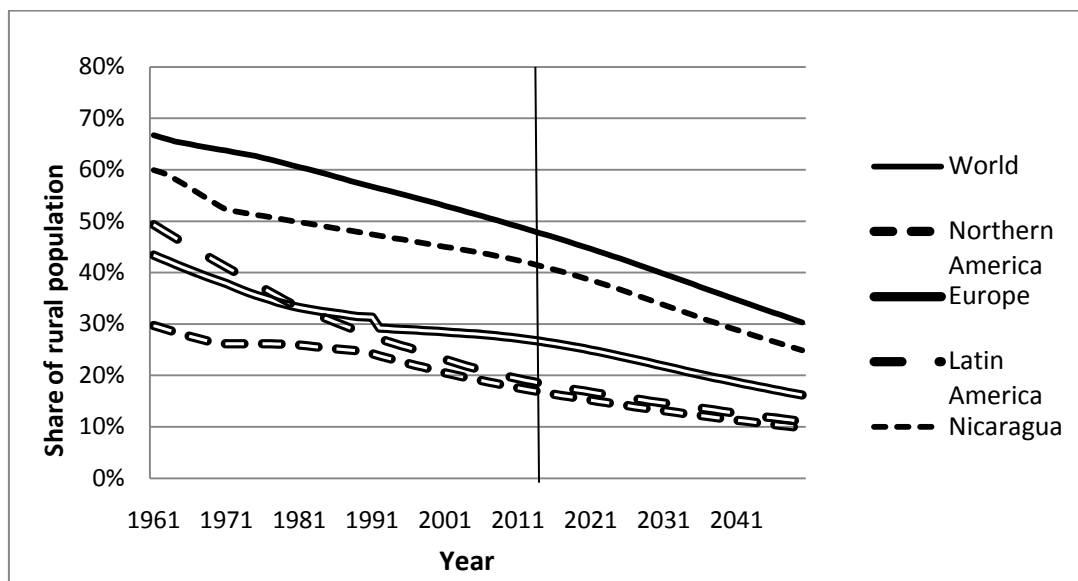


Figure 7: Share of population living in rural areas 1961-2050 (2008)

Source: Own illustration based on FAOSTAT 2011

Many countries in Central America (especially the smaller countries) have historically faced rapidly changing political situations and armed conflicts. This is also reflected in their urbanization process. Table 2 illustrates the share of rural-urban net migration in urban growth in Nicaragua and Latin America. Nicaragua has had high rural-urban migration with a steeply decreasing share of rural population until 1970. The curve then flattens as net migration to urban areas decreases to almost nothing between 1980 and 1990. Why is this?

	1950 - 1960	1960 - 1970	1970 - 1980	1980 - 1990	1990 - 2000
Nicaragua	31.5	39.8	17.7	1.0	10.3
Latin America	46.4	45.8	42.3	41.6	38.4

Table 2: Rural-Urban net migration as a component of urban growth in Nicaragua, 1950-2000

Source: adapted from Cerrutti/Bertoncello 2003:9

Internal conflicts in Nicaragua are certainly one reason. The 1979's Sandinista revolution and the following *contra*-war against the Sandinistas from 1981 until 1990 may have held people back in the country or made them flee out of Nicaragua. The Sandinista government, contrary to the previous one, pursued a policy of rural development. A land reform guaranteed small scale farmer access to land and co-operatives were formed in the 1980s. Since small scale farming is more labour intensive, more peasants were needed in the country [Fitzgerald 1985]. Furthermore, Managua, Nicaragua's capital and biggest city was completely destroyed by an earthquake in 1972 and then Somoza's government did not show much interest in reconstructing urban dwellings. So, both push- and pull-factors both contributed to rural migration.

Rural exodus is typically associated with negative impacts. Generally, economists have a positive perception of the free flow of labour, whereas social scientists and the non-governmental sector tend to be more reserved. For instance, Momagri - a Paris-based development NGO, outlines the consequences for urban development and infrastructure which cannot "accommodate these populations": "shanty towns represent most urban growth", which absorb many of the migrants [Bianco, undated]. Furthermore they bring up high urban unemployment rates and unfavourable health conditions of slum dwellers. Growing cities have serious environmental problems and face socio-economic challenges: Coy and

Kraas (2003) mention for instance the development of “diffuse Zentralität” (diffuse centrality) and upcoming inhomogeneity of urban spaces, among other challenges for urban planning. Fast urbanization concentrates poverty in urban areas; the United Nations Population Fund (UNFPA) calls this “Urbanization of poverty”. However, the fund emphasises the chances for a development aid since people are easier to reach in cities than in dispersed settlements. Nonetheless, the overall evaluation of rural-urban migration seems to be negative [UNFPA 2007].

An economic view of the phenomenon is provided by the World Bank’s *World Development Report 2009* which is subtitled “Reshaping Economic Geography”. To explain the “clustering of talented people” in cities basic economic laws are applied: “factors of production [...] move to places where they will earn the highest returns” and “skilled labor [...] earns higher economic return where it is abundant” [IBRD 2009:146]. Therefore, rural-urban migration is, economically, highly desirable in order to increase returns of inputs. The report suggests that there is no negative impact on the “stock of knowledge”, such as a brain drain, in rural areas. Quite contrary the authors argue that migrants keep “strong and active links” with their home community and “bring back ideas, knowledge, expectations of good governance and links to leading markets” [IBRD 2009:159]. The problem is seen in local policy-makers who have been “conditioned” by outdated literature on the danger of a rural exodus.

However, the World Bank only considers impacts of migration in the areas where (human) capital is accumulated. And, indeed, there is little doubt that “internal migration in LDCs [Least Developed Countries; H.D.] is welfare-improving in receiving regions” [de Haan 1999:29], but the effects on peripheral regions is much less studied. However, studies indicate that there are positive impacts of out-migration in the country. First, family migrants help overcome liquidity gaps and investment in means of production. Taylor and Lopez-Feldman [2010] showed that rural households in Mexico with family migrants “significantly increased incomes as well as the productivity of land” [ibid:82]. However, they also found that these positive effects take time to be realised and analysed in the long run.

3 Theoretical and Conceptual Basics

3.1 Migration

When thinking of migration, Europeans usually refer to foreigners from developing countries who migrate to Europe. The term is commonly used for these types of permanent and international movements of people, but migratory movements are not always permanent, nor international. In fact, the largest movement of people is non-permanently and internal: every year dozens of millions are travelling within China to be with their families for Chinese New Year. Sixty million Chinese people travelled on the last day of the 2006 festivities. Similar mass-movements occur on Thanksgiving in the US and on Christmas in European countries [IBRD 2009].

Despite the huge media coverage on international migration, it is not the largest flow of people. Instead, internal movements from “economically lagging to leading rural areas” [IBRD 2009:147] are more significant. Therefore, it is important to distinguish the different forms of migration carefully. Generally there are sub-types of both, internal and international migration and criteria for classifying types of migration: e.g. time (permanent or temporarily); distance (long or short); decision-making (voluntary or forced); reasons (e.g. economic or social) [Ellis 2003; Johnston 2000].

3.1.1 Laws of Migration

Migration and its analysis has been a key topic in geography for many years. The German-British geographer Ernst Georg Ravenstein was one of the founders of modern research on migration. In the late 19th century he wrote a series of papers titled “The laws of migration” in which he derives a series of “laws” from his analysis of human movements in European countries [Ravenstein 1889]. Later Grigg [1977] summarised his work and condensed eleven basic laws of migration. Some of the “laws” that are relevant to this study are as follows:

(1) “The majority of migrants go only a short distance” and (2) “[m]igration proceeds step by step” [Grigg 1977:42]. Thus, internal rural-rural and rural-urban migration is a first step, before transboundary migration might take place. These first two laws are widely accepted and countless times proved.

(10) “The major direction of migration is from the agricultural areas to the centres of industry and commerce”. This migration flow (9) “increases in volume as industries and commerce

develop and transport improves” [Grigg 1977:43]. However, the volume of migration from rural areas directly into industrial centres is “excessively small” and migration would still happen step-by-step. Ravenstein concludes that the main reasons of migration are economic.

(11). While most of his “laws” were valid throughout the years, the last one remains to be controversial. Many authors point out that important causes for migration are not only economic ones, but based on social processes and historical and cultural criteria [see Bähr 2010; Ellis 2003; de Haan 1999]. Ravenstein based his research on British Census data spanning from 1841 until 1881. Later he included those from other European countries and North America [Ravenstein 1889].

3.1.2 Migration Patterns

As shown in the previous sections there are different reasons and forms of migration. However, these reasons are not fixed, but change over time. In order to analyse this change in migration patterns, two hypotheses will be used here: for the analysis of spatial mobility flows Zelinsky’s hypothesis of mobility transition and for the analysis of urban and spatial development Richardson’s polarisation-reversal-hypothesis.

Mobility Transition

Wilbur Zelinsky, an American geographer, analysed these different mobility patterns and found that “[t]here are definite patterned regularities in the growth of personal mobility through space-time”. He argues that these regularities are “an essential component of modernization process[es]” [Zelinsky 1971:221-22] and that they depend on the type of society, i.e. the stage of development of the country. Figure 8 illustrates these trends and the respective stages of modernization.

Zelinsky published his “Hypothesis of mobility transition”, which links the two “axiomatic items”: the *theory of demographic transition* and Ravenstein’s *laws of migration*. The theory of demographic transition suggests that the more developed a society is, the lower its death- and birth rates; this is why migration becomes a more crucial factor for demography [Caldwell et al. 2006; Zelinsky 1971].

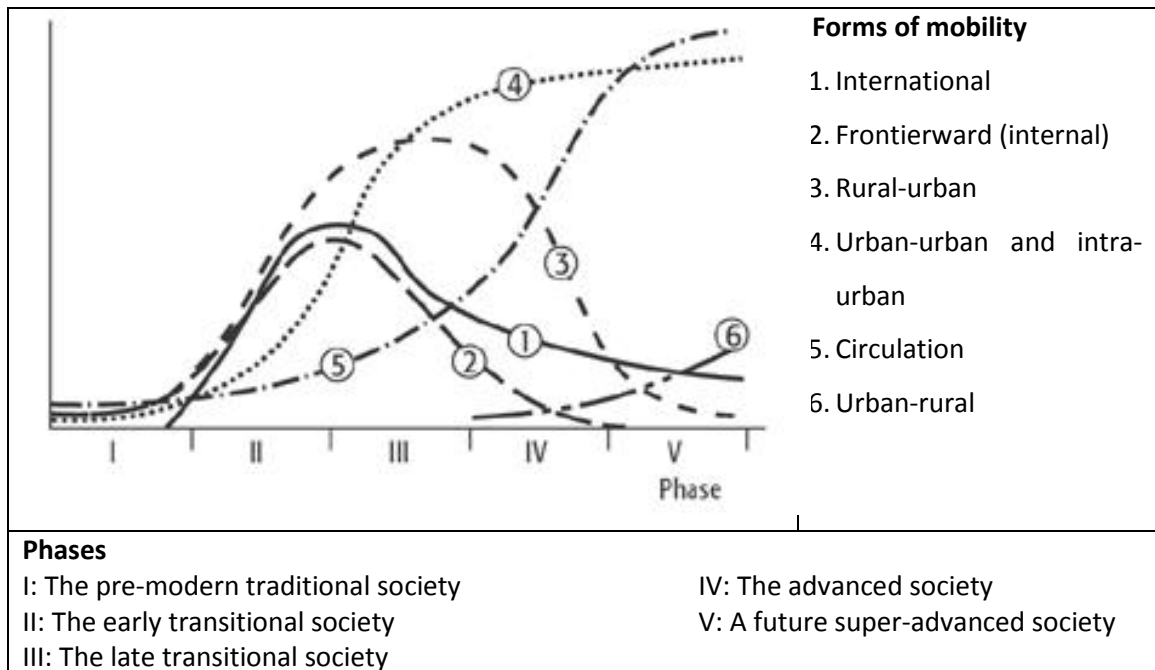


Figure 8: Mobility transition

Source: adapted from Gans 2001b and Zelinsky 1973

The first stage of a *pre-modern traditional society* shows constant and approximately equal levels of fertility- and death-rates. There is “little genuine residential migration” and only “limited circulation”. In the second phase, in Europe initiated by the *Agricultural Revolution*, the death rate starts to fall while fertility remains on the same level. This leads to an increase in population particularly in rural areas and therefore a “massive movement from the countryside to [old and new] cities” is recorded [Zelinsky 1971:230] as well as movements of rural pioneers to the agrarian frontier, if arable land is available. At the same time there is an outflow of people moving to foreign countries. Inter- and intra-urban migrations, as well as circulation show a significant growth [Caldwell et al. 2006; Zelinsky 1971].

The subsequent *late transitional society* is affected by a rapid decline in birth rate and, thus, a decelerated natural increase of population. Therefore, there is less pressure for migration and Zelinsky found declining movements in almost all categories. However, forms of mobility which are less influenced by population trends show a different picture: circulation (e.g. commuting into/out of a city) increases and urban-urban and intra-urban migration reaches a peak [ibid.].

Finally a stage is reached where both, fertility and death rates are low. Most “developed” countries are today in this phase of an *advanced society*. Migratory movements are basically the same as in the previous phase: intra-urban migration remains at a high level, whereas

other forms of permanent migration decrease and, partly, incline to zero. “Particularly the economic and pleasure-oriented” circulation becomes an important factor [Zelinsky 1971:230].

The upcoming phase, the *super-advanced society*, might be relevant in the future. Some authors argue that a birth rate that is too low to replace an area’s population will usher this new stage with a declining and ageing population [Caldwell et al. 2006; Galor 2005]. Zelinsky states that in this age “nearly all residential migration may be of intraurban and intraurban variety” [Zelinsky 1971:231]; since all other forms were already declining in earlier stages. Due to better information and communication technologies some migratory movements might be needless and circulation may decelerate, but remain at a high level. *Counterurbanisation* is added by some researches as a trend of urban-rural migration that already emerges in the fourth phase [Berry 1980; Gans 2001b]. It is caused by overcrowded cities and an “increase in the array of lifestyles” [Berry 1980:19].

Zelinsky’s hypothesis was widely discussed in the academic world. The work was found valuable as a framework for systemising migration patterns; however criticisms concern the missing link between mobility transition and technological, social and economic development and the unidirectional linkage to demographics [Bähr 2010]. Furthermore, it was noted that the approach is only a description and systematisation without explaining the illustrated development [inter alia Woods et al. 1993].

Polarisation Reversal

Analysing the development of “urban structures” in developing countries Harry W. Richardson found similar movements as the above mentioned on counterurbanization. He describes polarization reversal as “the turning point when spatial polarization trends [...] give away to a process of spatial dispersion out of the core region” [Richardson 1980:67]. The approach is based on centre-periphery model and similarly as Zelinsky’s hypothesis divided into five stages.

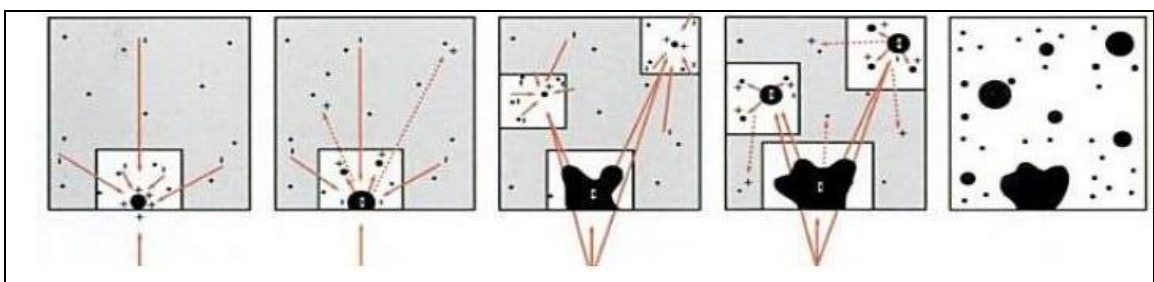


Figure 9: Model of the Polarisation-Reversal-Hypothesis

Source: Heineberg 2006:107 according to Richardson 1980

In the beginning, development and population tend to concentrate in a core region that is favoured by natural and/or political factors and guarantees economies of scale through accumulation of labour and capital. However, this centralization creates immense disparities between the core and the peri-core region and the “monocentric spatial structure becomes inefficient and costly” [ibid.]. In phase two, congestion and rising land costs trigger intraregional decentralization into the peri-core region. Figure 9 illustrates this change and the diversification in the allocation of foreign direct investments (FDI).

In the third phase, which is the crucial stage for Richardson, conditions emerge that make reallocation into other regions reasonable. This leads to the diffusion of technology and knowledge and to human migration from the core region to other regions. This interregional dispersion is the main feature of the polarization reversal hypothesis [Heineberg 2006; Richardson 1980]. In subsequent stages intra-regional decentralization occurs in the subregions, similarly to the early decentralization within the core region. Finally, a urban-industrial hierarchy emerges with little regional income disparity [ibid.].

3.1.3 Migration & Electrification

There is very little research done on the impact of electrification on migration and very few papers were published. In the previous chapter the contribution of electrification to rural development was discussed and, hence, this section mainly focuses on the interrelation of upgrading rural areas and migration.

Back in 1983 Rhodes, then working for the US Agency for International Development (USAID) in Manila, Philippines, worked on “Rural Development and Urban Migration” and asked “[c]an we keep them down on the farm?” [Rhodes 1983:34]. He founds that “there is little or no empirical evidence” that “rural electrification [...] reduce[s] rural-urban migration”, apart from generating permanent maintenance staff, who stay in the area [ibid:52]. His conclusion is that despite potentially increased agricultural and rural enterprise productivity rural electrification increases the rural-urban integration and therefore leads only to a “very weak slowing of rural-urban migration in both the short and long run” [ibid:58].

Another study by Bilsborrow et al. [1987] analyses the impact of different variables that may lead to rural-out migration (e.g. off-farm employment opportunities, education, age, electricity

supply) in Ecuador applying quantitative metrics. The findings are quite similar to Rhodes': "no pattern is observed between electrification and migration" [Bilsborrow et al., 1987:199].

However younger studies suggest the contrary: electrification usually involves an improvement in the infrastructure of information and communication technologies (ICT). Several studies investigate the impact of these improvements on migration [LaRose et al. 2007; Moon et al. 2010]. Although the studies focus on rural America and South Korea, respectively, they found a significant influence of improved internet infrastructure on migration intentions: Elder people appreciated the new technology as an upgrading of their community and tend to stay there, whereas younger rural dwellers realised job opportunities in the cities and, thus, were more likely to leave for urban areas [Moon et al. 2010].

Furthermore an important factor for rural-urban migration is the alluring urban lifestyle; and electricity plays an important role since its unavailability "is among the most visible signs of rural-urban and rural rich-poor socioeconomic gaps" [Kaygusuz 2011:942]. Therefore, electrification may decrease rural-urban-migration since one of the "most visible signs" is eliminated. On the other hand, people might expect a "more fulfilling way of life" in a city [Benson/O'Reilly 2009:608]; this is what is discussed, mostly in sociology, as "lifestyle migration".

3.2 The Sustainable Livelihood Framework

The impact of electrification is universal and influences almost all areas of rural livelihoods. Therefore, the sustainable livelihood framework (SLF) was chosen for structuring data and guiding analysis. The approach is a powerful tool to improve the understanding of livelihoods, particularly those of the poor. It provides a broader view of poverty than an economic-centred one. The approach is rooted in literature on food insecurity and famines (see Sen 1981). This is why it provides strength for understanding vulnerability.

UK's Institute of Development Studies (IDS) developed the SLF in the early 1990s and published the most important early papers [Chambers/Conway 1991, Scoones 1998]. Later it was applied in development research and by international development agencies, NGOs and UN agencies. Particularly the British Department for International Development (DFID) championed and refined the approach. DFID developed *Sustainable Livelihoods Guidance Sheets* which "aim to

stimulate reflection and learning”, as well as, give assistance to development practitioners [DFID 1999a:2].

But what is a sustainable livelihood? In his definition Scoones (1998) refers to the both single terms “sustainability” and “livelihood”:

“A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable if it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base.” [Scoones 1998:5 drawing from Chambers/Conway 1991]”

This is an adapted version of the definition from this study. Operationalising this connection of *sustainability* and *rural livelihoods* the framework suggests that a person's livelihood is composed of five *capital assets* (human, social, physical, natural and financial capital) which are the starting point for developing a *livelihood strategy*. The context for developing this strategy is determined by the household's *vulnerability* (grouped to shocks, trends and seasonality) and the *institutional set-up* (grouped into structures and processes). Figure 10 illustrates the interrelation of the framework's components. This section briefly explains each of the components and its functions within the framework.

The framework is designed to be used at all stages of the programme cycle and provides different benefits for the single steps. In practice it is widely used in the development world for project planning and policy analysis. However, the actual application in project monitoring and evaluation is limited [DFID 2010; Hostetler 2005; Koijman-van Dijk 2008].

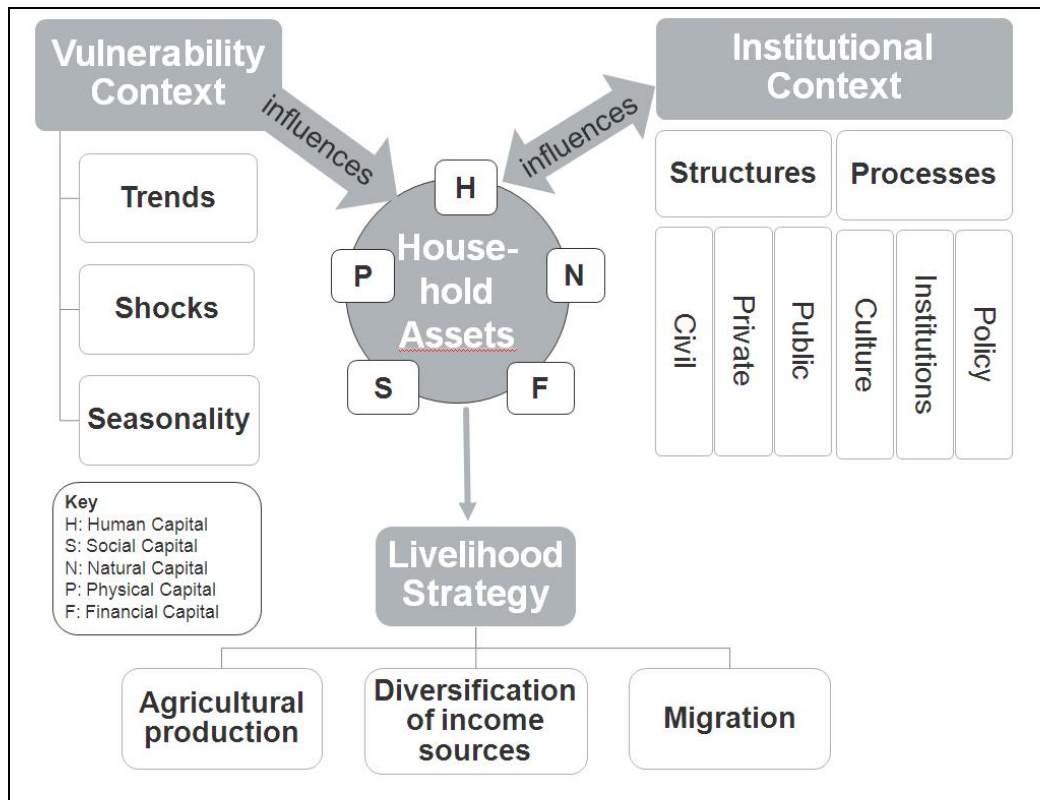


Figure 10: The Sustainable Livelihood Framework

Source: Own illustration based on DFID 1999b:1 and Scoones 1998

3.2.1 Households' livelihood assets

One core principle of the SLF is that it is people-centred and holistic; therefore it seeks to achieve a complete understanding of people's capital endowments, whether tangible or not. In order to yield a livelihood outcome, a combination of more than one asset is needed. A rural dweller that is well endowed with financial capital, but lacks arable land, will not have a high livelihood outcome. In particular, poor people need to combine everything they have to satisfy their needs. Scoones identified four different types of capital: *Natural capital, economic or financial capital, human capital and social capital*, but "other forms of 'capital' can be identified", he added [Scoones 1998:8]. That is what DFID did when they added *physical capital* to the list and, thus created the *asset pentagon*. The capital assets are described as follows and summarised in Table 3 (p. 25).

Human Capital

The term human capital represents all skills and knowledge which are needed to pursue a livelihood strategy as well as good health and the ability to work. Scoones summarises human capital for household-level analysis as the "amount and quality of labour available" [ibid:7].

While it is part of the asset pentagon and therefore the basis for achieving a livelihood outcome, human capital usually is an end in itself: good health conditions and access to education are core dimensions of human development and the MDGs, as well. However, human capital is needed in order to make use of other types of capital assets; without knowledge how to make use of one's assets, any asset endowment is useless [ibid; DFID 1999b].

Social Capital

Social Capital is probably the most debated capital asset. It is described as "social resources [...] upon which people draw when pursuing different livelihood strategies" [ibid:8]. This includes:

- *Networks* (vertical and horizontal) that increase people's ability to work together and to guarantee better access to institutions;
- *Formalised groups* with commonly accepted rules, norms and sanctions; and
- *Relationships of trust* that facilitate co-operation and form informal safety nets.

It is mainly because of *social capital* that the relation of household assets and *Transforming Structures and Processes* is two ways. Structures and processes are formed through social capital. In this interrelation *political capital*, having and using the right to partake in decision-making, plays a major role. Some authors argue that *political capital* should be the sixth capital asset in a capital hexagon (mainly championed by the *Overseas Development Institute*; see Baumann 2000; Farrington et al. 1999). In this study, *political capital* will be included in social capital. Although it definitely is important, all aspects of importance to rural livelihoods can be included into the social capital's networks-groups-relationship scheme or into the *Transforming Structures and Processes*. Social capital is important when it comes to economic relations. Mutual trust increases the efficiency and lowers the cost of working together. Networks and member-associations are also a convenient tool for community governance and to reduce the depletion of public goods, such as common infrastructure (*physical capital*) and shared resources (*natural capital*). Non-members, potential free-riders, can be banned from using these resources, while all members commonly agree on terms of use [DFID 1999b; Bowles/Gintis 2002; Scoones 1998].

Natural Capital

The term *natural capital* usually refers to the natural resource stocks and environmental services (e.g. hydrological cycle, pollution sinks), which are used to generate livelihood outcomes. This capital asset includes tangible and intangible goods as well as public and private ones. Therefore, everything from trees for firewood and construction to the atmosphere and the biodiversity is included. There are close links to the *vulnerability context*, since stresses and/or shocks are often related to the environment and therefore, to natural *capital*. In rural areas most people live from farming or fishing and need to gather firewood for cooking. Air pollution, for instance, compromises people's health and hence the ability to pursue certain livelihood strategies. For these reasons Transforming *Structures and Processes* are needed to support people in sustainably using *natural capital* [Scoones 1998; DFID 1999b].

Physical Capital

All basic infrastructure and means of production that contribute to livelihoods are grouped in this category. Generally, infrastructure (e.g. transportation, water & energy supply, sanitation, access to information) refers to public goods. However, many of these services can only be accessed for a fee. Housing is one of the few infrastructure goods which are, just like the producer goods, privately owned. Basic infrastructure is a core dimension of rural development. *Physical capital* is a pre-condition for increasing other capital assets; without adequate infrastructure time is allocated to non-productive activities such as the collection of firewood and water and without access to appropriate ICT knowledge human *capital* cannot be generated. Thus, means of production are needed to increase peasant's productivity [DFID 1999b].

Financial capital

Financial capital is essential for any livelihood strategy.. Financial capital includes stocks as well as inflows of money. Remittances and access to credits are covered in this category, as well. Financial capital is the most versatile capital asset since it can be (more or less easily) converted into other forms of capital, how and at what "exchange rate" is determined by the *Transforming Structures and Processes*. This context itself can be influenced by *financial capital* which is transformed into political power. Financial capital can be directly employed to achieve livelihood outcomes, when used to buy shelter or food [Scoones 1998; DFID 1999b].

Capital asset	Description	Importance
Human	Skills, knowledge, ability to labour and good health which allow pursuing a livelihood strategy	Needed to make use of other types of capital Intrinsic value
Social	Networks, formalised groups and relationships of trust upon which people draw pursuing their livelihood strategy	Improved economic efficiency Community governance To avoid “free-rider” problems with public goods
Natural	Stocks of natural resources Environmental services	Rural dwellers usually derive all or most of their income from resource-based activities Links to human health and vulnerability
Physical	Basic infrastructure Producer goods	Pre-condition for generation of other capital assets Producer goods increase farm efficiency
Financial	Available stock and inflow of money	Essential for every livelihood strategy Most versatile capital asset Directly employed to achieve livelihood outcomes

Table 3: Capital assets

Sources: DFID 1999b; Bowles/Gintis 2002 and Scoones 1998

3.2.2 Transforming Structures and Processes

Institutions, organizations, policies and legislation shape livelihoods within the framework. They determine *access* to and *terms of exchange* between livelihood assets as well as *returns* of livelihood strategies.

Structures

DFID describes structures as the “hardware of the framework” and includes all organizations, private as well as public, which are responsible for or active in legislation and policy or any kind of economic activity (e.g. delivery of services, trade). Structures can be identified at any level (vertical structures) and in different breadth (horizontal structures). This differentiation is most

obvious in governing organizations since they span from the local (sub-)mayor to supranational organizations and from the more general mayor's office to specialised local governmental organizations, such as the national extension service. *Structures* are important to make processes work, to enact and enforce laws, to build and regulate markets and to arrange social life in communities. The absence of well working structures is a large obstacle to development. Within these *structures* it is important that the poor are represented and affordable services are provided to them. Development agencies further promote private sector development in order to increase the efficiency of markets [DFID 1999b].

Processes

If *structures* are the hardware of a livelihood system, *processes* are the software; they determine how the agents – structures and people- work and interact. Several sub-categories are identified within processes. *Policies* provide a framework for development agencies and inform the process of *legislation*. North, a political scientist, therefore describes institutions as “the rules of the game in a society” [North 1990:3]. These rules are informal practices that are created and accepted by the agents to reduce uncertainties and create regularities which in turn increase the market's efficiency. The institutions are created within a framework of social norms and beliefs (*culture*), which are part of the processes itself.

3.2.3 Vulnerability Context

Obviously, livelihoods are influenced by their environment. Capital assets are affected by the vulnerability context and the decision to pursue a certain livelihood strategy is usually taken considering its vulnerability. Vulnerability is subdivided into three widely accepted groups: Shocks, trends and seasonality. The latter two are usually universal, whereas the first one may be idiosyncratic. In their first description of rural livelihood systems Chambers and Conway [1991] described stresses, which later were disaggregated into trends and seasonality, and shocks as the following:

“Stresses are pressures which are typically continuous and cumulative, predictable and distressing, such as season shortages, rising populations or declining resources, while shocks are impacts which are typically sudden, unpredictable and traumatic, such as fires, floods and epidemics.” [Conway 1987; Conway/Barbier 1990 according to Chambers and Conway 1991:10]

	Examples	Effects
Trends	Population trend Economic trend Technological trend	Slow & steady Usually more predictable Important influence on output of livelihood strategy
Shocks	Health shocks and death (human or livestock) Natural disaster/shocks Conflict (armed or unarmed) Economic shocks	Directly destroys assets Unpredictable with usually harsh consequences International economic shocks may trickle down
Seasonality	Of prices Of harvest Of employment opportunities	Magnitude is less predictable Enduring source of hardship for the poor Causes insecurity

Table 4: Trends, shocks and seasonality

Source: adapted from DFID 1999b

However, not all of the above listed examples are negative: trends may be either positive or negative. A trend can favour one group and endanger another one at the same time. Particularly the poor are more often unable to develop a livelihood strategy that transforms trends into positive livelihood outcomes, whether the trend is predicted or not. Generally their livelihood strategy is rather unable to cope with stresses, while others with a different composition of assets are more resilient. In principle, the vulnerability context cannot be influenced; it “lies furthest outside people’s control” [DFID 1999b:4]. Changes of vulnerability are in most cases a result of alterations of the *Transforming Structures and Processes* (e.g. policy changes). Turning it around, one aim of the SL approach is to build resilience and/or reduce vulnerability through favouring structures and processes [Scoones 1998; DFID 1999b]

3.2.4 Livelihood strategies

People seek to develop a livelihood strategy that is as resilient as possible. Despite the enormous diversity of livelihood strategies on all levels (individuals, households, communities...) Scoones divided them into three broad categories [Scoones 1998]:

- *Agricultural intensification or extensification*, either capital-led (drawing on financial capital and supporting policies) or labour-led (drawing on human capital and social

capital) both strategies require significant amounts of natural capital (farmland and if needed water for irrigation)

- *Livelihood diversification* to widen the income earning portfolio, particularly as a coping strategy in order to build resilience
- *Migration*, either voluntary (e.g. for employment opportunities or to build a business) or (quasi-) involuntary (“in need”-situation, marriage, eviction or displacement)

However, pursuing a certain strategy is not a static, but dynamic process. Different strategies are combined to a “*livelihood portfolio*” of a household: different household members have different income sources and may live in different places (permanently or temporarily). For an analysis the underlying livelihood goals should be identified.

3.3 Adapting the Sustainable Livelihoods Framework

The SLF provides a good framework for collecting and organising data, however some adjustments have to be made to meet the specific requirements for this study. This chapter outlines two of them: the geographic capital as well as the intensification of the linkage with migration issues.

3.3.1 Geographic Capital

Bird and Shepherd [2003] introduced geographic capital as a new dimension to highlight the importance of “the spatial patterning of disadvantage” [ibid.:593]. It includes “physical or frictional distance” from economic or political centres, urban agglomerations, coast and/or communication links. The geographical capital is not thought to be a sixth (or even seventh) capital asset. However, Hostetler, a Canadian geographer, includes the geographic capital into the asset pentagon [Hostetler 2005:117]. The entity of “the natural, physical, social and human capital of an area” builds the geographic capital, which in turn result in “spatial poverty traps” if it is low [Bird/Shepherd 2003:592]. These spatial poverty traps are both, a result of development policy and an obstacle to them. Studies have shown, that “[d]eficits in geographic capital were intervening factors in limiting the effectiveness” of development projects [Hostetler 2005:225; Bird et al. 2010a].

Bird et al. (2010b) suggest several factors that contribute to spatial poverty gaps:

- *Poor agro-ecology* can hinder the people from fulfilling their basic livelihood needs
- *Institutional, political or governance failures* occur, if remote and hardly accessible areas are out-of-reach for governmental officers and therefore have a “more weakly articulated contract with citizens”. This may compromise service delivery and hamper its monitoring and effectiveness.
- *Stigma and exclusion*: Stereotypes based on ethnicity, race, language, religion or culture may lead to discrimination against people living in certain areas. This is the main factor for spatial poverty gaps in urban and peri-urban areas.
- *Physical isolation and inadequate infrastructure*: low population densities lead to higher per-capita-cost for basic services. A key explanatory factor for spatial inequality within countries is a lack of public infrastructure in remote areas [Kanbur/Venables 2005 according to Bird et al. 2010b].

Spatial poverty gaps are major barriers to development for communities, particularly in rural areas of developing countries, and will be included in this study. However, the existence of these gaps does not vary between single households in a village and therefore they should not be seen as capital assets which vary by household. Spatial poverty gaps shape the way in which processes work, determine and restrict livelihood options. Therefore, geographic capital will be discussed in the section on *Transforming Structures and Processes*.

3.3.2 Sustainable Livelihoods and Migration

As shown before, movements of people are an important policy issue on all levels. However, the impact of such movements is poorly understood and in turn inadequate policy programmes are designed. Livelihood approaches can be used to develop a better understanding of the rural poor’s reasons for migration. People’s decisions are very complex and vary between gender, generation, social status and individual situation. Movements do not have sectoral, nor geographical borders: people switch freely between professions and countries without being held back by professional or language barriers. For instance, many Latin American immigrants in the US do not speak English and sustain themselves within the Latin community. In the SLF migration can be understood as movement of human capital (and

to a certain extent financial capital). Mobility of labour makes human capital the only capital asset that can be transferred completely to another place¹.

Migration can be part of a livelihood strategy in order to diversify the income structure or improve the resilience to shocks. Most migratory movements are in search for a better and more secure livelihood – it is chosen mostly in emergency situation as a last resort to sustain the livelihood [Nyberg-Sørensen et al. 2002]. Some movements include a migration of the household as a whole while in other cases some family members stay at the old place to look after their immobile belongings (e.g. houses, land and sometimes cattle) [Waddington 2003].

Usually migrants need to have some capital assets if they seek to migrate. For instance, financial capital is needed in order to pay transaction costs (e.g. transportation and accommodation) and social capital (social networks for support in the destination place; esp. for international migration).

¹ Financial capital (e.g. transfers from the state and remittances) may be spatially bound to a certain area or livelihood situations.

4 Research Design and Methodology

Good research requires well-designed methodology. This section outlines the research question and hypotheses as well as the scope and scale of the analysis. The study follows multiple goals as defined by Maxwell [according to Flick 2009]: first a personal goal, since it is a diploma thesis to obtain the degree of a geographer; second a more practical goal to create an impact assessment for the German International Cooperation (GIZ) and; last, contribute to the development and refining of migration theory as a scholarly objective.

The first question is how well shaped the research design should be before starting field work. Miles and Huberman [1994] have pointed out the differences between two approaches: tight versus loose. Loose (and therefore inductive) designs are particularly useful when “exotic cultures, unstudied phenomena, or very complex social phenomena” are explored (Miles & Huberman 1994:16). However, impact assessments are usually built on tight research designs since the site, as well as, the theme are pre-defined. Rural electrification is a well-studied topic and the focus on migration is well-delineated, which makes the formulation of research questions straightforward. However, the rural electrification-migration linkage is little evaluated and will be further developed in this study using an overall tight research design (due to the limited time and resources) with some room for flexibility that is typically characteristic of “loose” designs. Using such a conceptual framework enables the researcher to mix elements of both loose and tight research designs and to start with a broad perspective which is narrowed through the research process (see also section 4.2.1).

4.1 Research Questions and Hypotheses

Research question I

What are the most important impacts of rural electrification and who benefits most?

Hypothesis I

I.1 Electrification with renewable energy technologies provides a reliable and cheap source of electricity and significantly contributes to development (see section 2.2). Thus, there is a significant impact on people’s livelihood, particularly the resilience to shocks will be enhanced since electricity enables people to build and improve businesses and, thus, contribute to livelihood diversification.

I.2 Bearing in mind the explanations in section 2, households pursuing an activity in the productive sector will benefit most, if enabling conditions (e.g. a market for luxury goods and services) are in place.

Research question II

Does rural electrification influence rural-urban migration patterns in developing countries?

Hypotheses II

II.1 Following Ravenstein's laws one reason for increasing rural-out migration is improved transportation (see section 3.1.1). This was probably valid in the 19th century (and still maybe true); however the "transportation" of the 21st century is the infrastructure of information and communication technology (ICT). Hence, electrification may increase rural-out migration of skilled young rural dwellers when it comes along with the establishment of ICT infrastructure, such as mobile networks, internet and ordinary telephones.

II.2 On the other hand this new electricity supply promotes rural development. This first phase of development can lead to the emergence of a rural "anchor village" of development which attracts capital and labour. Rural-rural as well as urban-rural migration ("re-ruralisation") provides labour forces. Capital, however, will not be supplied by FDI as suggested by Richardson, but most likely by remittances sent by people who migrated out of the village.

II.3 Electrification is an important factor for rural development (see section 2.2) and tends to attract more rural-rural migrants. Taking into consideration Ravenstein's first two "laws" that migration proceeds step-by-step and mainly on short distances, electrified rural places may serve as a first step for rural migrants on the way to (urban) places. Therefore, people may tend to live less time in villages with electricity supply and rather migrate further into the city.

4.2 Methodology

4.2.1 Scope and Scale of the Analysis

The sustainable livelihood framework was designed to "find out about livelihoods in order to improve the design and implementation of poverty reduction efforts" [DFID 2000b:4.2]. Therefore, a holistic view is necessary and the scope of the study initially needs to be "broad

and shallow". At the beginning of the investigation crucial elements of the livelihoods and key impacts of electrification are identified. After this first phase, when "meaning and causes of poverty become better understood" [ibid.] the boundaries of investigation can be narrowed towards a more specialised analysis. However, it is important to keep the other dimensions of livelihoods in mind throughout the research process.

Given the tight schedule and limited amount of resources available for the case studies, all aspects were not evaluated. Therefore in the "small" case studies the households' assets are given greater emphasis than structural issues. Therefore, one criterion for the selection of case studies was the selection of similar environments and geographic regions to minimise the discrepancy of structural issues.

Social capital is not only the most debated capital asset (see section 3.2.1) but also the hardest to measure and analyse. Due to time constraints there was no chance to analyse social capital to an adequate degree. Instead of looking at the direct impact on social capital, the impact on the environment where social capital is built is analyzed. This includes places for inner-community interaction, security and communication issues among others. As outlined in the research questions high impact is expected in the productive and service sector. Therefore, this sector will be analyzed in the physical capital-section. This sector includes most rural non-agricultural income generating activities and ranges from carpenters to saddlers and from grain milling to the provision of information and communication services. This sector also provides basic infrastructure and, thus, is important to the analysis of physical capital.

First interviews revealed that the electrified communities are growing; therefore, the focus of the study was changed on the evaluation of in-migration and the study's scope is limited to the villages' centres. However, partial out-migration from the villages' households is investigated as well.

4.2.2 Methods of Analysis

The research design is based on a mix of qualitative and quantitative methods. Such an approach provides multiple advantages: 1) methodological *triangulation* enhances confidence and reduces uncertainties of the findings [Flick 2009b]; 2) research in developing countries often has to deal with a lack of information/data. A mixed methods design allows the researcher to fill data gaps through the use of other methods and sources and; 3) findings from

qualitative methods are used to inform quantitative methods, which in turn provide a basis for further qualitative research.

For the analysis different means are available: *Google maps* provides good quality maps of the research area and for mapping a GPS coordinates ArcGIS was used. Survey data was analysed with IBM's SPSS Statistical package and SPSS data in turn was integrated in ArcGIS for the development of thematic maps.

4.2.2.1 Qualitative

Qualitative research plays an important role in increasing the breadth and depth of a study. Loose interviews with GIZ project staff and a discussion of the planned research with governmental officers who are responsible for the execution of the electrification project helped to gain an understanding of the processes and overall context. This was complemented by key informant interviews in El Naranjo, as well as by informal discussions and interviews with local residents and the project promoter.

Furthermore, the qualitative research informed the quantitative research on critical livelihood elements and key impacts of electrification. The findings of the qualitative study were discussed again with governmental officers in order to help explain the root causes of the findings as well as improve the robustness of the study through triangulation of the results.

In El Naranjo many key informants were interviewed in order to gain more information about the *transforming structures and processes, vulnerability context* and coping strategies. The interviews were conducted with family members of all groups (see subsequent section for information on grouping) and the deputy major as well as other informants such as shop owners and local traders. One aspect of these interviews was a retrospective analysis of their reasons for migration; thereby, livelihoods were connected directly with migration issues.

Participatory rural appraisal methods were also applied. A ranking of electricity services (e.g. TV, radio, lighting, refrigeration) was conducted and a formal focus group discussion on rural development and electricity supply was planned and set up, but could not happen due to a lack of interest(hardly anyone showed up). Thereafter more informal methods were applied and the multi-week community stays allowed time for participant observation. This included informal interviews and structured observation. The relatively long community stay allowed

me to gain more acceptance among the community members and informal interviews were more straightforward and, thereby more fruitful. A seasonal diagram was developed in the informal (focus) group discussions.

4.2.2.2 Quantitative

One problem associated with qualitative research is that information is collected on the household level only. Thus, in order to get detailed data on impacts of electrification and migration patterns on community level a sample survey was conducted. The semi-structured questionnaire was informed by qualitative methods and covered a wide range of issues; characteristics of households' residents and uses of electricity and information and communication technologies (ICT) were included, as well as business activities. The structure allowed for the analysis of livelihoods in disaggregated groups (male/female, young/old, rich/poor...). The questionnaires provided space for taking notes on qualitative aspects and the research assistants were asked to inquire for further information if interesting aspects emerged in a household interview. In this way the different methods were triangulated in order to enhance the findings' reliability; this information is cited with the village's name (e.g. OT for Ocote Tuma) followed by the household's ID. The questionnaire was pre-tested for the analysis of Ocote Tuma and further developed thereafter. A questionnaire adapted to the requirements of a village without access to electricity was developed for case study III (see annex I for full content of both questionnaires and their structure).

Due to the relatively high rate of illiteracy all questionnaires were conducted verbally by the research team. In Ocote Tuma I was supported by Dr. Lisa Herrmann, a Managua based medical doctor, and in El Naranjo and Rosa Grande Ing. Oscar Gomez, engineer of forestry and Ing. Alisson Figueroa, engineer of natural resources, were supportive research assistants. The support of local research assistants may have decreased the bias and increased the honesty of respondents which usually is a critical aspect when conducting personal interviews [Scheyvens et al. 2003]. The assistants also supported the qualitative research in order to increase the reliability of findings through researcher triangulation [Flick 2009b].

The sample includes all households within the nucleus community (i.e.. along the main road and side streets). A household was only excluded if no adult household member could be reached after three attempts (Note: in Rosa Grande only one attempt was undertaken). Since all interviews were conducted personally, the response rate was high. Figure 11 shows that in

all communities nearly all households were surveyed; the rate drops only in Rosa Grande below 95%. This high rate was achieved because the research team could return to houses where nobody was met. Rosa Grande was visited only once and, thus the rate is lower.

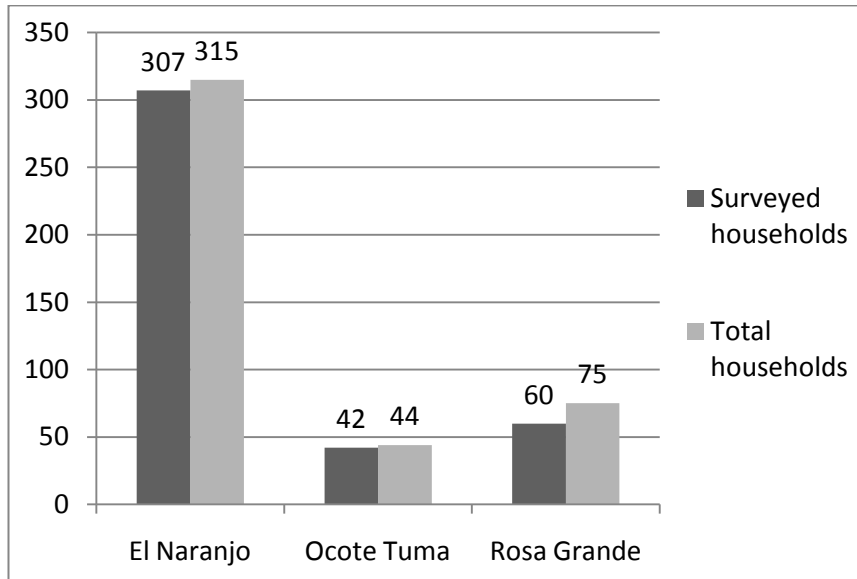


Figure 11: Number of total and surveyed households

Source: Own survey

The statistical data was grouped by main occupation and household income source. These groups built the basis for further statistical analysis. Every group has different characteristics (e.g. varying capital endowment or vulnerability) and may contain sub-groups (e.g. with/without access to land). Four different groups could be identified:

- I. Famers
- II. Families with a home-business
- III. Families with regular employment
- IV. Day labourer or unemployed

Households with access to arable land (leased or self-owned) who are mainly dedicated to farming are –little surprise– gathered in the “Farmers”-group. CABAL [2007], a Nicaragua research and advisory group, divides farmers into three groups: small scale subsistence farmers with 50mz of land or less, *finceros* (51-200mz) and medium to large scale farmers (more than 200mz). The threshold for subsistence farming, an equivalent of 34 hectares, seems to be quite high, though. However, it was the only number that could be found in literature for this region. Therefore, this limit is adopted in this study and another threshold of 30mz of area of holding is introduced as a lower limit of subsistence farming.

Any kind of home-based and self-employed income generating activity is considered a “home business” (e.g. carpenters, mechanics, doctors, shop-owners, traders...). If the household’s “income generators” are hired (formally or informally) by a business or organisation (e.g. at the mayor’s office, school, in a shop or restaurant) the household appears as “family with regular work”. The last category includes households with very insecure income: people without any or only day-to-day work and farmers who operate on one *manaza* or less.

4.2.3 Sequence of Work

The sequence of work was coordinated with the regional EnDev-programme coordinator, Klaus Hornberger, and partner institutions. First, a site for conducting all three case studies was identified based on data availability, partner’s interest and GIZ’ activities. Therefore, a first literature study was undertaken and interviews were conducted. Before leaving for the villages, information was collected and discussed with ministerial officers of the *Fondo para el Desarrollo de la Industria Eléctrica Nacional* (FODIEN), the national agency in charge of development of the electricity industry. The information gathered in the village visits was discussed along with the methodology with the same officers in Managua. In the end, findings were presented to a delegation of FODIEN comprising among others the national promoter of PCH projects as well José Ramón Zeledón, the technical director of FODIEN. This meeting served to countercheck findings and find out about similar observations in other electrified villages in order to be able to generalise findings through spatial triangulation.

First village visit: El Naranjo

The first visit in El Naranjo took place in late January with a duration of ten days. The visit followed multiple goals: besides an overall assessment of households’ assets, key assets and institutions were to be identified and the key impacts on assets were to be found out in order to inform the questionnaire for the subsequent village visit. The same end was pursued with the mapping of the village since a village map for identifying and numbering all households was provided during the second village visit.

First village visit: Ocote Tuma

Three weeks later the first case study was carried out in Ocote Tuma for the micro hydropower plant (MHP). The research was supported by Dr. Lisa Herrmann who helped with interviews and conducting the survey. The aims of the visit were to map the village, assess the impacts of

electrification in key areas as defined during the first visit to El Naranjo, complete a migration analysis, and pre-test the questionnaire for El Naranjo.

Second village visit: El Naranjo and Rosa Grande

The main visit in El Naranjo took place from mid-March until beginning of April. The research was complemented by Ing. Oscar Gomez and Ing. Alisson Figueroa, both graduates from the National University of Agriculture. This main stay was completed to: analyse household assets and livelihood strategies of all groups complete, a retrospective analysis of migration tendencies and conduct the survey. Two days were devoted for an evaluation of impacts in Rosa Grande; this time allowed a basic analysis only but was enough for conducting a significant amount of surveys.

4.3 Challenges Encountered

Fieldwork

Doing research in developing countries is always a challenge and involves quick adaptation to different situations and cultures. A challenge I faced was the role as team leader. Adequate briefing proved to be more complex than it was thought to be and task planning had to be more detailed and accurate. This is even more challenging in an environment where plans change rapidly and it is difficult to plan in advance in a reliable way. Similarly, the appointed personal interview with a local representative of a national ministry did not happen and emailed questions were also promised to be answered which did not happen either.

While conducting the surveys it turned out that many people had problems comparing situations and assessing changes. Many people found it difficult to respond to questions which asked them to compare the community and family situation today with that before electrification or to assess factors for migration. This resulted in many statements like “It’s the same now” or “everything is important to me”. Surprisingly they had fewer problems differentiating between situation of the community and that of the family, although when asked for the reasons for their perception responses became more indistinct.

Research Design

Another challenge emerged after the pre-test in Ocote Tuma and the adaptation of the questionnaire. The use of a new questionnaire resulted in different information for El Naranjo and Rosa Grande making it hard to compare all aspects of the communities. Due to time

constraints Ocote Tuma could not be visited a second time and a second visit would also be questionable since all households were already surveyed. Therefore, the research design was not perfect and a pre-test should not be combined with the data acquisition of one case study. However, this problem was expected and, therefore, Ocote Tuma was chosen only as a second case study of an electrified village and thus, was not given as much importance as Rosa Grande or El Naranjo.

Quality of Secondary Information

Many papers and studies regarding the situation and development of the PCH in El Naranjo are available from GIZ and the national Ministry for Energy and Mining (MEM). Most of these papers give exact information that seemed to be detailed and very useful. However, the quality of information was arguable. For instance, in 2009 an impact study of all Swiss-(co)financed PCH was carried out [Solis et al. 2009]. This study included a 2005 baseline study of El Naranjo. First of all, the study may be biased since it was ordered by the MEM which needs to justify and is accountable for its investment in the project. Furthermore, the study does not outline which parts of the community were included in the analysis; El Naranjo's population is 3225 (approx. 537 families) [Solis et al. 2009:20], but according to the latest census only 350 families actually live in El Naranjo [INIDE 2005b:2]. Apart from these inconsistencies, the methodology has to be criticised as well. For example, all of the data is based on interviews with "local leaders", which were conducted in presence of a governmental local promoter [Solis et al. 2009:4]. People criticised these "local leader" interviews when they were interviewed for this study and mentioned that information given by local leader for earlier studies was not accurate.

4.4 Study Area: Municipio de Waslala

Selecting the case study is essential to guarantee the comparability of the villages that are evaluated. In order to ensure the socio-economic comparability all case studies were conducted in the same *municipio*. The *Municipio de Waslala* in the *Región Autónoma Atlántico Norte (RAAN)*² is located in the humid tropics with nine humid months, an annual precipitation of 1,500mm and average temperatures above 25°C in all months. The *municipio* is located in the hilly north of Nicaragua between Matagalpa and Siuna (see Figure 12). El Naranjo and Rosa Grande are villages on the road between these two cities. However, nearly all economic

² Geographically Waslala is part of RAAN, however politically and administratively it is assigned to the *Departamento de Matagalpa* (see further discussion in section 5.1.2.3).

activity and outflows are directed towards Matagalpa. This is mainly due to low economic activity in the RAAN-region where Siuna is situated. The total population of Municipio *de Waslala* is around 44,000 people of which 83% live in rural areas [INIFOM 2011].



Figure 12: Map of Nicaragua and location of the Municipio de Waslala

Source: adapted from Nations Online undated

The main economic activity in Waslala is agriculture – mostly subsistence agriculture. According Nitlapán, a Nicaraguan agricultural research institute, there are 4738 farmers in the municipality of Waslala operating on 155,247mz (approx. 106,000 hectare³) of agricultural land (CABAL 2004:8). Table 5 shows the size of farms and the number of farmers. Nearly 85% of all farmers in the studied area are operating on subsistence level and have less than 50mz (34 hectares) available. Half of them operate on less than 10 *manzanas* (6.8 hectares).

	Small scale subsistence farmer			Campesino finquero (small scale farmer)	medium- and large scale farmer	Total
	0 - 2.50 Mzs.	2.51 - 10 Mzs.	10.01 - 50 Mzs.	50.01 - 200 Mzs.	more than 200 Mzs.	
Farmland in Manzanas						
Number of farmers	513	1389	2071	690	75	4738
% of total	10,8%	29,3%	43,7%	14,6%	1,6%	100

Table 5: Number of farmer in Waslala and their land tendency

Source: adapted from CABAL 2004:8

The main products are staple foods, such as corn (with a sown area of 20,500mz) and frijoles (black beans) which are found on approximately 8,900mz of the land. Cash crops such as coffee (3,200mz) and cocoa are mainly produced on medium scale farms. Livestock production is concentrated on cattle (30,000mz), pork (10,000mz) and chicken (100,000mz). Livestock is widely used for both milk and meat production [CABAL 2004:6].

The entire municipality experienced in-migration when the Violeta Chamorro's government incentivised resettlements and frontierward migration after the end of the civil war in the 90s when ex-soldiers needed to be reallocated and were brought to Waslala where abundant farmland was available. Before this period only a few rural agglomerations were registered in the municipio [KI 5].

Only 961 households (11.6%) had access to electricity in 2005 [INIDE 2005c]. The municipality's capital Waslala is the only city which is connected to the national grid. Figure 5 shows that the whole region has low electrification rates. However, the government is tackling this situation with rural electrification programmes as the case studies will show. The case studies are all conducted in a socioeconomically similar region. The map below (Figure 13) depicts the

³ According to official data (INIFOM 2011) the total area of the *municipio* of Waslala is 1,329.5 km² and it is said to be widely covered by forest. Therefore, it is doubtful that an area of 1,060 km² (80%) is used for agriculture.

Municipio de Waslala and parts of the Municipio de Siuna; two of the evaluated villages, El Naranjo and Rosa Grande, are on the main road Matagalpa – Waslala – Siuna and the third case study is south of Waslala accessible by a recently built road which is still not represented maps.

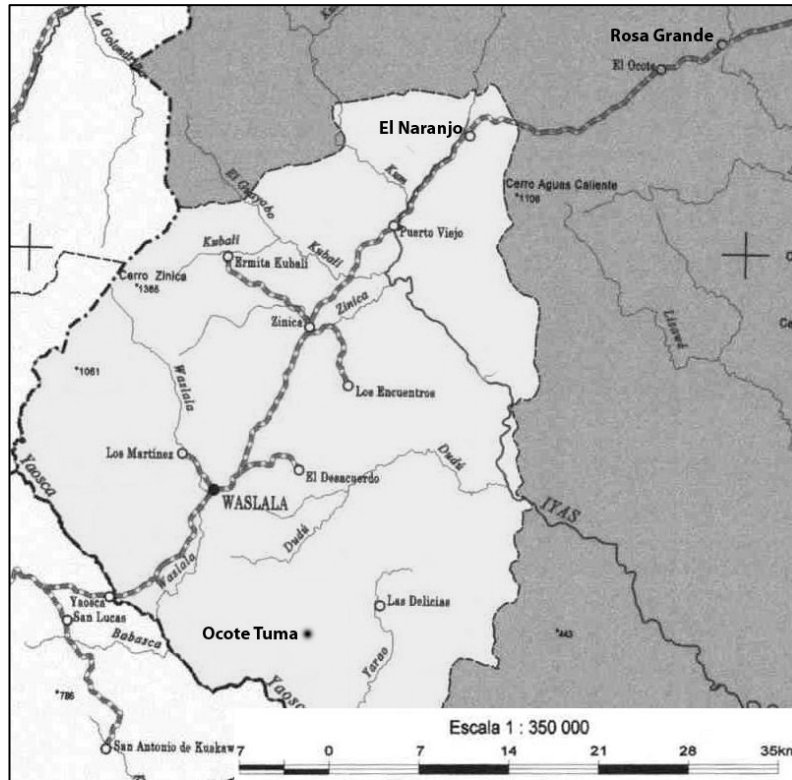


Figure 13: Map of the Municipio de Waslala

Source: adapted from INETER 2005

5 Findings

All case studies were conducted in the same region but the villages still have very different characteristics. Therefore, each section deals with one case study and first characterises the community based on the criteria outlined in the previous chapter and demographic data. After the introductory section, livelihoods are analysed and the livelihood strategies are pointed out. Each part concludes with an evaluation of recent migratory movements and the impact on communal development. After the evaluation of the three villages, the case studies are compared and differences in their development, livelihood strategies and migration patterns are discussed.

5.1 Case study I: Village with mini-hydro power

5.1.1 El Naranjo

The main case study was conducted in the community of El Naranjo. El Naranjo has a population of 2,100 spread across 350 households. Half of the population is younger than 15 years and the rate of illiteracy is 32% of the total population [INIDE 2005b]. El Naranjo's population's gender distribution is not equal. Following official census data there are more males among those aged under 15; this relation turns around when people get older.



Figure 14: Photo of El Naranjo's main road

Source: own photo

The persons included in the survey have the same gender ratio as the census' adult population and represent a big share of El Naranjo's adult population (see comparison in Table 6). The community stretches along Matagalpa – Waslala – Siuna road, which is pictured above, with a couple of alleys (see cartography of El Naranjo: Figure 42 in Annex I) and some higher parts in the hills. Most of the businesses also gather along the main street. There are some houses without data; these buildings are either unoccupied or churches, schools, health post, the mayor's office or the like. However, El Naranjo has a high "urbanization" rate: relatively few people live in remote parts of the community and most are clustered in Central El Naranjo and its districts. This made it easier to include a high percentage of the total population into the survey.

	Male		Female	
	<i>total</i>	<i>%</i>	<i>total</i>	<i>%</i>
Younger than 15 ¹	520	52%	488	48%
Older than 15 ¹	519	48%	555	52%
Own survey ²	259	47%	292	53%

Table 6: El Naranjo: Male and female population break down

Sources: ¹ INIDE 2005b:2; ² own survey

The distribution of the household's main income sources is depicted in Figure 15. Self employed home business owners make up the largest group with nearly two in five families working in this sector. The second largest group is that of day labourers and unemployed individuals with roughly a third of total households. This may appear as a high figure, but the 2008 survey of Solis et al. (2009) stated an unemployment rate of 62%. Apart from earlier mentioned shortcomings the difference may result from varying units of analysis. Solis et al. May have included all adults and defined housewives as "unemployed", whereas this study looks at the main income source of households and only rated a household as "unemployed" if no or only very irregular income sources are available.

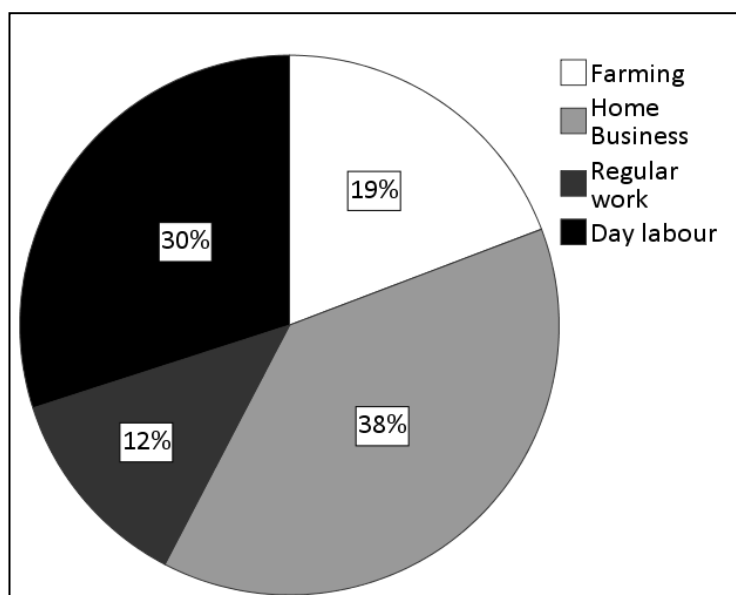


Figure 15: Household's income generation in El Naranjo (grouped)

Source: Own survey

Only one in eight households receives their main income from regular employment. This includes teachers, pastors and drivers for the male population and teachers, housekeepers and assistants for the women. Somewhat bigger is the group of farmers -nearly a fifth of the population makes a living farming. However, 24% of households had access to land, but some only grew some staple foods and dedicated themselves to other income opportunities (see section on livelihood strategy p. 60).

Electricity Supply

In 2001, a small power generator (120kW) fuelled with diesel was installed by ENEL, a state-owned power utility company. In the beginning electricity was provided from 6pm to 9pm every day at a cost of C\$ 250 per month. Due to the emerging diesel supply and management problems the generator worked only one week per month and later was completely abandoned (van den Akker/Urquijo 2009; KI 4).

In the context of a governmental electrification programme through mini-hydropower plants a PCH with a capacity of 212 kW was installed near El Naranjo. A mini-grid was built and today a total of 726 clients in eight communities are supplied with renewable power [KI 4]. Ten percent of the respondents had their own electricity supply before (mainly individual fuel generators and a few solar panels and car batteries), but they use hydropower today and only keep their generators for back-up capacity.

However, 35 households (11%) are not connected to the mini-grid and do not have electricity. Two-thirds of these households belong to the group of day labourers and unemployed, the others are mainly farmers. The main reason for not being connected is the high price followed by not being convinced of the advantages.

5.1.2 Livelihood Analysis

5.1.2.1 Household's assets

The distribution of capital assets is quite different between the different groups and electrification had a significant influence on the endowment with these assets. This section seeks to summarise the availability of capital assets and the main impacts of electrification.

Financial Capital

The endowment with financial capital is relatively high in the group of shop owners. Some do have bank accounts, but due to a mistrust in banks most have their savings at home [KI 7]. However, the relatively high rate of houses without a connection to the grid suggests that the financial capital of these households is very low. Furthermore, there is no bank or credit institute in El Naranjo. An office of the *Fondo de Desarrollo Local* (FDL; Fond for local development) was closed in 2009 and today there are no financial service institutes in El Naranjo anymore. The next office of the FDL is in Waslala.

Some households had access to electricity before electrification. There is not a big difference in the technology used between the four groups, although business-owners and regular workers (above all pastors) tended to have a fuel engine, whereas farmers often had a solar panel on their roof. The generators consumed considerable amounts of fuel and, thus, more than a third of the “pre-electrified” interviewees complained about the high cost, which is significantly lower now.

The owners of bigger shops mentioned that they used to order ice cubes for beverage refrigeration in insulating boxes from Waslala every day. Today they have refrigerators and some have freezers to produce and sell ice cubes to villages without electricity supply. This way they managed to both reduce cost and increase their income [inter alia KI 7]. Lolo, the owner of a large store, said that he earns more today than before the electrification because his shop “is open even in the night [now]. Before [the electrification and public lighting] it was

too dangerous.” Lolo opened a new hostel because “after the electrification more people came and wanted to stay overnight. So we saw the necessity to open a hostel” and thereby increased his income and financial capital [KI 7]. Shortly after the electrification a saloon/casino opened with 15 gambling machines. Apart from the positive impacts on the owner’s financial capital, mostly farmers gamble there after selling their harvest to local traders. Therefore, there is an expected significant negative impact on the financial capital of the group of farmers. Another saloon is located in “Waslalita” a village district of El Naranjo with similar impacts.

However, many people complain about the high electricity price. Sixty one percent of the surveyed households said, that they consider the price too high. Not surprisingly, this share was higher in groups with little income (day labourer/unemployed) or high consumption (home business) and was lower in households with low to medium consumption and intermediate income (farmer and regular employees).

Those who are connected pay a very unequal electricity bill depicted in Figure 16. The bills range from C\$60, the minimum consumption, to C\$ 4500. Nearly half of the households consumed electricity worth more than C\$100 (5 USD) a month. Most farmers and day labourers belong to this group, as well as small home businesses. Within the three highest categories (more than C\$ 250) big home-businesses, like the radio, the casino, big shops and carpenters make up the lions share.

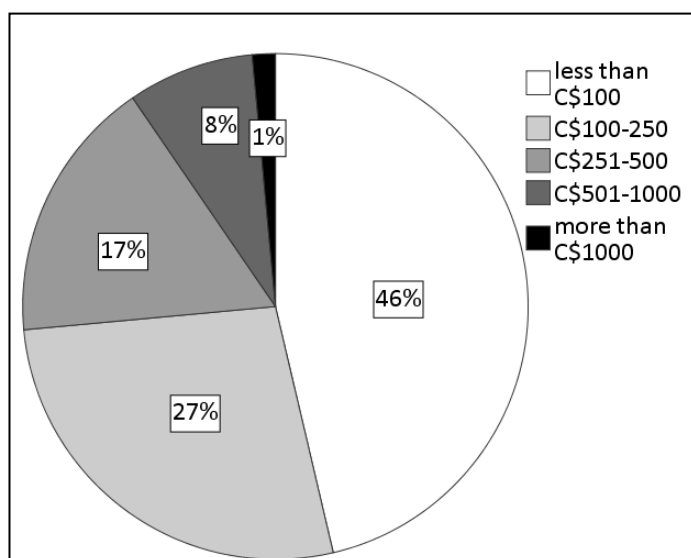


Figure 16: El Naranjo: monthly electricity expenditures

Source: own survey

Natural Capital

On the side of “personal” natural capital, the distribution of farm sizes in El Naranjo does not vary much from that of the municipal level (as shown in Table 7). Two thirds grow mainly for subsistence (less than 30mz) and 31% of the farms are medium-sized and, thus, produce a larger surplus. It’s important to notice that 16 of the farms are owned by families who are grouped as non-farming families and generate their main income from another sector. Most of these farms are subsistence farms for basic staple production (see further discussion on livelihood diversification in section 5.1.2.4).

		Waslala (in %)	El Naranjo (in %)	
				accumulated
Farm size	1-10mz	40.1	44.6	44.6
	11-30mz	43.7	24.3	68.9
	30-50mz	14.6	13.5	82.4
	51-200mz	1.6	16.2	98.6
	more than 200mz	1.6	1.4	100
Total (absolute number - n)		4738	74	

Table 7: Size of farms in El Naranjo and Municipio Waslala

Sources: CABAL 2008 (adapted) and own survey

The forests of the *microcuenca*, the catchment basin, ensure that there is a relatively constant year-round water flow in the river that supplies the PCH. In order to secure this water supply HINNSA, the PCH operator and local electricity provider, buys land in critical parts of the catchment area that either is covered with forest or can be reforested to avoid its permanent deforestation and/or degradation. In turn this provides a healthier environment for humans and increased biodiversity. Drinking water supply is secured at the same time, since it is taken from the same basin. Apart from simply buying land, HINNSA provides environmental capacity building to farmers in the *microcuenca*. This aims not only to avoid deforestation, but also to reduce the excessive use of fertilizer (with expected positive impacts on water quality as well) [KI 4].

On the other hand, the deputy mayor voiced his fear that in-migration may result in increasing deforestation. Firewood is already collected from far away and today many people make a living gathering firewood – without doubt some of this wood is logged in the nearby forests. In

El Naranjo a quarter of all houses are built from wood, which is the cheapest building and, hence, very tempting for migrants from poorer areas [KI 5; own survey].

Natural capital is not exclusively decreased through destruction, but also by pollution. Due to a lack of adequate waste management systems waste disposal, particularly that of toxic wastes has an adverse effect on natural capital. The affected environment is a public good and regulation is absent. The most common hazards are batteries which are disposed inadequately. The best way to face the degradation of natural capital is by avoiding waste production. Electrification may, thus, decrease the use of batteries. After the electrification 27% of El Naranjo's households said that they do not use batteries anymore. Forty six percent of households have a battery-driven radio and 47% use a flashlight – some use both of them.

Besides the soil pollution the air quality is also affected. Before electricity was supplied by the PCH around 50 mini plants powered by combustion fuels were operated in the area of the new mini-grid. Since they are not needed anymore, around 60 gallons of fuel are saved every day⁴, which contributes to reduced noise and air pollution and decreases CO₂ emissions by around 250 tons per year [BLU 2010].

Human Capital

El Naranjo has two primary schools and one secondary school, as well as an institute of higher education. The primary school works daily, while the secondary school used to be closed during the week and opened on weekends only. However, this changed two years ago due to high demand for daily classes. Today grade one and two of the secondary school have daily courses. This will be expanded every year and today's first and second graders will have daily classes until they graduate [KI 5].

The electricity supply directly impacts human capital since the school building is connected to the electricity grid and several learning-services were established. However, the school's infrastructure is not yet connected to the internet. Nevertheless, shortly after electrification an internet cafe was set up and students now have to use the internet for schoolwork, since teacher give them "internet research tasks" for homework. According to the survey, approximately one third of all secondary school kids already use the internet⁵.

⁴ Assuming that every generator was used 1.2 hours daily and consumes one gallon of Diesel per hour.

⁵ Usually only the adults were surveyed and the true number might be higher.

Computer lessons

In order to develop IT skills, HINNSA, the power plant operator, offers private computer lessons (*clases de computación*). Students pay a monthly fee of C\$ 175 (US\$ 8) and receive four hours weekly. Thirty students work in four shifts on ten computers and 57 students already “graduated” from the IT school. The IT teacher observed that the main problem they are facing is that main secondary students cancel the classes, since they do not have time besides school and working on the field. Another reason is a lack of financial resources of some students [KI 1].

“Electric light gives children the opportunity of doing their homework in the evening”, is a well know and often cited statement when it comes to the impact of electrification on human capital. However, this study cannot find any evidence for this hypothesis. Quite the contrary less than one in twenty households stated that the children work for school after 6pm, but every second said that they watch TV at that time. Observations also confirmed that kids were doing their homework in the afternoon in order to free their evenings to watch TV.

An often advantageous factor of rural electrification is that good teachers like to go to and stay in communities where electricity is available. In many communities this is an important contribution to increased human capital. However, in the *Municipio de Waslala* teachers theoretically rotate every year from one school to another. This policy offsets the effect and favours rural school without electricity. However, the rotation does not apply to all teachers, thus there might be some effect [KI 8].

Another aspect of human capital is human security. Apart from impacts on the financial capital due to longer opening hours, the public lighting has led to a decreased crime rate in the village and people feel safer. Marizu Gonzalez Albarrez, the owner of a small shop commented, “We have more self-confidence, today. Before, without lighting, we were afraid [outside]” [KI 7].

A private institute of higher education was opened in El Naranjo in April 2011. This institute offers four different courses (e.g. project development and agro-pastoral systems). Due to time and capacity restrains further investigation on this and other positive or negative impacts on human capital were not evaluated. However, there may be an adverse impact on human health through the spreading of small shops selling mainly coke and potato crisps. The TV may have a negative impact, as well.

Physical Capital

Public Physical Capital

Public infrastructure has greatly improved in recent years. As mentioned in the previous section a communication centre opened after electrification. At the moment of the visit one computer was connected to the internet and two telephones were working. Two more businesses offer telephone services; however, there is still no mobile network available but according to the deputy mayor it will be installed this year by a nationwide service provider [KI 5]. The actual usage of this infrastructure is discussed in the subsequent sections. A local businessman offers cable TV service as well and has more than 100 clients [KI 7].

Besides the electric network there is a network of water pipelines. The water is taken from a nearby river, filtered and distributed to the households. However, the water is not potable, since it is not processed in any way and only roughly filtered. Particularly in the dry season water is short and there are outages throughout the day. In a communal plenary meeting to discuss the most pressing problems: the water issue was top-ranked for the last years. At the time of visit a project was underway to install water purification and storage units.

Private Physical Capital

Furthermore, financial capital was converted into physical capital to set up shops and workshops or to build a business in the service sector. The majority of businesses were established after the electrification (compare Figure 17). A total of 78 shops⁶ exist in the village selling a huge variety of goods: staple foods, kitchen utilities, shoes and clothes among others. Most of them are very small, but nonetheless nearly all have a fridge and/or freezer. In particular, workshops with high electricity consumption were established in the past three years. Three of El Naranjo's four carpenters built their business after electrification; among them is a big one, the *Carpintería Blandon*, which is fully equipped with different types of electric saws, turning lathes, sanders and other equipment.

⁶ Total number of shops in Figure 17 varies due to incomplete survey data.

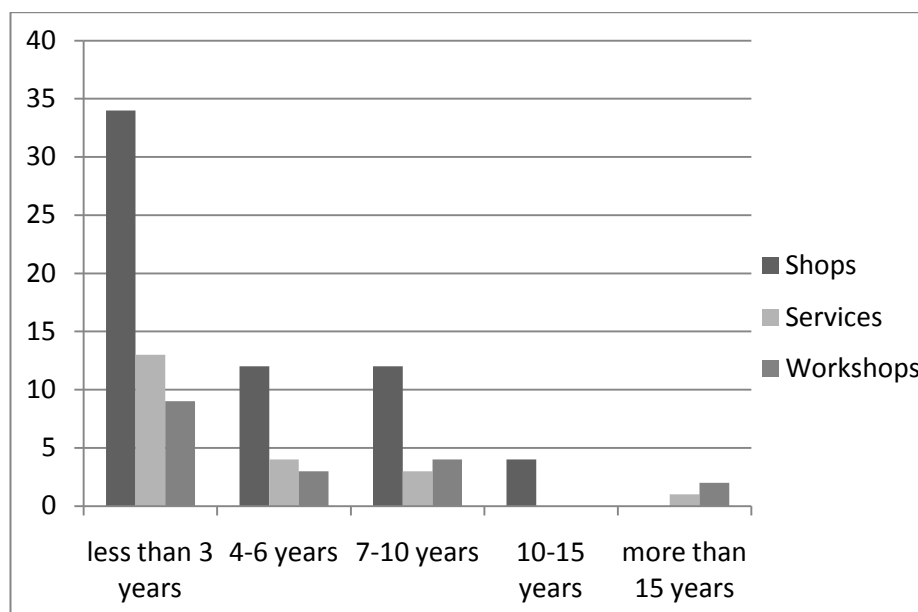


Figure 17: El Naranjo: Number of business, sorted by years of operation and type

Source: own survey

Obviously there is an impact on the physical capital of rural dwellers' households, as well. For example, electric household appliances and TV sets were acquired in many households. With regards to capital assets these were acquired through financial capital (money), physical capital (animals) or social capital (appliances as remittances). However, the evaluation of the impact of electrification on these goods is beyond this study's scope.

In El Naranjo more than 60% of all houses are stone-made, while only 24% are made of wood. The rest are made of both wood and stone (mixed) or other materials. Interestingly, the group of farmers had the highest share of stone-made houses - 73% of all farmers' households were made of stone. The assumption that many farmers in El Naranjo are relatively well-off is confirmed in the analysis of ownership of cattle since 47% of the farmers owned at least one head of cattle. Further, most farmers had more cattle: 37% of cattle-owning farmers had between eleven and 50 heads and 19% owned more than 50 heads of cattle.

Social Capital

There seems to be a high impact on social capital. Public lighting allows people to stay outside after sundown. On average adults go to bed at 8:30pm and kids 15 minutes earlier with little variation between genders. Consequently, the children sleep longer as well: 9:10hrs compared to 8:25hrs for adults.

Load management was induced due to low water availability during the dry season between 6pm to 8pm. That is why the difference between evenings with and without electricity could be observed on El Naranjo's main street. And it is quite impressive: if there is light boys play on the street and men are discussing gathered in small groups after having dinner at home or in one of the cafeterias. If the electricity supply system breaks down the situation changes rapidly. People go home quickly and the street becomes calm immediately. Nonetheless, most people tend to stay home after 6pm. Watching TV and/or chatting with the family are by far the most common evening activities. The subsistence farmer Modesto Mattei has an easy explanation for this: "the TV brings a lot of joy into our lives", he said and is probably right. However, it is important to note that there is a gender imbalance in these activities; females watch more TV than man, while the latter are more frequently outside chatting or working in their business.

Unfortunately, there is no baseline data to be compared with the data from the survey in this study. However, electrification seems to provide conditions that enable people to establish and deepen personal contacts after sunset. Apart from meeting at the street, some social groups meet for playing billiards while others go gambling. Furthermore, there are five religious communities and two political parties, as well as a committee for water and another one for electricity. These groups are built upon shared values and/or beliefs and are important social units in the community. Electricity and (public) lighting facilitate meetings of these groups after business hours and provide more security on the streets. Before electrification raids were common at night. Today delinquent activities have shifted out of the lighted village.

Telecommunication is crucial for maintaining social relationships. As described earlier telephone and internet services are provided in El Naranjo. These services are widely but unequally used. In total, four out of five households used at least one kind of telecommunication. Most people used a landline phone services only and seventy five percent of all households make a phone call at least once a month. As depicted in Figure 18 more people use the internet (15%) than a mobile phone (12%), which is not very surprising given that cell phone service is only available in Waslala or on certain mountain tops.

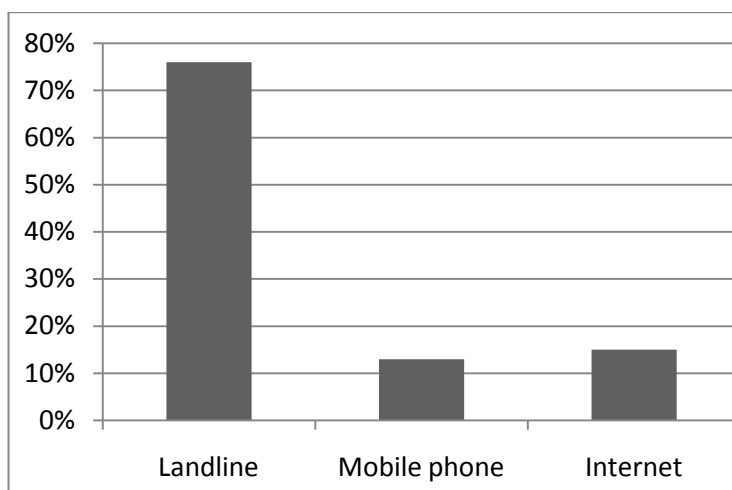


Figure 18: Share of households using ICT at least once a month

Source: Own survey

Different information and communication technologies serve different purposes (see Figure 19): internet is mainly used for information (schoolwork and work), whereas telephones (landline and mobile) are used to communicate with family members in and outside of Nicaragua⁷. The internet is hardly used for communication and *Facebook* is not yet popular among rural dwellers.

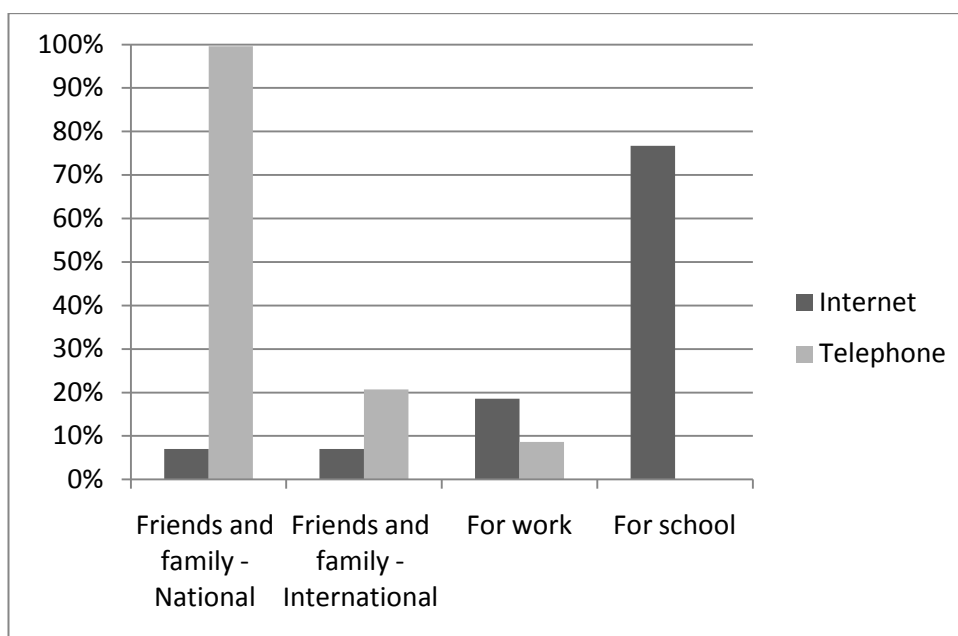


Figure 19: El Naranjo: Purpose of ICT use as a share of total technology user

Source: Own survey

⁷ However, the absolute number of people who use the telephone for work is still higher (20), than that of internet users (8).

However, the social cohesion seems to be relatively small. Mutual accusations between single members and/or groups of the community demonstrate distrust. Church attendance is also relatively low; there is no base of shared values in the community.

5.1.2.2 Vulnerability Context

In the rural context all dwellers are prone to seasonality, shocks and trends. This section discusses briefly the most important factors in each category and concludes with an evaluation of vulnerability on each of the four groups. However, there are many more factors which distribute to the vulnerability context but could not be evaluated in this study. The vulnerability context is hardly influenced by electrification, but important for the understanding of peoples' needs and their livelihood strategies. This is why coping strategies, which are influenced by electricity supply, are discussed jointly with livelihood strategies later on.

Seasonality

El Naranjo's economy relies on agricultural production. The production cycle makes the whole economy go up and down. The main product and cash crop is *frijoles* (black beans) which are planted two times a year. Figure 20 illustrates⁸ a main harvest in March/April which is planted in December and a smaller harvest (mid-harvest) in October that is sown in August. Maize is harvested and planted at similar times as *frijoles*. Only coffee is harvested at different times. It is harvested in August and to a lesser extent in December. However, very few people have coffee plantations.

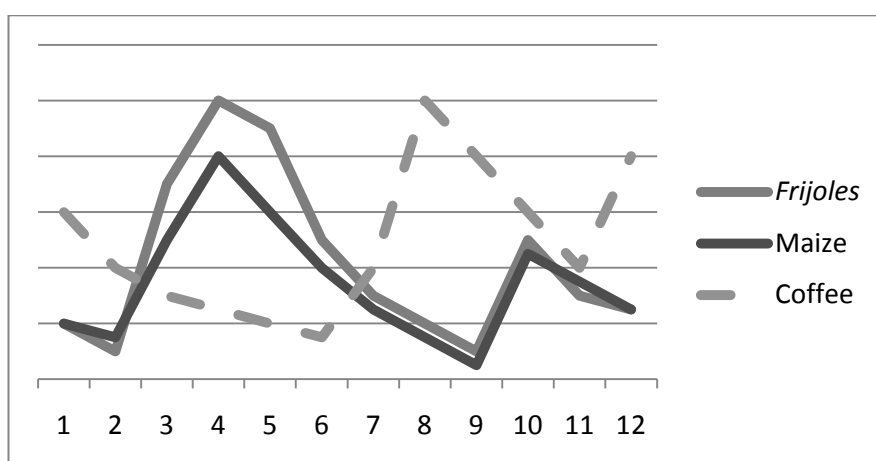


Figure 20: El Naranjo: Approximate Changes in stock of staples and coffee (Jan-Dec)

Source: own illustration based on KI 5, KI 6, KI 7

⁸ The figure is just for a qualitative illustration and does not claim to have any quantitative evidence.

Generally, people try to sell their crops little by little, since in normal years the price nearly doubles from April to August/September [KI 5]. However, a bigger portion is sold directly after the harvest for investments in consumer goods such as clothes, furniture or electric appliances [KI 7]. August and September are the months where some farming families start to run out of food; though most families do not suffer from hunger. The economy is very low in these months and businesses as well as farmers may experience hardship. However, in some cases farmers may profit from their coffee harvest.

Shocks

The main shocks the community experienced are droughts and excessive rain. Nearly half of the interviewed farming households stated that they had crop losses due to a drought during seed time and excessive rains at harvest time. Observation confirmed destroyed plants and heavy rains in the dry season. People held that either climate change or *El Niño* was responsible for the weather anomalies.

Furthermore, murals provide evidence of problems with rats. Texts like "*Evitar las ratas*" (avoid the rats) followed by instructions on post-harvest storage and techniques illustrate the problem. The deputy mayor said that there was a rat infestation in 2008 which led to many diseases and small agricultural yields. Earlier El Naranjo's population had problems with epidemics like cholera, which occurred yearly with the first rain in June/July. More recently, no cases have been registered [KI 5].

Trends

Two main trends were observed: an ongoing degradation of the surrounding land and an increase in population. The first one will be discussed here, whereas the latter one is considered later. The chapter on natural capital already touched on the problem of tree-cutting; the catchment basin is becoming increasingly deforested since farmer cut trees to keep their animals on that space. There is little that can be done against this trend; the land is owned by the farmers and the national Ministry of the Environment and National Resources does little to change this [KI 4]. Deforestation threatens both water and electricity supply, and may change the micro-climate with adverse impacts on local agriculture.

Exposure and Coping Capacities

The four groups are differently exposed to the discussed vulnerability issues and have varying coping capacities. A classification summarizing both is found in Table 8.

In particular, farmers are exposed to seasonality and shocks. A weather-related shock may destroy large parts of a farmer's harvest and he runs the risk of cash and food shortages in the time before harvest. Indeed, depending on farm size, nearly all produced surplus of grains they sell for buying non-necessary goods. If a shock or extraordinary seasonality occurs, the farmer reduces the consumption of these goods or earns additional money looking for day labour on big farms, collecting firewood or selling land or animals. All of the interviewed farmers affirmed that they had enough food for their families either way [KI 5; KI 6]. However, farmer's coping capacity is low: cattle can be sold year-round for additional income, but if there is no food for the farmer, there is none for the cattle either; and skinny cows do not fetch high prices. Furthermore, the cow's milk is needed for homemade-cheese production. Only better-off farmers have a higher coping capacity, since they have enough physical capital that can be sold off without compromising their ability of production in the next season; and sometimes enough financial capital to bridge the crisis [KI 5].

Home-business owners have an advantage and a disadvantage compared with farming households. On the one hand they have a year-round income source and profit from the harvest of coffee when the economy is low in August, while on the other hand shocks in agriculture are even harder for home-businesses, since farmers coping strategy is to lower spending on consumer goods. Furthermore, in crisis and low season prices for agricultural products go up which makes it even harder for them to sustain their family. However, businesses trading staple foods may profit from food shortages, when prices and profit margins increase. Contrary to (small) farmers, business owner tend to have more savings for times of crisis and they can easily increase their prices. Bigger business can dismiss employees and thereby assure the livelihood of their own families [KI 3; KI 7].

Exposure to risks varies widely within the group of families with an income from regular employment. Formal employees of the state or important companies (e.g. the power company) will most likely keep their jobs in times of stresses and the population trend increases job security since more people are needed to provide public and private services. On the other hand, people with informal employment are very vulnerable since they are usually

employed in small private enterprises (e.g. shops, cafeterias, carpenter’s shops) and are the first to be dismissed when sales go down in times of crisis. The latter group is mostly composed of single women with children and have very low coping capacity. In contrast, the formal employees are usually better educated and have a higher coping capacity [KI 3].

Day labourers and unemployed individuals are the most-exposed and least-resilient group. It is hard to find work when the harvest fails and money for day labourers is scarce. In most cases day labourers do not have access to land and therefore have to buy all their food at the local market –for high prices in times of scarcity. Furthermore, they do not have land or cattle to sell off and they face stiff competition in the short-term “job market” in times of crisis [KI 3].

	Exposition	Coping capacity
Farmer	High	Low-medium
Home-business	Low – very high	Medium – high
Employed	Low – very high	Very low - medium
Day-labourer	Very high	Low

Table 8: El Naranjo: Exposition and coping capacity

Source: Own compilation

5.1.2.3 Transforming Structures and Processes

Structures

El Naranjo is a community within the *municipio* Waslala. The village is located two hours eastwards of Waslala, the municipality’s capital and the location of the mayor’s office. The village has its own locally elected deputy mayor (*alcalde filial*). The deputy mayor has his office in El Naranjo. Waslala is the westernmost municipality of the *Región Autónoma del Atlántico Norte* (Autonomous Region of the Northern Atlantic – RAAN), a remote, poor and dispersedly populated region (see map on p. 40). Due to this remoteness, the *municipio* belongs administratively and politically to the State of Matagalpa [INIFOM 2011]. In a discussion between village dwellers, this structure and peripheral location was identified as a major disadvantage.

One of the main income sources of municipalities are transfer payments from the national and state government for supporting rural development. Since El Naranjo politically belongs to Matagalpa, but geographically to RAAN the deputy mayor concludes that he and his village are

powerless in the described framework. “All the [transferred] money stays in Waslala”, he complains and that other actors within the state are too powerful [KI 5].

The community decided to change the structure and developed a plan in order to become a municipality on its own. According to the deputy mayor the new *municipio* should be part of RAAN. The rationale behind this is to be a more powerful actor in state politics and, thus, receive a bigger share of the transfer payments from the national government. As a tiny municipality this aim is easier to reach in a poor state with relatively high transfers like RAAN [KI 5; KI 7].

Geographic Capital

In the current structure El Naranjo’s geographic capital is relatively low. The village is geographically, as well as politically, marginalised. However, there was an increase in geographic capital after electrification; villages without electricity are stigmatised as “left behind” and underachievers. Whereas today, El Naranjo’s people as well as governmental officers see the village as more advanced. This was mainly shown in two examples:

1. After the electrification two hotels, the only hotels in the village, opened since more people came to the village: mainly businessman and governmental officers.
2. When asked about the major advantages of electricity people often simply said that they do not have to live in *la oscurana*, the darkness, anymore. They see themselves as more developed and the light itself as an important impact on people’s self-esteem. People from neighbouring villages without electricity confirmed this perception. Producing this image is important to overcome the stigma of rural dwellers that frequently leads to exclusion.

The friction of distance, which includes the accessibility of the community and is an important indicator for geographic capital, is smaller after electrification; communication technologies allow better interaction between the governmental agencies and the community. However, beside undoubted positive effects of the sought “independency” from the *Municipio de Waslala* it may have an adverse impact on geographic capital as well. RAAN’s capital, Puerto Cabezas, is far away and only in the dry season reachable by a rough road. The physical and above all the frictional distance would be much higher. This is, by the way, the reason why Waslala belongs administratively and politically to the State of Matagalpa [INIFOM 2011.].

Processes

The national policy of electrification is one of the most important processes. Furthermore, it nicely demonstrates how agents interact within the context of transforming structures and processes. The general ideas of the policy are outlined in section 2.3.

The national Ministry for Energy and Mines (MEM) is responsible for the execution of all nation-wide electrification programmes. These international donors' programmes usually require that the programmes' national counterpart, i.e. the MEM, contributes their own funds towards the programmes' budget. The MEM in turn contributes with own money, but demands financial distributions from the beneficiaries (e.g. the local *alcaldía*, the mayor's office). In the case of El Naranjo the hydropower provider HINNSA is still due to pay their share. The MEM never pushed their claim, but they always could.

As outlined in the analysis of financial capital, many consumers in El Naranjo are unhappy with their high electricity bill and approached the MEM which has a strong interest in satisfying the people. The agent-agent structure favours the powerful MEM: El Naranjo has a small geographic capital endowment and an unfavourable peripheral situation between two states and the financing structure of PCH projects is also disadvantageous. There are rumours that the MEM will pressure HINNSA to lower the tariff to a level that hardly covers its costs and offers a waiver of their financial counterpart in return [KI 4].

Some people suggest this has to do with the presidential and parliamentary elections which are to be held on November 6th of this year. However, the lower tariff jeopardises the financial sustainability of the PCH project and HINNSA is faced with a Hobson's choice.

5.1.2.4 Livelihood Strategies

In addition to "in need"-strategies outlined in the vulnerability section, households seek to increase their resilience in a "long-term strategy". As outlined in the previous section, 78 out of 307 surveyed households (25%) stated they owned a shop in the village. Forty five of these shops were small shops. These small shops supply the households with a second source of income besides their main occupation. According to the survey data 17% of the farming and 10% of the unemployed families operated a small home-shop and through this diversification of income source they increased their resilience to shocks in the agricultural sector.

Twenty one of these “second income shops” (60%⁹) were established in the three years after the electrification compared to six shops (17%) in the three years before electrification. Nearly all of the households which set up a small shop have lived in the village for a long time already. Only 10% of the small shops-owners moved to El Naranjo in the last 3 years. This suggests that some households changed their livelihood strategy to diversify their income sources.

Home business owners seek to increase their resilience as well. An important factor contributing to their vulnerability is that they have to buy all their food in the market which cannot be influenced by them. A share of the business owners (10% of all) recognised this menace and decided to grow food for subsistence on their own land. Some have cattle as well, which serves for milk production and thus a second source of income. Diversifying their income sources in this manner increased their resilience to business and idiosyncratic shocks. However, this livelihood strategy seems to have little relation to the electrification.

Two thirds of the households said that the overall situation of the community is better today, compared to the situation three years ago. People named the electricity supply, a higher population and *más movimiento* (loosely: a more flourishing village) as reasons for their satisfaction. However, only 40% affirmed that the situation of their family is more favourable today. This is mainly due to very low satisfaction rates among farmers and day labourers (both less than 30%), who complain about too little work, a bad harvest and rising prices for staple food.

Livelihood strategies and village development

Economic development usually involves a change in livelihood strategies and occupations of the rural dwellers; of particular importance is the evaluation of activities in the non-farming sector: at the first stage there are only farmers, but if a certain village size is reached, traders come to buy surplus agricultural production and sell it to urban markets. The traders, thus, generate financial capital, which is distributed among the farmers and brought in circulation to buy non-food products. Thereby farmers and traders build a market for “luxury” products which attracts craftsmen, carpenters and specialised shops.

This process can be followed looking at the development of El Naranjo: approximately half of the farmers live in the village for more than ten years, while the average trader lives there for

⁹ Due to missing data this percentage is based on 35 shops with known year of establishment.

only 9 years (the “median” trader for 7 years only), thus, besides some “old traders” many came in the last years. In the next phase businesses developed: two-thirds of all workshops and three-quarters of all shops were established in the last six years. Lastly, a service sector (ICT, barber, hotels, milling) emerged with 60% of the businesses being established in the last 3 years. Ocote Tuma shows a similar development with both, traders and shops who came to the village recently; boosted by the electrification.

5.1.3 Migration

Since the 1990s El Naranjo is growing and key informants confirmed that there is only little out-migration [KI 5; KI4]. Nonetheless, 61 households (20%) stated that at least one household member left the family in the last three years. Particularly high out-migration was registered in households with low income: two-thirds are day labouring or farming households and only one quarter from a family with a home-business, where family members rather stay to work in their own business. Although most people left in order to work at another place, only 16% send remittances to their families in El Naranjo; and all but one family that receive remittances is in the farming sector.

This section seeks to analyse the migration into the village. It is differentiated between how many people came to the village at which point of time (“quantity of migration”) and the reasons why these people came and where they came from, as well as their occupation (“quality of migration”).

5.1.3.1 Quantity of Migration

El Naranjo is indeed a flourishing village that has attracted a lot of people. A quarter of all households moved to the village recently (i.e. in the last three years). Figure 21 illustrates the duration of residency in El Naranjo. The time ranges from two weeks to 33 years with an average of 9.5 years. A significant share of the population had also lived in El Naranjo for a long time already. However, a total of 61 households were established after electrification and 16 other households observed in-migration.

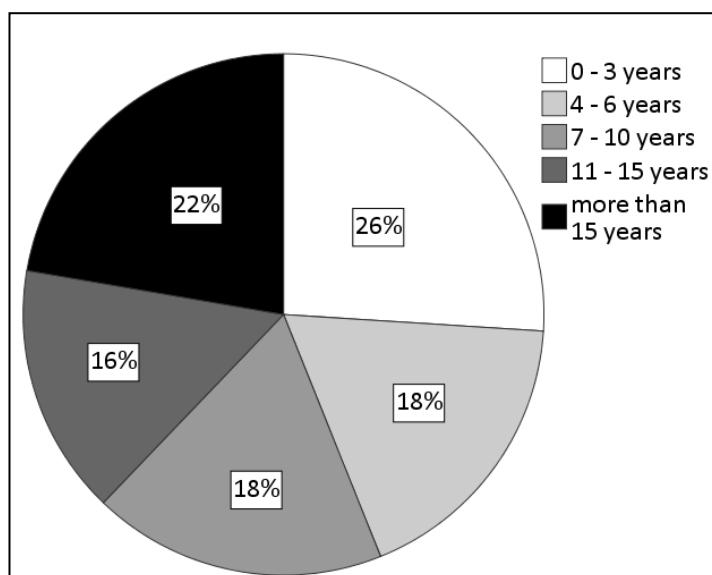


Figure 21: El Naranjo: Duration of residency

Source: own survey

5.1.3.2 Quality of Migration

This section analyzes the quality of migration, i.e. the occupation and origin of recent migrants as well as their reasons for migrating to El Naranjo. Therefore, the dataset is reduced to those households which were established since electrification in 2008. Thanks to the size of the original sample, 77 households fell into this category. With this sample size we were able to further divide the migrated households into sub-sections for more-detailed analysis.

Occupation

More interesting than the question “When did they come?” is it to ask “Who came and why?”. Figure 17 (p.52) already gave a first idea: most of the businesses were established in the last three years. Further, as depicted in Figure 22, the share of home business owners amongst migrants is above average, whereas the share for farmers and unemployed individuals is below El Naranjo’s average (compare Figure 15, p. 45 and Figure 23).

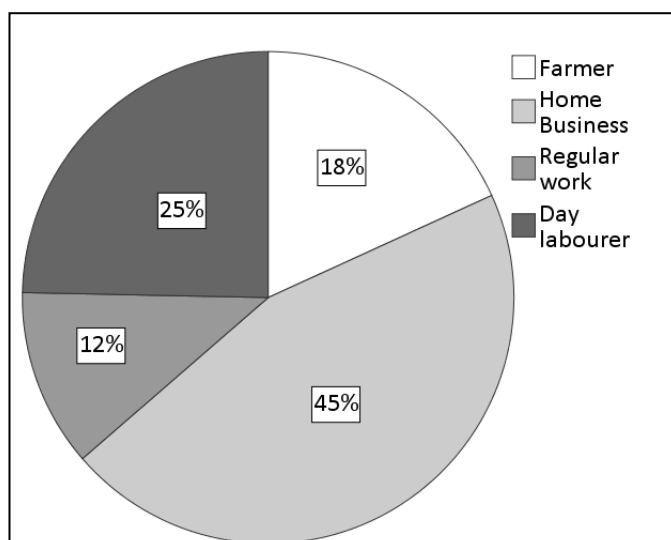


Figure 22: El Naranjo: Recent migrants (<3 years), sorted by groups

Source: Own survey

Interestingly, there are two groups of migrated farmers: those which are relatively well off and those that are primarily small subsistence farmers. Two-thirds of the recently migrated farmers are subsistence small-scale farmer with less than 10mz, but 30% are medium-scale farmers with more than 30mz (20ha). Additionally, half of them own at least ten heads of cattle and 21% have more than 50 heads of cattle.

The more detailed Figure 23 depicts the share of people with certain “main occupations” for recently migrated people in comparison to the group of people with a longer duration of residency. It can be seen that a greater number of other businesses were established than shops. These businesses included builders, carpenters, a dentist and a photographer (with digital camera equipment) among others. One of them was the carpenter Jose Cristobal Blandón, who came directly after the electrification because of “good business opportunities”. He worked in Waslala before, but got angry about the electricity blackouts. In El Naranjo there is “a better security of supply than in the city”, he admitted. Today, he owns a carpenter’s shop and employs five to eight workers [EN 324].

Another interesting difference is seen in female employment. Figure 23 shows that people who had been living in El Naranjo longer more frequently indicated that “household activities” was their main occupation (44%) in comparison to those who migrated more recently (40%). However, this is due gender inequalities in the sample group. An analysis of the female’s main

occupation shows that in both groups, recently migrated and others, household activities make up 71% of the work.



Figure 23: El Naranjo: Main occupation of migrants

Source: Own survey

Origin of Migrants

Migrants who came to El Naranjo within the last three years have quite diverse origins. Figure 24 illustrates that most people's place of origin was urban areas. In particular, Waslala, Siuna and Department Matagalpa (with most from the city of Matagalpa) were most frequently named. Few are from the Municipio de Waslala (excluding Waslala itself). This explains as well the high electrification rate in the points of origin: nearly two thirds (63%) had access to electricity where they lived before.

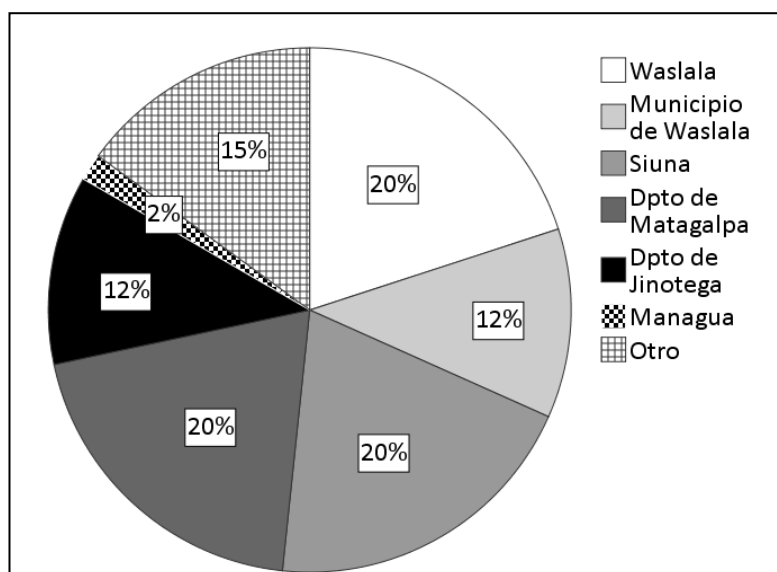


Figure 24: El Naranjo: Origin of recent migrants

Source: Own survey

Reasons for Migrating

There is significant diversity in motivations for moving to El Naranjo. However, in general they can be grouped into three categories: for business, for a “better life” or for the family. The largest group is that of those who came for business (i.e. to work or to build a business). They make up nearly 40% of the total. A quarter of the migrants came because they expected a better quality of life in El Naranjo and 17% came due to marriage or because family members already lived there. Reasons such as family and marriage are not included in the following analysis since infrastructure or other push- or pull factors did not play a role in the decision-making process.

In terms of important infrastructure, water supply clearly ranked first. Half of the migrants considered the water supply to be very important (“I would not have moved if there was no adequate water supply in El Naranjo.”). As seen in Figure 25 the second most important elements were equally electricity supply and work opportunities. One in four migrants said they would not have gone to this place, if there was no electricity or work. These top three reasons are followed by schooling, which at 17% is also considered to be very important.

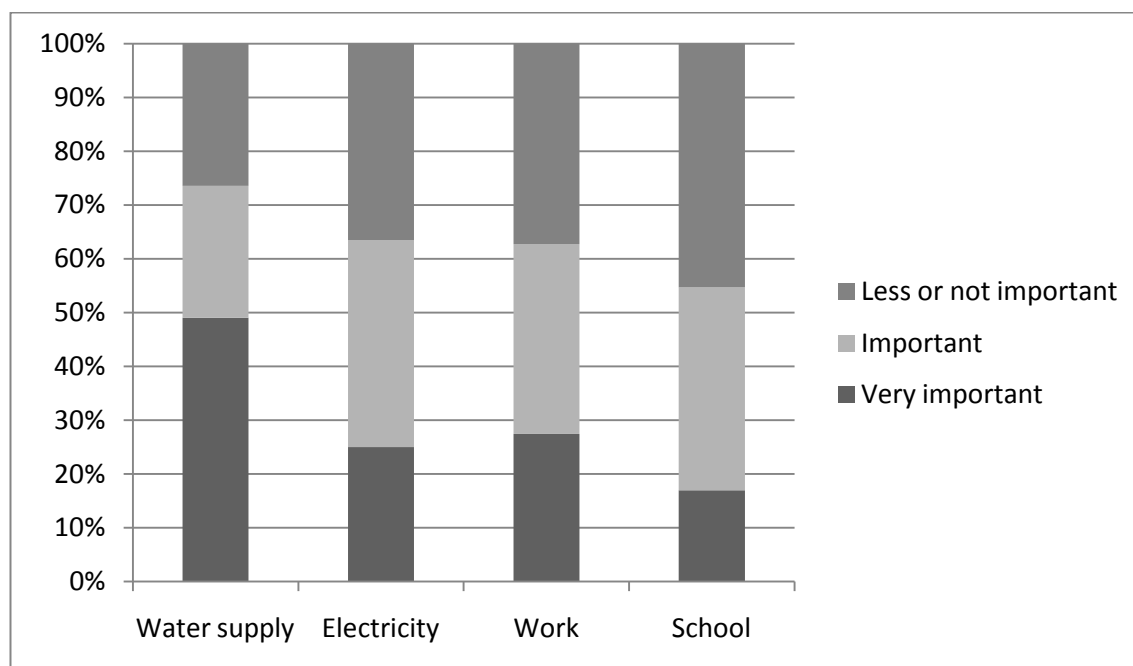


Figure 25: El Naranjo: Importance of basic infrastructure to recent migrants

Source: Own survey

The importance of electricity varies widely between the four different occupational groups. Not surprisingly, home businesses profit most from electricity and, thus, it is very important to them; but the share of home business owners who do not value the electricity is still higher than the share of those who do. More interesting (and statistically more irresponsible) is a look deeper into the home-business sector as depicted in Figure 26. In this figure you can see that migrated shop owners do not care about electricity at all. Similarly, traders seemed to care less. However, self-employed individuals cared as much about electricity as they did for water supply.

Admittedly, we are now talking about nine households, only. All of them had electricity where they lived before and brought knowledge and services to the village: Carpenter Blandón is among them just as a dentist, a doctor, a wholesale baker, a photographer and a bus operator who runs the El Naranjo – Waslala line.

Why are shop owners not crazy about getting electricity? The answer is quite simple - they don't need it. Although the migrants opened 14 new shops only five of them used electricity other than for lighting. Most shops sell clothes or shoes, kitchen utensils or similar products that were not food.

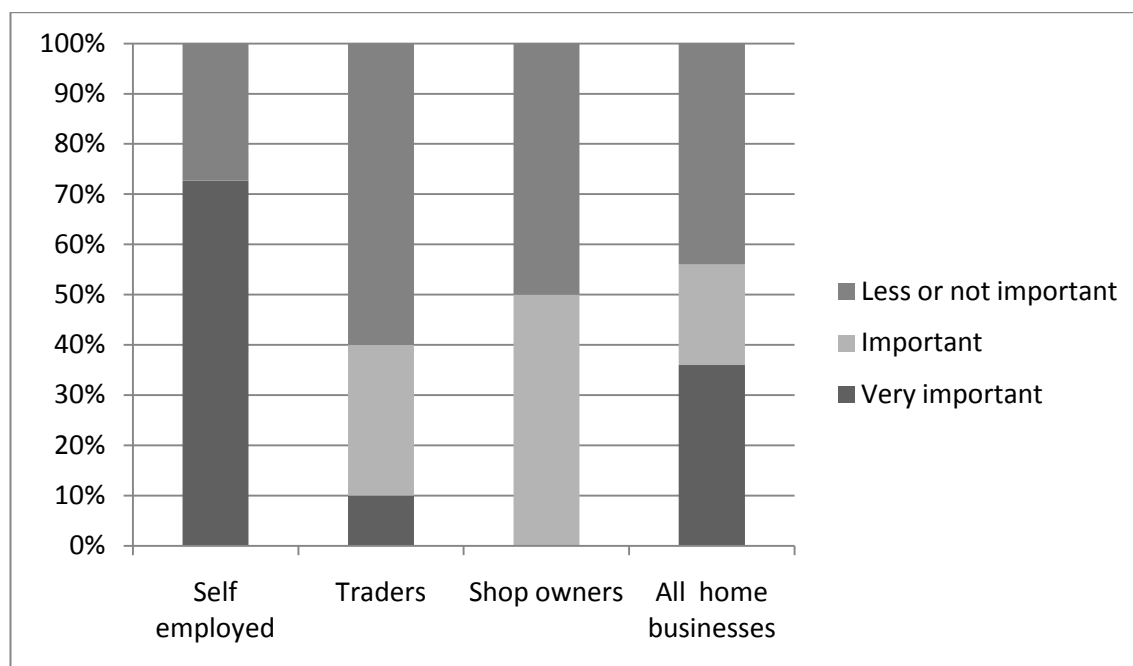


Figure 26: El Naranjo: Importance of electricity to recent migrants in the home-business sector

Source: Own survey

5.2 Case Study II: Villages with Micro-hydro Power

5.2.1 Ocote Tuma

In 2005, Ocote Tuma had a population of 1,700 spread across approximately 280 households. The community is more rural and geographically more wide-spread than El Naranjo. Only a few people from the community live in *caserío*, the village's centre with some houses clustered along the street. The photo below shows the local restaurant and veterinary's shop. Two recently migrated people transport wood for building a house.



Figure 27: Photo of Ocote Tuma's centre

Source: Own photo

Table 9 shows that the male-female ratio inverts between the census and survey data: many men still live and work on the *finca* (farm) in the uplands while their wives live with the children in the *caserío*. In Ocote Tuma 42 households were surveyed.

	Male		Female	
	<i>total</i>	%	<i>total</i>	%
Younger than 15 ¹	481	58	434	42
Older than 15 ¹	398	51	379	49
Own survey ²	35	47	40	53

Table 9: El Naranjo: Male and female population

Sources: ¹ INIDE 2005b:1; ² own survey

The community is characterised by agricultural activity. More than half of the households earn their income in this sector. Further, if you include day labourers, who work nearly exclusively in agriculture, this share rises to 70%. However, Figure 28 depicts that there is a relatively large

group of self employed people; most of them are shop owners, yet, there are also carpenters, traders, a baker, a painter and a cook¹⁰. The regular employees are either pastors or teachers.

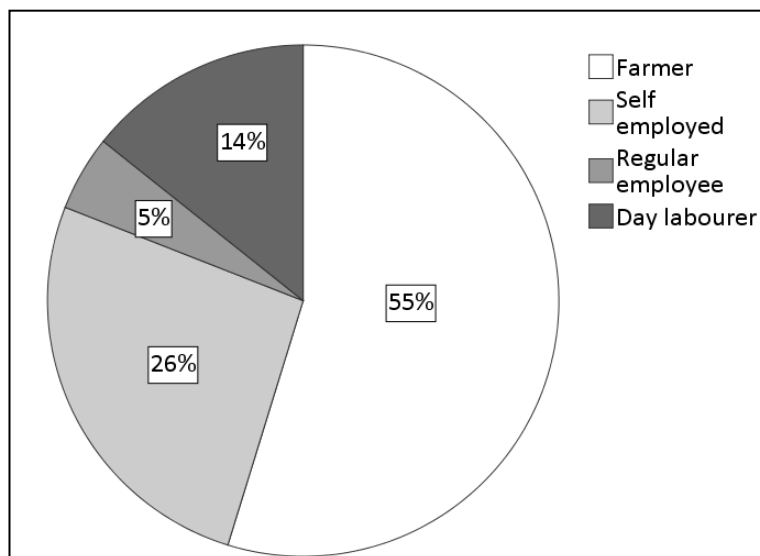


Figure 28: Ocote Tuma: Population grouped by source of income.

Source: Own survey

Electricity Supply

In Ocote Tuma a 30kW micro hydropower plant (MCH for its Spanish acronym) was installed in 2007 and designed to supply 26 households. Today, 47 consumers are connected to the mini-grid in a range of 1,000m around the power house. The grid was built without current transformers and is delivered directly at low voltage to the consumers. This system design does not allow electricity to be transported further than approximately one kilometre.

In contrast to El Naranjo, there is no private power provider that administers electricity distribution, but a communal energy committee. Therefore, the power plant is owned by the entire community. Due to this formation and the missing of electric meters, the tariff structure is different as well. Each household pays C\$ 4,000 (approx. US\$ 200)¹¹ for the right to electricity and a fixed monthly fee according to the number of electric appliances used. The monthly fee varies between two and five US Dollars.

¹⁰ In some families both, mother and father, are self employed.

¹¹ Those who helped building the power infrastructure in 2007 paid a reduced connection fee of US\$ 100.

Thirty six out of the 42 surveyed households were connected to the grid (86%). The six households that were not connected complained about the high connection fee. Before electrification the two churches and one shop had a diesel power generator.

5.2.2 Livelihood Analysis

5.2.2.1 Household's Assets

The electrification had a significant influence on the capital endowment. This section seeks to summarise the main impacts and outline their importance on mobility decisions.

Financial Capital

There is a big difference between poor and better-off households. In particular, those who migrated from Waslala to Ocote Tuma have more financial assets. The fact that most of the households had no problem paying the high grid-connection fee of US\$ 100 or US\$200, respectively, made clear that most households do have access to financial capital. On the other hand a fifth of all households stated that they have problems paying their electricity bill of mostly C\$ 60 (US\$3) and considered it too high. Figure 29 depicts that those who complain about their bill are amongst those who pay the least. Half of the households paid the minimum of C\$ 60, one quarter paid between C\$ 61 and 100 and the last quarter paid more than C\$ 100.

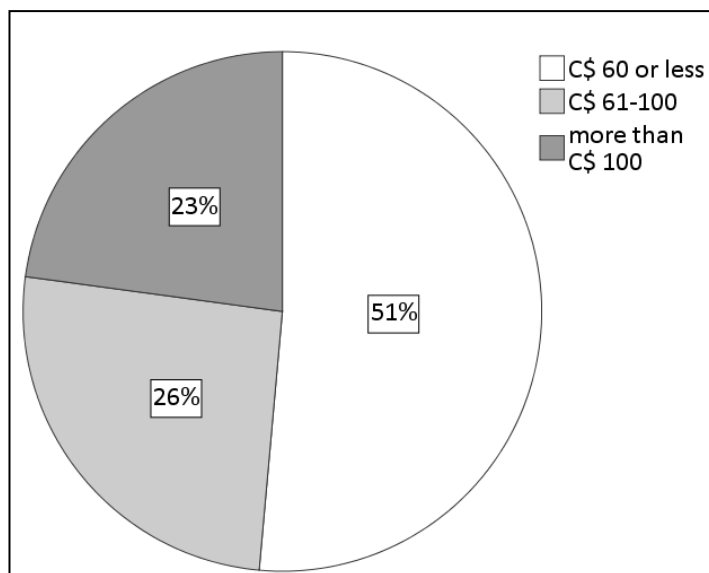


Figure 29: Ocote Tuma: Monthly electricity expenditures

Source: Own survey

Particularly those who were using a power engine before have a reduced financial burden. Most people (51%) use electricity for lighting only. Depending on the kind of lighting they used before, the expenditures may be higher for these households. However, this analysis was not part of the study. Eight households earn additional income through a small shop today, one with a carpenter's shop. Nonetheless, shops that existed before the electrification complain about stiffer competition and decreasing sales [OT 1].

Natural Capital

Most of the households have access to land that they cultivate. Nearly all farmers do not own the land, but rent it from landlords. Instead of a rental fee the farmers pay half of their harvest. Some households are occupied only by the wife and her children; these households have no direct access (i.e. by household members) to land, but in most cases the husband still lives on the *finca*. Only one household's head stated they did not have access to land nor another occupation.

The forests around Ocote Tuma are mainly well preserved. However, there is some pressure on the forests due to the increased population and a higher demand for constructing materials (see Figure 27). According to a teacher of the local school many trees were cut in the last years for building houses. Furthermore, the additional population needs firewood for cooking. All these factors contribute to increased pressure on the forests [KI 8].

Human Capital

Ocote Tuma has a school which offers all six forms of primary school and forms one to three in secondary school. The last two years of secondary school have to be completed in Waslala. There are 187 students in primary school and 150 in secondary school, which is only every other weekend. Students, especially those of the secondary school, come from all parts of the community and nearby communities. Some walk three hours to school – one way [KI 8].

Since the number of students increased sharply in the last years, the first and second forms have two sections of 35 students each. The secondary school was established in 2008, due to increasing numbers of pupils in Ocote Tuma. If the increase in population and, thus in students, is due to the electrification (see discussion in section 5.2.3), there would be an important impact of electrification on human capital, since more pupils now have the opportunity to go to school.

The primary school's teachers emphasised many advantages of the electrification on human capital: the teachers can prepare educational material (e.g. poster) for the classes at night and the students get to know modern technology. Audio and computers are frequently used in school, which is not only pedagogically useful, but also opens the pupils' mind. Some students also go to Waslala to prepare presentations and do research for homework on the internet. For the same reason – opening pupils' minds – the teachers appreciate migration which brought many students from other villages with different cultural backgrounds together. The electrification enabled people to work in other sectors than trade and agriculture. Two households stated that their children acquired knowledge for setting up a carpenter's shop and today both work in this business. In this way, electrification has helped build new job opportunities for the rural youth.

As in El Naranjo, the security aspect of light was mentioned. A woman said that life in the darkness was ugly and she was afraid of leaving her house at night ("*La vida en la oscurana era fea. Me dio miedita.*") [OT 28]. However, this issue was not mentioned as often as in El Naranjo which is probably due to lower crime rates.

There is still no health post available in Ocote Tuma. However, shops are selling human and veterinary drugs, as well as vaccines. This contributes to an improvement of human and animal health leading to increases in human capital and in the case of animals' physical capital.

Physical Capital

Public Physical Capital

Ocote Tuma has little public physical capital. There is limited infrastructure with no means of communication, a small, but weak, electricity network, and only a few water pipes. The infrastructure of businesses is better though. Many surveyed people said that they have a better life now, since there are more shops and more things available in the village (see discussion in the Livelihood Strategies section). All the big shops in the village were established after electrification including a pharmacy and a veterinary shop. The same is true for the carpenter's and tailor's shops. Figure 30 depicts the time the 14 small or big shops have been working in Ocote Tuma. Two-thirds of them were established after the electrification and a further quarter in the two years preceding electrification.

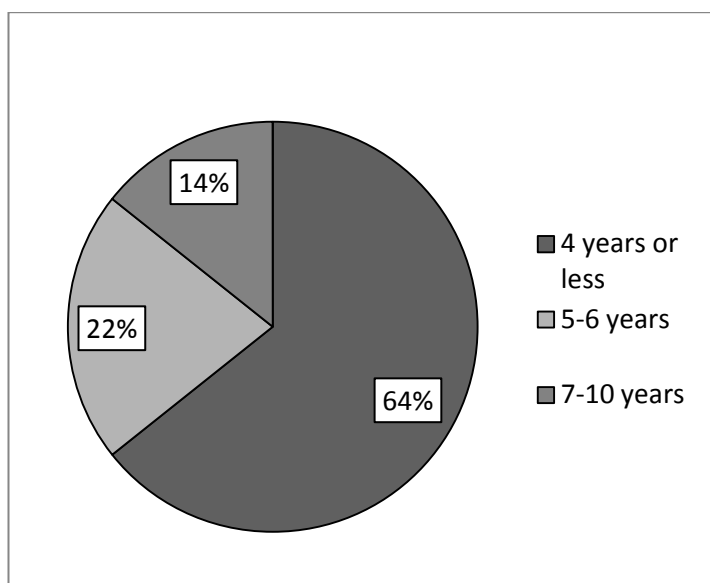


Figure 30: Ocote Tuma: Years of operation (shops)

Source: Own survey

Personal Physical Capital

After electrification many households transformed their financial capital into physical capital. A fifth of all households have a fridge and many more have acquired a TV set with a DVD player (there is no TV reception in Ocote Tuma); the photo on p. 69 shows the only house with a satellite dish. However, three-quarter of all houses are built of wood. Only 14% are stone-made and some are made of mixed material, mainly wood and stone.

Social Capital

The DVD players are at the same time a reason for a decrease in social capital since more violence among pupils was observed by the teachers. They traced this back to the viewing of violent movies at home [K18]. Indeed, the percentage of kids watching TV after 6pm (36%) is higher than that of their parents (29%). The teacher mentioned as well, that drugs were brought to Ocote Tuma by children of in-migrated families. Unfortunately and exclusively due to time constraints the village's drug market could not be evaluated.

Social life in Ocote Tuma is very limited. During the day very few people were on the street and after sunset the street was empty. Average bedtime is 8:10pm with little variation by gender and age. This might be attributed to missing public lighting, but the main reason seems to be the high percentage of farmers in the village who get up early. On average a farmer gets up at 5am after 8:50hrs of sleep. His wife gets up half an hour earlier to prepare breakfast – with

slightly less sleep. Outside evening activities are limited to attending church during twice weekly services. The churches have a huge influence on people's lives and many follow strict religious rules. There seems to be quite strong relationships between the dwellers; this is partly because of the membership in a church.

Even though the next landline telephone or point with mobile reception is two hours away, 60% of the households use these means of communication; albeit hardly anybody more often than once a week. As depicted in Table 10 primarily self-employed people use ICT; probably because most of them migrated to Ocote Tuma and have family in other parts of the country. Farmers tend to use landline telephones in public communication centres in Waslala, whereas self-employed individuals tend to use mobile phones. In this case it is hard to say, if electrification has had an impact on the use of ICT since there has been no change in ICT infrastructure since electrification. According to the survey nobody uses the internet, although the teachers said that some pupils use the internet in Waslala for their homework.

Group	Mobile Phones	Landline	Internet	Total
Farmer	26%	35%	0%	48%
Self employed	64%	55%	0%	91%
Regular employee	100%	50%	0%	100%
Day labourer	0%	17%	0%	17%
Table 10: Ocote Tuma: ICT's use by group (as share of group)				
<i>Source: Own survey</i>				

A little bit apart from all other houses but still connected to the mini-grid is Ocote Tuma's bar. The bar was established outside the *caserío* in 2009, because the community is made up of mostly strict evangelical Christians who did not want the bar to be build inside. It is said that the bar has a bad influence on the youths, causes noises and tumults [OT 30; KI 2]. This suggests a high social cohesion between the community members, based on shared values and views.

5.2.2.2 Vulnerability Context

The vulnerability is similar to that in El Naranjo. Ocote Tuma is spatially close and generally the same crops are planted. The only difference is that instead of coffee more farmers grow cocoa. Cocoa is harvested throughout the year with a main harvest between October and January

when most cocoa pods are ripe. Therefore, there is a change in seasonality, but none in terms of trends and shocks.

Bearing in mind Figure 20 (p. 55) of the agricultural production cycle and the deducted vulnerabilities, the substitution of coffee for cocoa will rather increase the vulnerability. The mid-crops of *frijoles* and maize in October guarantee an income and food for farmers for the rest of the year and there is already some “*movimiento*” at the end of the year. Hence, the income for both, farmer and businesses is even lower in the season of the greatest need: before mid-crops.

The exposition to these hazards as well as the coping capacity is similar to that in El Naranjo as outlined in 5.1.2.2. Though a difference can be found in the group of farmers; most farmers in Ocote Tuma do not own the land that they cultivate. Thus, they cannot sell land in emergencies and are more vulnerable to stresses.

5.2.2.3 Transforming Structures and Processes

Due to the size of the village there are hardly any formal or informal structures and processes which can be identified for the purposes of this study.

Structure

Ocote Tuma is a community in the *Municipio de Waslala*. However, there is no formal structure or representation of the mayor’s office. It is administered from Waslala. The only formal structure that could be found was the “energy committee” which is responsible for the management of the MCH. There is an *acopio de cacao* (“cocoa gathering”), an intermediary which buys, gathers and sells the cocoa. However, it only operates in high season.

Geographic Capital

The geographic capital is low in Ocote Tuma. It is politically and spatially marginalised and this will hardly change. The *caserío* is small, the rest of the community is far-flung and it is located apart from decision-making organisms. Particularly the frictional distance is big, since there are no busses running to reach the community. However, a street was build in 2007 and since then small trucks take passengers and freight to Waslala. They go twice a day and take two hours for the 14km. This improvement allowed governmental officers to get to Ocote Tuma by jeep and thereby improved communication between the community, their needs and governmental

agencies. The presence of these officers has significantly increased since the electric system was installed and the road was build [KI 2].

5.2.2.4 Livelihood Strategies

In Ocote Tuma many households build resilience by diversifying their income sources. Farming households have set up seven small “second income shops” (SIS) (30% of all farming households) and two farmers work as builders (9%) to generate additional income.

All but one SIS was established after electrification and most of them (five out of seven) by dwellers who had lived longer than four years in the community. This suggests that a change of the livelihood strategy occurred after electrification when (above all) farmers’ wives started to build small businesses.

Less than half of the population thinks that the situation of their family has improved in the years since electrification. Main reasons for this are the bad harvest farmers experienced this year and the rise in food prices. However, the change in the community is perceived much better. Three quarters of the people surveyed said that the community was better (i.e. more developed) now than it was before. Most interviewees appreciated the electricity supply and Avel Oroz, a small scale farmer who lives in the *caserío* for ten years, was not the only one who was happy “that there are more shops and businesses now” [OT 54].

5.2.3 Migration

This section analyses the composition of the population, as well as in-migration within the last four years. The threshold of four years was chosen in Ocote Tuma because the MCH was built in 2007. When comparing the village with El Naranjo, it is important to keep in mind that El Naranjo’s threshold is three years. Ocote Tuma hardly experiences any out-migration. The survey confirmed statements in interviews, that there is only in-migration. Only six families (14%) stated that a family member left the household in the last four years. All of them left because they got married.

5.2.3.1 Quantity of Migration

The *caserío* is indeed relatively young. Figure 31 depicts that more than half of the population came to Ocote Tuma within the four years since electrification. However, it is important to notice that there was high in-migration already occurring before electrification. Almost 20% of

the population migrated to Ocote Tuma in just two years. The duration of residency ranges widely: the newest community members moved in just one month back and the oldest lived in Ocote Tuma all his life (40 years). Therefore, the average duration is longer (6.5 years), than the median (four years). Besides the 24 households which were newly established, three were joined by either the father or the mother of the family who lived elsewhere before.

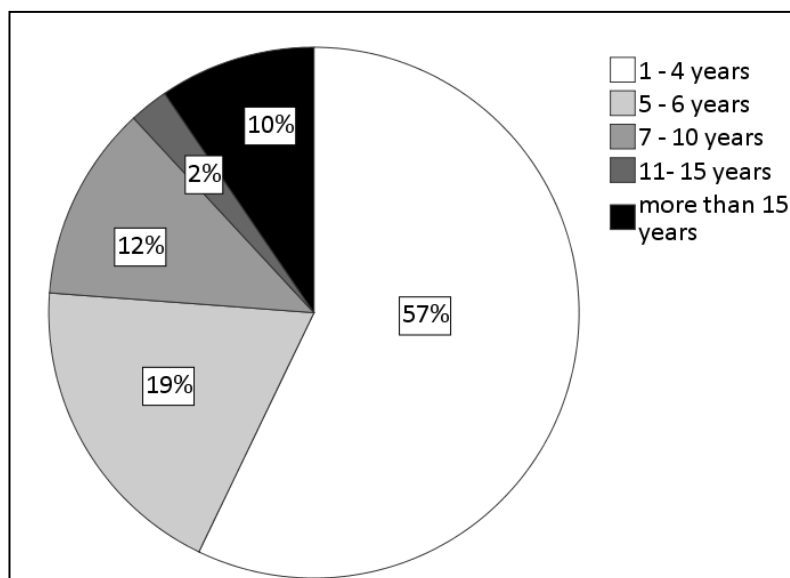


Figure 31: Ocote Tuma: Duration of residency

Source: Own survey

5.2.3.2 Quality of Migration

This section will discuss the attributes of those who recently migrated to Ocote Tuma. However, reducing the dataset to recent migrants only brings its size down to a small number of cases ($n_M=24$). Therefore, the validity of findings is reduced, particularly if sub-categories are built from this dataset.

Occupation

In the last four years the *caserío* has attracted two types of migrants: farmers and businessmen. Figure 32 shows that both groups make up a similar share of recent migrants (40%). Day labourers and rotating pastors make up the rest. The self-employed group consists mainly of shop owners: all seven big shops were set up after electrification. Others in the “self-employed” sector include craftsmen like carpenters, a painter, a baker and a builder.

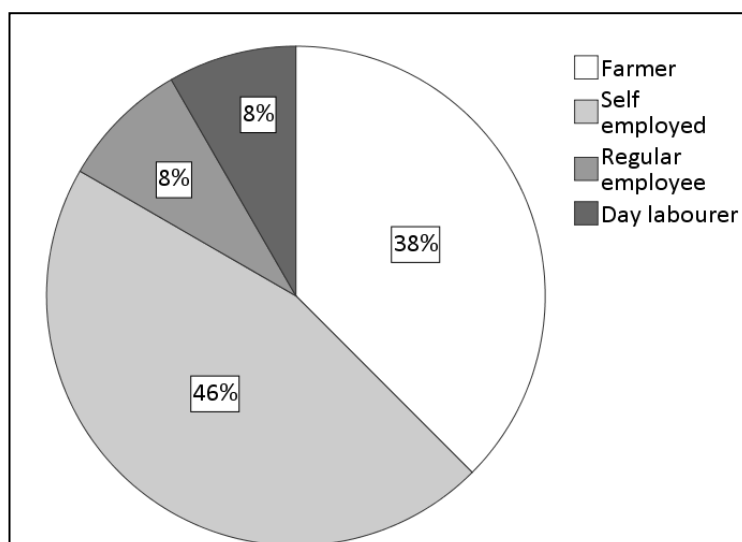


Figure 32: Ocote Tuma: Recent migrants (<4 years), by group

Source: Own survey

Interestingly none of the eight recently migrated farmers liked their new life. Nobody said that their family situation was better now in comparison to that in their old place. They complained about high prices in the *caserío* and many just liked life on the *finca* more. In the group of established farmers who lived there before electrification, eight of 14 stated that their family situation had improved. The migrated business owners seemed to be quite happy as well: all but one thought their life was better now than it was before [OT 3; OT 8].

Origin and Reasons for Migrating

The origin of recent migrants is not as diverse as in El Naranjo. Two-thirds came from other rural parts of the *Municipio de Waslala*, mainly from the uplands which are close to the village. Figure 33 depicts that another quarter originates in the city of Waslala. The latter group and the migrants from Matagalpa and Managua were those who came to set up shops and those who had electricity at their place of origin. They would not have come if there was no electricity in Ocote Tuma [OT 34].

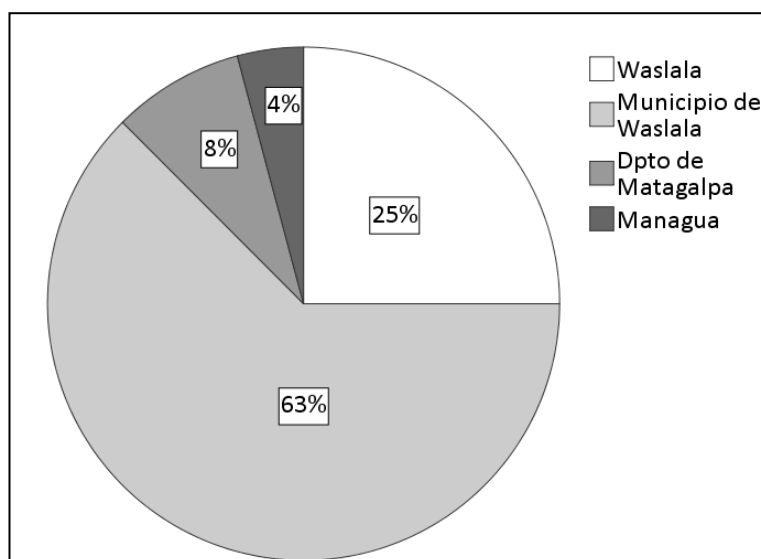


Figure 33: Ocote Tuma: Origin of recent migrants

Source: Own survey

Farmers make up more than half of the migrants from the *Municipio de Waslala*. However, there are some self-employed individuals among those who came from rural areas: former farmers now try their luck as craftsmen. Some, like Perfirio Cortedano, still have their lot of land to produce some staples but work mainly in the productive sector now [OT 5]. This example shows how electrification has caused changes in livelihood strategy, shifting from agricultural production through migration towards a diversification of the income sources.

5.3 Case Study III: Village without Access to Electricity

5.3.1 Rosa Grande

Rosa Grande is a small community that stretches along Waslala – Siuna Street. The population of Rosa Grande was 1.400 people living in 230 households when the last census was carried out in 2005. Although this community has a smaller population than Ocote Tuma, more households are situated along the main street and could be reached (60 households were surveyed). The houses stretch along the street on a length of 2.4 km with two clusters: one around the school and another near the river. The 2005 census found that there were slightly more men living in the community; in the sample the ratio is inverted. This is due to a similar reason as in Ocote Tuma: women and children live in central parts of the community while the fathers live and work out on their land a lot.

	Male		Female	
	<i>total</i>	<i>%</i>	<i>total</i>	<i>%</i>
Younger than 15 ¹	373	53	326	47
Older than 15 ¹	357	52	335	48
Own survey ²	49	46	58	54

Table 11: Rosa Grande: Male and female population

Sources: ¹ INIDE 2005a:1; ² own survey

Rosa Grande's population mostly lives on farming: 60% of the surveyed household's main occupation was agricultural production. Figure 34 depicts the main sources of income and shows that besides the farming and unemployed/day labouring households only a quarter are employed or self-employed.

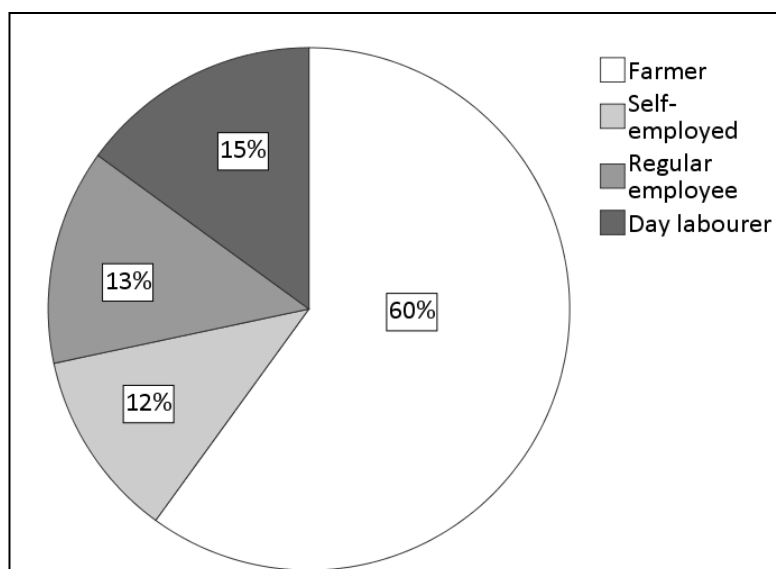


Figure 34: Rosa Grande: Population grouped by source of income

Source: Own survey

Regular employees include teachers of the local school and one pastor. Besides shop owners the self-employed category includes traders of basic grains. Some of these non-agriculture families have access to land, though.

Electricity Supply

There is no centralised electricity generation or a mini-grid in Rosa Grande. However, 15% of the families have sought a personal solution for their electricity supply. Solar home systems (SHS) were acquired by six households (10% of all households) and three households have

individual fuel power plants. At least one more family had a power plant at the time of the first village visit but at the second visit it was damaged and the family did not want to repair the generator due to a lack of financial resources and rumours of forthcoming electrification of Rosa Grande. According to the director of El Naranjo's electricity provider, a 450kW hydropower plant will be installed in Rosa Grande soon. This plant shall be interconnected with El Naranjo's overloaded grid.

Furthermore, institutions of basic infrastructure (school, health post) were electrified by the EUROsolar programme. This highly impacted many capital assets. This is further discussed in subsequent sections.

5.3.2 Livelihood Analysis

5.3.2.1 Households' Assets

Financial Capital

The endowment with financial capital is low: farmers have relatively small farms and most produce for their own consumption and only generate a low income. Other income generating activities are rare; therefore, little money can be spent in the community's shops which in turn generate little financial capital.

Some shop owners acquired solar home systems (SHS). This does not seem to have an impact on their businesses, though. Business owners stated that nothing changed after buying the SHS. Expected impacts of electrification like longer opening hours, TVs to attract customers or similar things were not observed in Rosa Grande.

Natural Capital

With a large share of farming households, the community has a lot of natural capital available. Forty two of the 60 households had access to land. The size of the land lots did not vary as much as elsewhere. The farmers owned between one *manzana* and 76 *manzanas*. The land lots were smaller than in El Naranjo and smaller than the municipal's average. Table 12 shows that the difference is mostly in an above average share of small subsistence farms with less than 10mz (6.8ha) and less medium-sized farms with more than 50mz (34ha). This has a negative impact on financial capital since a bigger share of the harvest is self-consumed and fewer crops are sold.

		Waslala (in %)	Rosa Grande (in %)	
				accumulated
Farm size	1-10mz	40.1	52.4	52.4
	11-30mz	43.7	28.6	81.0
	31-50mz		11.9	92.9
	51-200mz	14.6	7.1	100
	more than 200mz	1.6	0	
Total (absolute number - n)		4738	42	

Table 12: Size of farms in Rosa Grande and the Municipio of Waslala

Sources: CABAL 2008 (adapted) and own survey

Environmental Degradation

Batteries are widely used in Rosa Grande: only one household said that they do not use any batteries. Batteries are mainly used in flashlights for lighting (95%) and for battery-driven radios (90%).

Human Capital

Rosa Grande has an elementary school and since 2006 a secondary school as well. The elementary school has daily classes while the secondary school allows working within the week and has special teachers coming from the municipality's capital Siuna every other weekend. The school is one of the beneficiaries of the EUROsolar programme of the European Union. The programme provided five computers which are connected to the internet and a projector; both of which are powered by a solar system.

Besides the school, there is a health post. The facility is also electrified and provides medical care including vaccinations to the people. Thereby it contributes to improving the rural dwellers' health status and increases human capital.

At the household level, lighting is one of the main sources of indoor air pollution and, thus impacts health. The pollution depends on the means of lighting: the two preceding villages with electric light do not have any air pollution from this source. Figure 35 shows that households in Rosa Grande use mainly candles (58% of all households) and 23% stated to have either electric bulbs or to use flashlights. Indeed, candles pollute relatively little; while oil

lamps pollute more and are used in 19% of households; with adverse impacts on the households' member's health.

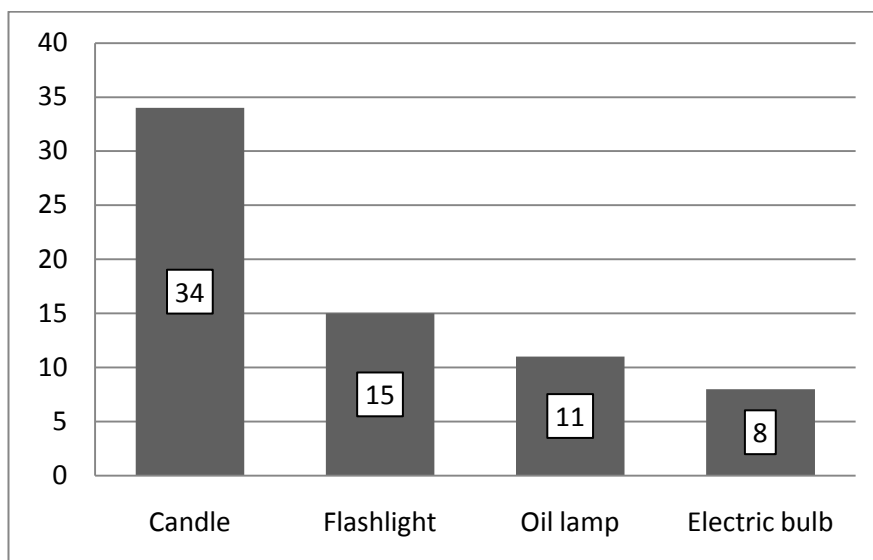


Figure 35: Rosa Grande: Households' means of lighting (n=59)

Source: Own survey

Physical Capital

Public Physical Capital

Rosa Grande's ICT infrastructure is relatively good. Although there is no public landline phone, nor mobile reception, the school offers solar power driven internet services through a satellite system. Mobile phone signals can be captured at a point which is only 30-minutes-walk from the school. For five years there has been a small water grid and most households are supplied with potable water through this system. The infrastructure of shops is also relatively good.

In total, 14 shops exist in the community of which five provide the main income of the family and the remaining nine are SIS, only. As depicted in Figure 36 most shops were established in the last three years. However, considering infrastructure issues it is important to notice that the population density is much smaller than in the other two case studies. Besides the shops (selling mostly food products), no business infrastructure exists.

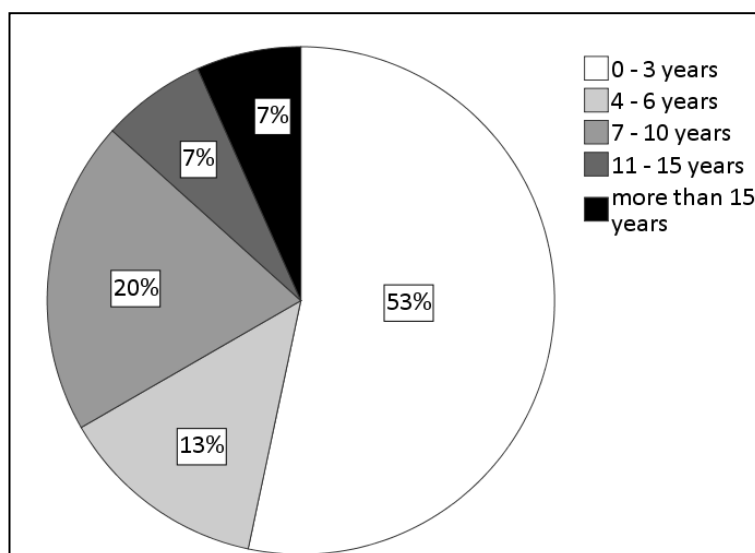


Figure 36: Rosa Grande: Years of operation (shops)

Source: Own survey

Private Physical Capital

With regards to personal physical capital, housing and cattle were analyzed. Three-quarters of all houses was built of wood. Fourteen houses (23%) were made of stone and one with other or mixed materials. Obviously, farmers (76% wooden houses) and day labourers (100%) tend to have wooden-made houses, while self-employed individuals (43% stone-made) and regular employees (38%) tended to have stone-made houses. Seventeen households possessed cattle, most of them having small quantities of 10 heads or less, but five farmers had between 11 and 50 heads of cattle. A little more than a third of all farming households had at least one head of cattle.

Social Capital

Due to the relatively good infrastructure, 63% of all interviewees used ICT. Besides nearly all self and regular employed persons this group is composed by half of the farmers and day labourers who use communication technologies as well. Mobile phones are more widely used than landline phones, since the nearest point of reception is closer than the next public communication centre. Seventeen percent also stated that they used the internet at least once a month, but most people did not know about the new internet service offered at the local school.

Activities after 6pm do not vary much. More than 80% of all groups (female, male and kids) stay home and chat with the family, before going to sleep. Secondary activities include

housework for the female, TV for the group of fathers, as well as, attending church. At 7:30pm the average “Rosa Grandian” goes to bed and sleeps 9:00 hours (female), 9:20 hours (male) and 9:35 hours (kids).

5.3.2.2 Vulnerability Context

The vulnerability context is very similar to that of El Naranjo as outlined in section 5.1.2.2. Due to the high number of households whose main income source is farming the community is more vulnerable to seasonality and agricultural shocks. Particularly subsistence farmers without cattle to sell when in need are exposed to these threats.

5.3.2.3 Livelihood Strategies

The analysis of households’ assets showed that there are 15 shops of which nine are small SIS. These small shops were – in contrast to main income shops – predominately established by women in the last three years. Today, 16% of the farmers have a SIS and, thus, more diversified income sources. Besides the shops, a chocolate manufactory was established by a Siuna-based NGO and generates a second income for two families. Furthermore, 42% of business owners (three out of seven) have land for their own food production and thereby decrease their vulnerability to economic crisis and shocks.

Only a quarter of all families think that their families’ lives have improved in the last three years. There is no big difference between the occupational groups with the exception that self-employed individuals are more optimistic. Looking at the community level the perception is somewhat better - 60% of the households think the situation is superior to that of 2008. The difference is particularly notable in the group of regular employees, mainly teachers: from 17% satisfaction at household level to 100% at community level. Interviewees said that this is mainly due to the improved living situation after electrification (lighting) [KI 8]. Though, due to the small number of regular employees no conclusions can be drawn on this.

The reasons for this are similar to the other case studies; due to draught large parts of the crop were lost. This is particularly harsh for the many small subsistence farmers. Some of them said that they had to sell cattle to buy staple foods. On the other hand the significantly improved schooling was valued, as well as the improved ICT infrastructure.

5.3.3 Migration

The out-migration in Rosa Grande is at a relatively low level, as well. Only ten households said that a family member left in the last three years, eight of these household were farmers; most have relatively big farms, though. Interestingly most of the out-migrants left for education (university or high school) and to a lesser extent for marrying.

5.3.3.1 Quantity of Migration

Evaluating the duration of residency, Figure 37 depicts two bigger blocks: more than 40% of the residents live in Rosa Grande for more than 15 years; and, the second block, a quarter of all households was established in the last three years.

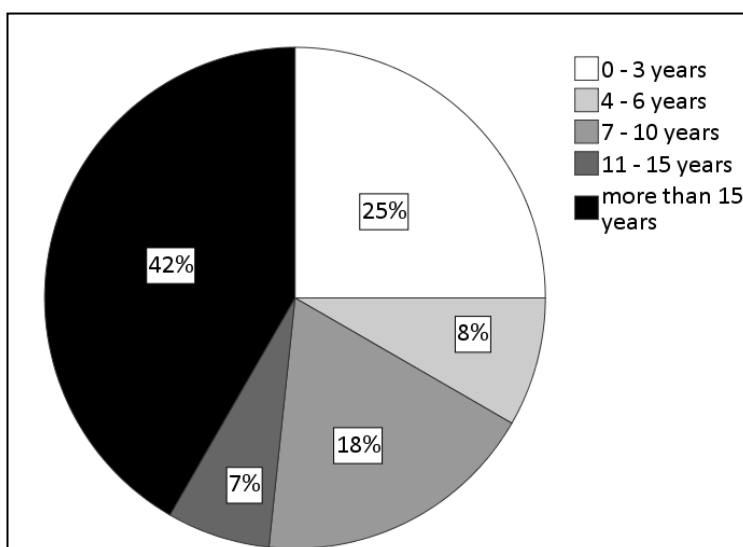


Figure 37: Rosa Grande: Duration of residency

Source: Own survey

5.3.3.2 Quality of Migration

Similar to the analysis for Ocote Tuma, the dataset for the evaluation of the quality of migration is limited to those households which recently migrated. Thus, the number of cases becomes very small (n=15) and the validity of the findings is reduced.

Occupation

The families that came to Rosa Grande recently are predominately farmers and day labourers. In total, they account for three quarters of all in-migration in the last three years. The two smaller pieces depicted in Figure 38 account for a teacher, pastor, trader and shop owner, respectively. The group of farming families are small scale subsistence farmers; all but one owned less than 10mz.

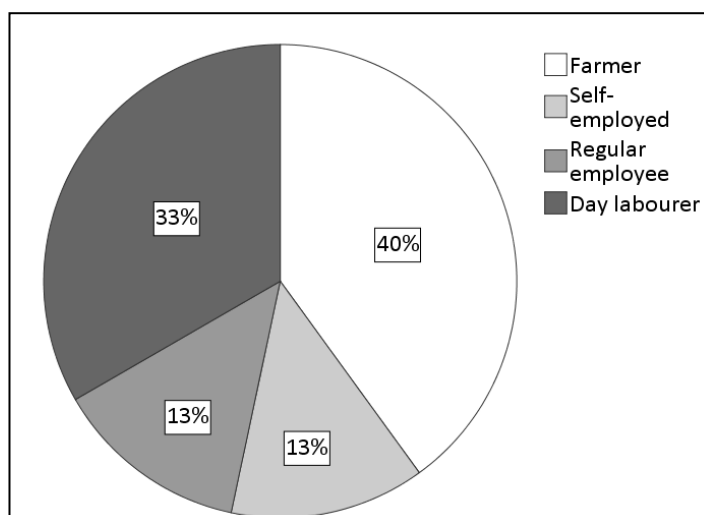


Figure 38: Rosa Grande: recent migrants (< 3 years) by group

Source: Own survey

The recent migrants' physical capital endowment is also lower than that of the established dwellers since the houses of all recent migrants are built of wood. Only one-fifth of the recent migrants had cattle – compared to one third of others.

Origin and Reasons for Migration

A quarter of the families had electricity where they lived before and, hence, came from rather urban parts in the State of Matagalpa or other States. The majority of recent migrants came from rather close and rural parts of the municipalities of Siuna and Waslala. Figure 39 shows that two-thirds of the migrants came from other villages or, more likely, from the uplands where they have/had their farm.

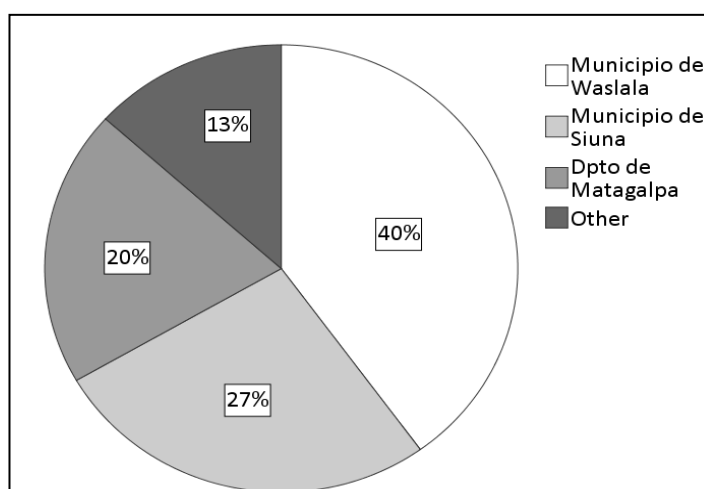


Figure 39: Rosa Grande: Origin of recent migrants (<3 years)

Source: Own survey

40% of the recent migrants, among them all but one of those who had electricity before, said they came to be closer to their family that lived in Rosa Grande. Three migrants (20%) came for work and another three for a better quality of life. Similar to El Naranjo, and probably one of the few reasons to move to Rosa Grande, is the importance of water supply, as depicted in Figure 40. All recent migrants¹² said that they would not have moved if there was no water supply. The health post and access to a school were also seen as very important to 44% and 33% of the population, respectively. Not surprisingly electricity is not very important to the migrants; however, 80% said that this is still an important factor.

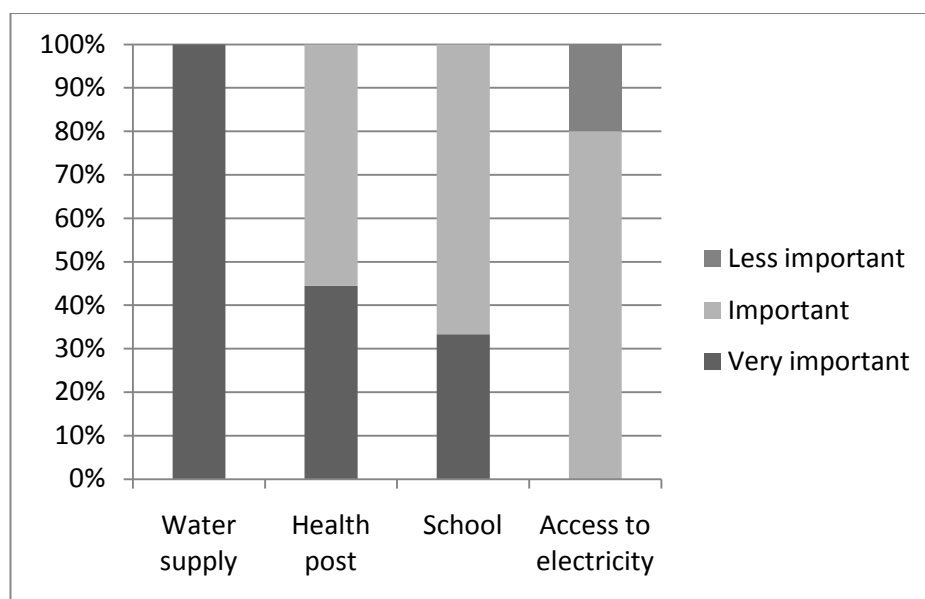


Figure 40: Rosa Grande: Importance of basic infrastructure to recent migrants

Source: Own survey

5.4 Summary

The analysis has shown that the structure of the three villages is different. Rosa Grande and Ocote Tuma are both villages that are shaped by agricultural activity with high shares of farming households (55% in Ocote Tuma and 60% in Rosa Grande, respectively). In contrast, El Naranjo has a high share of self employed home business owners (38%), but also a high share of day-labourers (30%). Consequently, the livelihood situation of the people in the three villages is also very different.

Livelihoods Analysis

Capital Asset Endowment

¹² Without considering those with compelling reasons for migration, like family reunion.

The radar chart (Figure 41) attempts to summarise the endowment with the five capital assets of all the studied communities. It is based on the aspects included in this study. Thus, many aspects were not evaluated and the diagram does not imply universal and overall validity. Inadmissibly personal and community livelihoods are mixed, but nonetheless the chart nicely concentrates the difference between the communities. In order to accommodate these deficiencies the scale is not to be interpreted as an exact quantitative measure, but rather qualitatively. In general, the bigger the distance from the centre the higher the respective capital's endowment is.

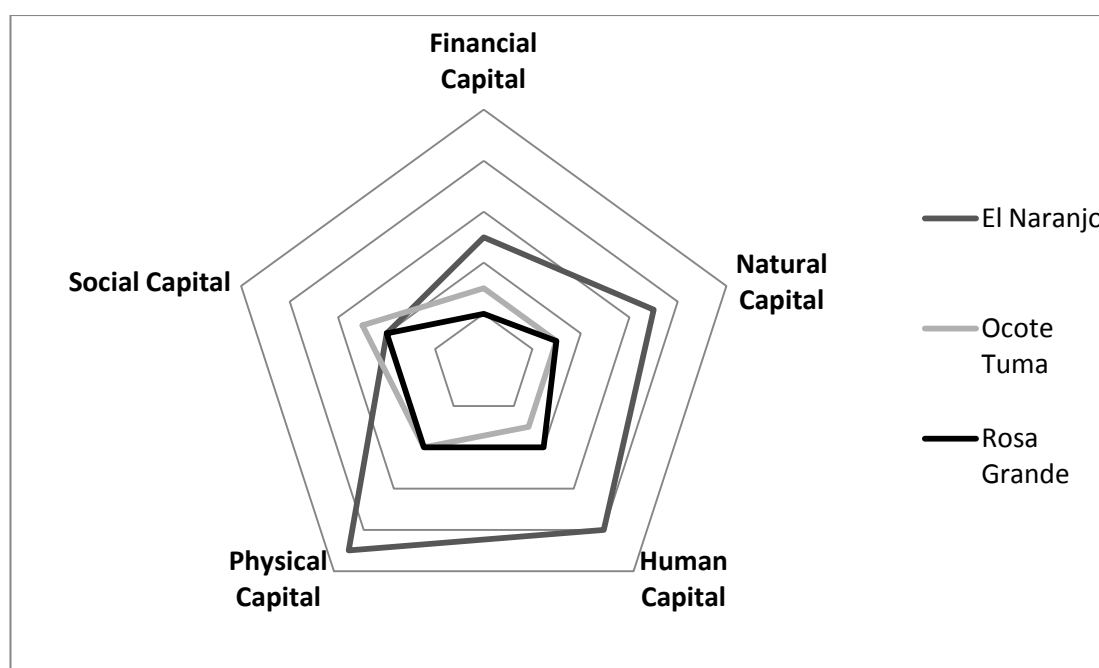


Figure 41: Capital assets endowment in all case studies

Source: own illustration

The **financial capital** is relatively low in all three communities. Generally, the productive sector (including shops) and bigger farms generate financial capital. Rosa Grande does not have much productive capacity and only few shops and farms above subsistence level. Ocote Tuma has more shops, but also mostly small farms. El Naranjo's structure is different; there are less farming households and more productive activities and shops. Some people have bank accounts and many have relatively high electricity bills. Although farms are bigger than in the other two case studies they are more or less at the municipality's average and farmers and day labourers make up half of the population and represent a part of the population with little financial capital endowment. A higher income of shops is the main impact of the electrification. Big shops save money on fuel they need for power generator and all type of shops experience increased turnovers mainly through refrigerated drinks. Another impact is

that more people now generate a second income and therefore have an increased financial capital. However, the impact of the poor's capital is apparently very low.

For an evaluation of **natural capital** the farm size comes to importance again. In contrast to the analysis above, smallholder farms are important since they guarantee a livelihood for most farmers. An important point is that most farmers in El Naranjo and Rosa Grande own their farms, while Ocote Tuma's farmers mostly lease them. Another aspect of natural capital is the degradation of surrounding forests and lands. The high population pressure along the Waslala – Siuna main road and the agricultural pressure (especially for pasture) lead to higher degradation and deforestation in El Naranjo and Rosa Grande. This is in contrast to Ocote Tuma where forests are mainly intact and the pressure is lower. However, there is little evidence for impacts of the electrification: the population pressure cannot be traced back to power supply. However, HINNSA's capacity building sensitises farmers for environmental issues and may lead to decreasing deforestation, although only little impact is visible today.

All communities have a primary and secondary school and therefore a certain level of **human capital**. However, there are differences in the frequency (daily or weekly) as well as in the equipment available: Ocote Tuma does not have internet at school and provides very little space. However, the migrants bring skills and knowledge to the community; whereas Rosa Grande mainly receives unskilled migration. Only El Naranjo has a (newly established) institute of higher education and the migrants are mostly skilled. However, schools profit from accessing knowledge in the internet and media use in classes. . In regards to health, there does not seem to be much difference between the communities other than the fact that El Naranjo and Rosa Grande have a health post, while Ocote Tuma has to rely on Waslala's hospital only. In the electrified communities people tend to stay up longer and get 30-45 minutes less sleep. However sleeping time is still relatively high and no adverse impacts are expected; though, in some cases human health can be affected negatively, particularly in the case of children.

The difference in **physical capital** is particular high. El Naranjo has a very high value due to stone-made houses, relatively greater cattle holdings, good ICT infrastructure (especially with the mobile network which is under construction), a strong and relatively stable electricity grid, as well as a good infrastructure of non-food shops and relatively good street access. In contrast, Ocote Tuma and Rosa Grande have little ICT infrastructure and a small non-food shop sector. The most notable change after electrification is indeed the improvement of the ICT

infrastructure, especially in El Naranjo and Rosa Grande's school. Nonetheless, Rosa Grande provides good street access and is served by some busses, while Ocote Tuma has a (weak) electricity grid, but transportation is only provided by trucks.

Social capital is El Naranjo's only weak category. Although communication is well developed through ICT and public lighting, the community cohesion is much lower than in Ocote Tuma where values are shared. In Rosa Grande ICT is moderately used and there is basically no interaction after sundown. People go to sleep at 7:30pm compared to 8:10pm in Ocote Tuma and 8:30pm in El Naranjo. The community cohesion of Rosa Grande was not analyzed in this study.

Livelihood Strategy

The analysis has shown that rural dwellers tend to diversify their livelihoods, especially farmers' wives who try to generate a second income. The preferred option is opening a small food product store. One in six farmers in El Naranjo and Rosa Grande pursued such a small business; in Ocote Tuma this share doubles. In all three communities the majority of shops, big and small, were established in the last three years. A difference, though, is in the type of shops: Rosa Grande's shops are mainly food product shops, whereas in Ocote Tuma specialised shops like a pharmacy and a veterinary's shop were established. The reason for this change in livelihood strategy could not be determined; however, there might be some relationship to crop failures. The influence of electricity on the spread of small shops seems to be small since it is observed in all case studies. There might be an interrelation with the growing population, as well.

Another finding is that some business owners have their own land that they cultivate to ensure a personal supply of staples. This strategy is much more wide-spread in Rosa Grande than in El Naranjo and can be explained by Rosa Grande's economic structure; most people are farmers as were the business owners before they opened their businesses. Nonetheless, this way the household's resilience to shocks is enhanced.

	El Naranjo	Ocote Tuma	Rosa Grande
“Life is better now”			
Family level	40%	44%	25%
“Life is better now”			
Community level	66%	74%	60%

Table 13: Retrospective evaluation of the life/community situation before and after electrification (as % of the respective community)

Source: Own survey

The overall satisfaction with their family’s and their community’s situation is considerably higher in the communities with electricity supply. However, as outlined in Table 13 only a few people affirmed that their life is better now than it was three years ago. Due to this dissatisfaction people may decide to change their livelihood strategy, again and migrate to another place. However, the high rate of people who are pleased about community development is mainly because of the electrification and the new services provided, such as public lighting or improved ICT (even in the case of Rosa Grande).

Migration

The analysis of migratory movements and particularly recent migration has put forth several differences between the communities. A growing population and in-migration was noticed by most of the interviewed households and, indeed, a quarter of the entire population moved to El Naranjo and Rosa Grande in the past three years. Even more notable is the migration in Ocote Tuma where more than half of the households were established within the last four years. However, with the exception of Ocote Tuma there is no big difference in the quantity of migration between communities with or without electricity.

Table 14 shows who was attracted by the communities. The analysis has shown that the “quality” of migration is much higher in communities with access to electricity. Recent migrants who came to these places tend to be self-employed,, come from urban areas and have some kind of specialised business knowledge. Those coming to a place without electricity tended to be farmers or day-labourers from rural areas looking for family reunion. All three communities attracted many farmers who lived in the close by uplands and came for different reasons to the village (e.g. schooling, water supply, working opportunities and “better life” among others).

		El Naranjo	Ocote Tuma	Rosa Grande	
Quantity	Recent migrant ¹³	% of total population	26%	57%	25%
	Occupation	Farmer	18%	38%	40%
		Day labourer	25%	8%	33%
		Home business	45%	46%	13%
		Regular employee	12%	8%	13%
Origin ¹⁴	Rather urban	63%	35%	27%	
	Rather rural	37%	65%	73%	
Quality	Reasons	Business and work opportunities	34%	37%	27%
		Better life ¹⁵	25%	26%	20%
		Family	24%	15%	53%

Table 14: Quality and quantity of migration

Source: Own survey

However, the question remains whether access to electricity important for migratory decisions? In Ocote Tuma it was definitely important for those who came from Waslala to build a business, whereas for the farmers other aspects seemed to be of more importance. In El Naranjo the answer is not that straightforward. The survey has shown that the importance of electricity differs among the occupational groups with self-employed people attaching more importance to it. In fact, all self-employed individuals but the bricklayers said that they would not have moved to the village if there was no electricity. Those who migrated in the last three years have created employment opportunities for local village people (i.e. at the carpenter's shop, at the big bakery or as a driver for the bus operator). Thus, electrification is a key factor in incentivizing skilled labour migration.

¹³ Recent migrants: El Naranjo and Rosa Grande: <3 years; Ocote Tuma: <4 years

¹⁴ Rural and urban origins were determined based on given regions/cities and if electricity was available.

¹⁵ Includes: School, basic services and „better life”

6 Conclusions

Discussion of Hypothesis

The case studies have shown that an adaptation of the original study's focus was needed. There was no sign of significant rural-urban movements or rural exodus; young people, who are usually the first to be attracted to cities, stayed in the villages instead. Quite contrary, the studied villages experience a significant growth in the last years. Why is this?

Certainly, and this answers the first research question, many people managed to improve their livelihood in the rural context. Instead of migration rural dwellers have chosen another livelihood strategy: income diversification. Income diversification diminishes the need for rural dwellers to move to the city in search of a better livelihood, thus eliminating one of the main push factors for migration. Through diversification, farmers are able to become less dependent on their agricultural incomes and enhance their resilience to shocks. However, this development was observed in both, electrified and not electrified villages. No evidence was found that electricity supply encourages the establishment of small shops for income diversification. Nonetheless, electrification contributed to an increase in human capital, particularly through the use of computers at school, IT classes and access to the internet. This has offered rural youth opportunities that they would certainly miss otherwise. However, most of these changes involve additional costs and the households that are already better-off benefit more than poorer ones. The same is true within the group of farming households which opened a small shop; the rural poor hardly benefited from electrification while the better-off took advantage of the improvements. The rural poor do not have access to financial capital that is needed for building human capital or increasing livelihood resilience through income diversification. Therefore, the impact on the rural poor is rather small (positive impacts include possible cost reductions and improved health conditions through clean electric lighting and a better infrastructure for food product shops).

Nonetheless (and bringing me to the second hypothesis), there were more large shops with a wider range of products, as well as, craftsman's establishments in the villages with electricity supply. In the case study without hydropower only shops for secondary income generation were established and no craftsman established a business.

The main finding, though, is that electrification pulls skilled labour migration from rather urban areas and/or "economically lagging to leading rural areas" [IBRD 2009:153]. These skilled

migrants have a high endowment with all five capital assets and, thus, stimulate local economic development. In particular, Ocote Tuma would not have experienced much development without in-migrants who established businesses. However, it remains unclear if rural “development poles” or “anchor villages” will emerge, since electrification took place only three to four years ago and more time is needed for development. Yet, there is no evidence that this development is backed by constant money flow into the village: no FDI are made, national transfer payments do not reach the village and only a few households receive remittances from out-migrants. The remittances are not used for the development of income generating activities, though. However, the prevailing form of money in-flows is the transfer of financial capital jointly with all other capital assets by in-migration.

A condition for sustained business development is the existence of “enabling conditions”. In El Naranjo the market for “services and luxury goods” was quite large before the village was electrified: many businesses already existed and big farmers generated a surplus of financial capital. However, the electrification in El Naranjo and Ocote Tuma attracted migrants of which almost half were business owners and a large share came from rather urban places. These migrants brought knowledge, innovations and money into the villages and, thus, created “enabling conditions” for business development.

Another analysed aspect was the correlation between the use of ICT and out-migration. Information and communication systems connect people over distances and can therefore be seen as the “transport infrastructure of the 21st century”. Most households that experienced out-migration are located in communities with access to modern ICT infrastructure. The out-migrants are mainly farmers that leave in search for work in the receiving region. In villages without or with bad electricity / ICT infrastructure the labour out-migration is much lower. However, there are hardly any “educational out-migrants” in El Naranjo. The ubiquity of knowledge through ICT systems along with the establishment of institutes of higher education certainly contributes to the lower out-migration rate. There was no evidence for out-migration of skilled young people in places with electricity, whereas in Rosa Grande half nearly all out-migrants without compelling reason (e.g. marriage) left the village in search for better education. This finding is consistent with the first one: poor farmer hardly profit from electrification and consider an “in need”-strategy to sustain their livelihood – migration. On the other hand families which are better-off profit and stay in electrified villages, while those

who live in parts without access to electricity seek to increase their livelihood outcome through migration.

In Ocote Tuma the situation is somewhat different: farmers profit indirectly from the electrification since led to the establishment of basic food product shops in the village. However, their medium-term profit will be limited since they lack capital assets for business development (mostly human, social and financial capital). A first sign is the dissatisfaction of recently migrated farmers. For this reason people may further migrate towards more urban areas in search of paid work and use Ocote Tuma as a stepping stone to adapt to a more urban lifestyle.

Recommendations and the Way Forward

The contribution of this study is to provide the ground work for policy makers who strive to minimise rural–urban immigration in order to promote sustainable *rural* development. In this study, electrification had an impact on almost all of the people in the villages. However, the poor seemed to benefit the least, since they lack the capital assets needed to use the electricity in a productive way. Therefore, rural development policy should be more holistic considering aspects of increasing the capital endowment of the poor in order to enable them to also profit from electrification. A key element is the provision of financing and technical assistance for business development to kick-start productive uses. Particularly home-based activities, such as tailoring or providing ICT services increase incomes and may empower women. This allows the rural poor to diversify their income structure in order build resilience within their livelihood strategy.

This study has also found that a water supply seems to be a more important factor in migration decisions than electrification. Therefore, good policy should consider linking electricity supply with water purification. The electrification of social services, such as schools, may be extended by a water purification unit for providing access to potable water and draw migratory movements towards the facilities of social services. This way electricity is provided jointly with clean water and more people may send their children to school or seek medical assistance.

However, the study made clear that there are still gaps for further research. In the first place the base of this research should be broadened to test this study's findings in other communities. A couple of objects of investigation were beyond this study's scope, this is why

the medium- and long-term impacts of electrification on migration were not touched upon. Additional questions include: Do migrants stay in the village in order to develop their business or do they migrate further or back after a certain time? Do poor households profit from better public infrastructure and increase their capital endowment in order to make use of the electricity; or do they continue to use electricity for non-productive purposes only? Migrants who left the village before electrification for life in the city or in other villages were also excluded in the present study. This group and their intentions of and reasons for migration are quite important for the evaluation of migration and should be included in further research. On a policy level the rationale of electrification should be evaluated in connection with other policies in order to take a more holistic approach to (rural) development.

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Key Informants

ID	Name	Institution / Function	Date
KI 1	Orozco Rayo, Daybi Samuel	HINNSA El Naranjo, IT teacher	01/04/2011
KI 2	Don Inicio Reyes	Hidroeléctrica Ocote Tuma, Technician	
KI 3	Garvin Morales	Carpenter, El Naranjo	
KI 4	Rommel Loaisiga	HINNSA EL Naranjo, Director	
KI 5	Ramón Saturnino Montenegro	Mayor's office Waslala, deputy mayor for El Naranjo	
KI 6	Modesto Mattei	Subsistence farmer, El Naranjo	
KI 7	Andrés Eliodoro "Lolo" Montenegro Castro	Owner of "Hostal Montenegro" and a shop	
KI 8	José Miguel Ruiz	Elementary School Ocote Tuma / Teacher	

ID	Community	
[RG xx]	Rosa Grande	Household ID xx
[OT xx]	Ocote Tuma	Household ID xx
[EN xx]	El Naranjo	Household ID xx

Annex I: Maps of the case studies

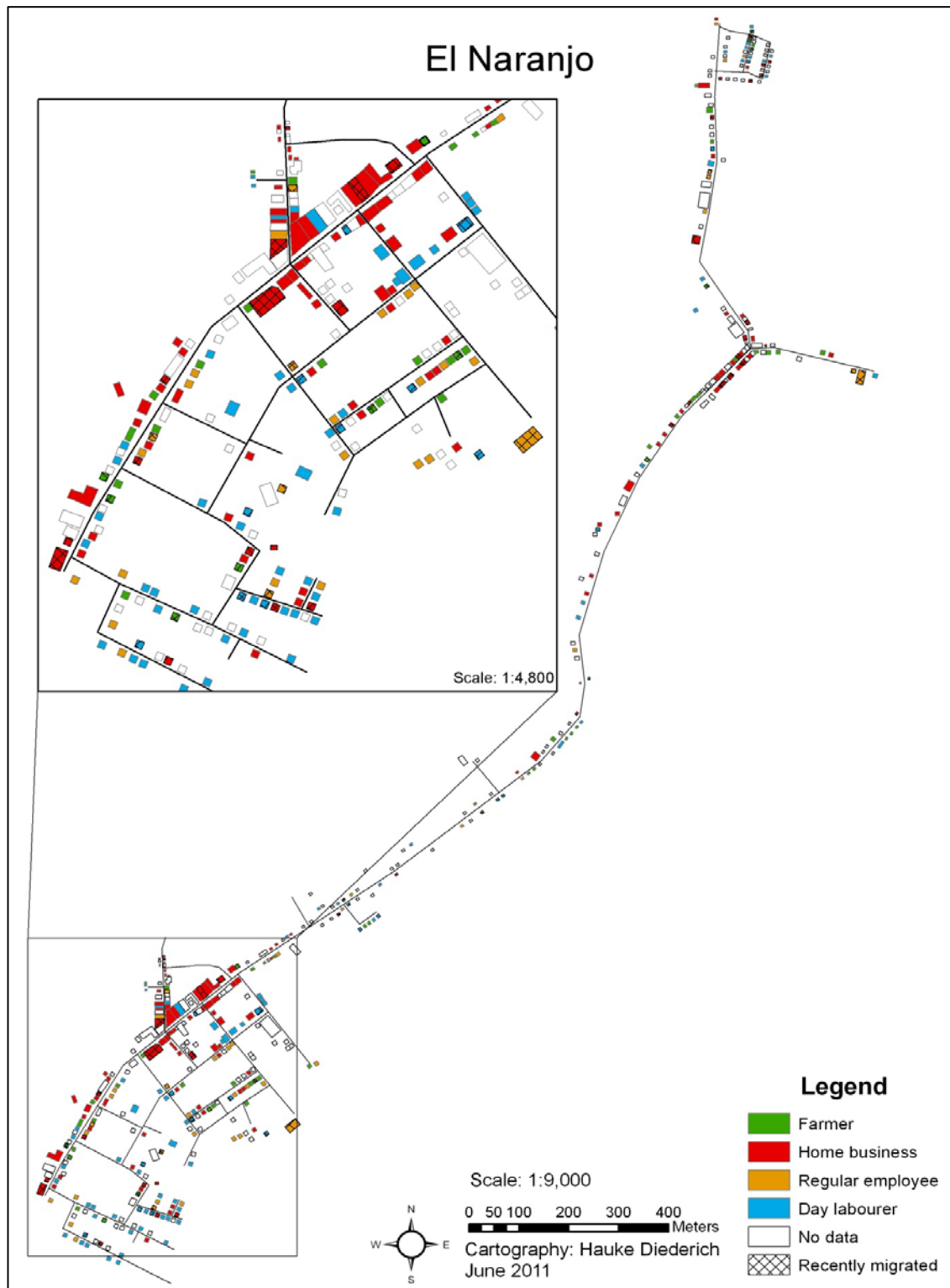


Figure 42: Map of El Naranjo: Source of income and migration

Source: own cartography

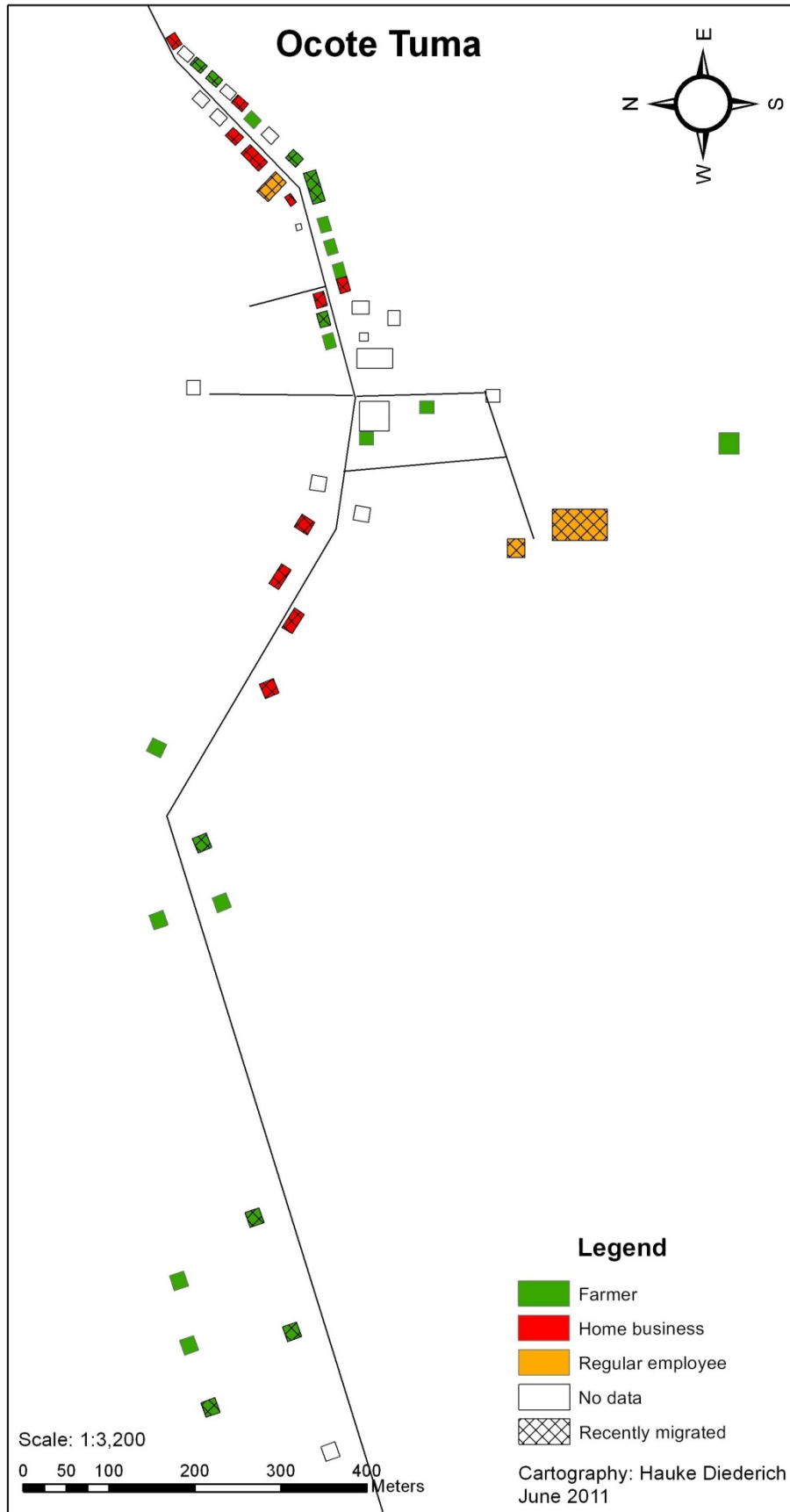


Figure 43: Map of Ocote Tuma: Source of income and migration

Source: own cartography

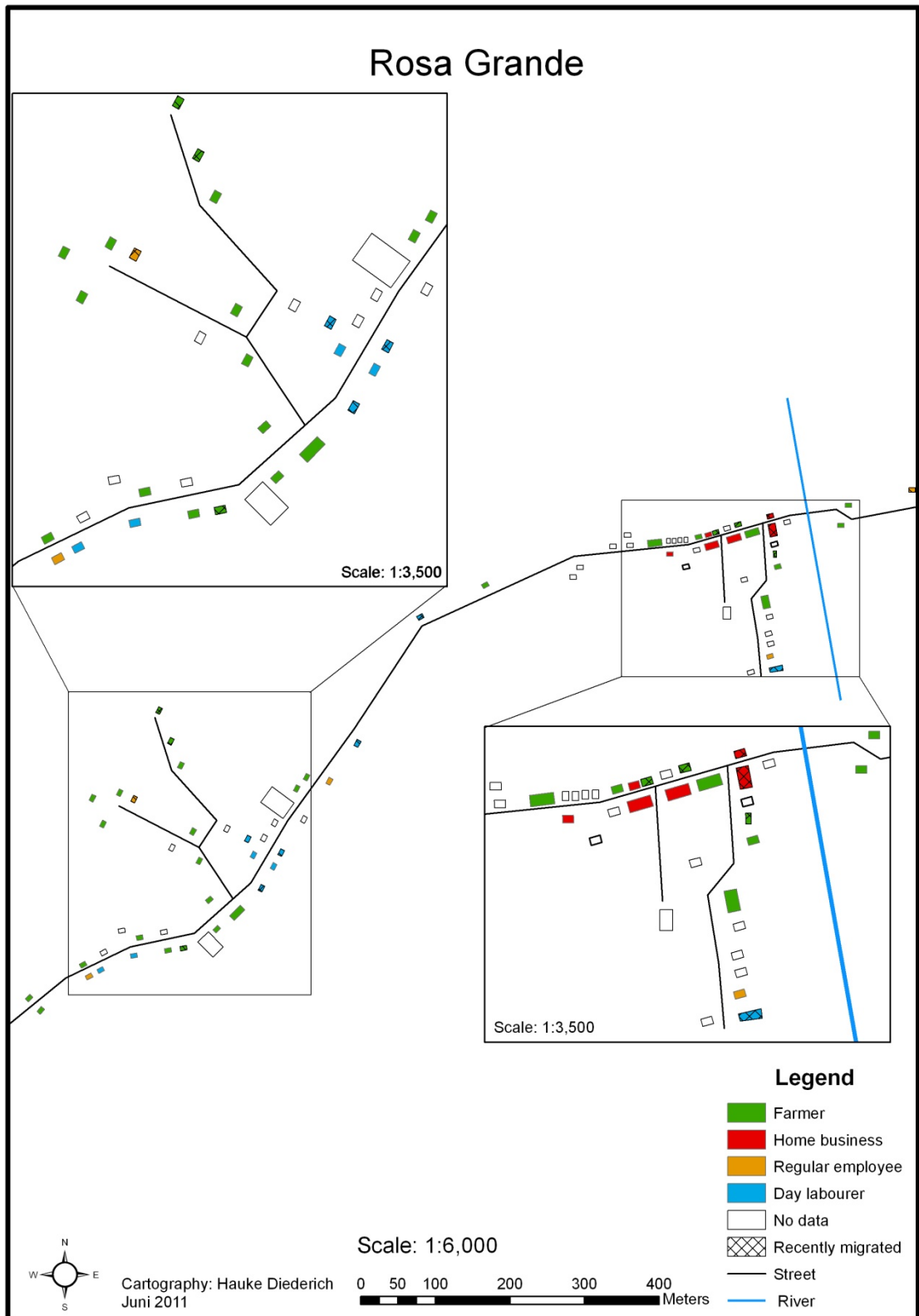



Figure 44: Map of Rosa Grande: Source of income and migration


Source: own cartography

Annex II: Questionnaires

El Naranja



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Investigación sobre la electrificación y la migración

Cuestionario I: Hogares

Datos básicos

Comunidad	Barrio	No. de casa	Nombre del(a) entrevistador(a)	Fecha

1. Material de los muros de la casa: madera ladrillos chapa mixto

A) General

¿Quien vive en la casa?	Sexo	Edad	Nivel de educación	Ocupación principal	Ocupación secundaria	Jefe/a del hogar (Marcar con "X")	Respondí el cuestionario (Marcar con "X")
	m f	años	0: ningún 1: primaria 2: secundaria 3: formación profesional 4: universitaria *: está estudiando	0: Desemplead@ 1: Agricultor 2: comerciante 3: Estudiante 4: Em@ de casa 5: venta 6: Otro (especifique)			
Padre							
Madre							
Abuelo							
Abuela							
Hij@s (mayor de 5 años)							
1º							
2º							
3º							
4º							
5º							
6º							
Otros (herman@s, tí@s, ...)							


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4. ¿Hay familiares que se fueron de su hogar dentro de los tres años pasados?
 Sí No

¿Quién?	Sexo	Edad actual	Nivel de educación	¿A dónde?	¿Por qué?	¿Ud. recibe remesas y/o otros aportes de él o ella?
1: Padre	m f	años	0: Ningún 1: Primaria 2: Secundaria 3: Formación profesional 4: Universitaria *: está estudiando	1: Waslala 1b: Municipio de Waslala 2: Matagalpa 2b: Dpto. de MG 4: Managua 5: Extranjero 6: Otro (esp.)	1: Trabajo 2: Acceso a tierra 3: Familia 4: Escuela 5: Universidad 6: Casamiento 7: Otro (especifique)	1: Dinero 2: Viveres 3: Electrodomésticos 4: Ropa 5: Otro (especifique)
2: Madre						
3: Hijo						
4: Hija						
5: Todos						
6: Otro (especif.)						

C) Electricidad

1. ¿Ud. es conectado a la red eléctrica?
 Sí No

2. ¿Usa algunos equipos eléctricos que necesite pilas y/o batería de carro?
 No Radio Interna Alumbrado Tele Otro: _____

3. En caso de no es conectado, ¿Por qué?
 Precio alto No tiene ventajas recién mudado Otro: _____

4. En caso de sí es conectado: ¿Cuáles son las dos ventajas mayores de la luz? [Pon 1 y 2]
 Alumbrado indiv. Electrodomésticos (sin refri;TV) Refri Televisión / DVD Trabajo Estudios Seguridad/Alumbrado público Comunicación Otro: _____


5. ¿Qué ha usado antes de la energía hidroeléctrica? [Múltiples]
 Nada Batería de carro Planta Diesel Panel solar Otro: _____

5b. ¿Había problemas con esta forma de electricidad?
 Alto costo (C\$ _____) Contaminación Ruidos Indisponibilidad de combustible / recarga Otro: _____


6. ¿Cuánto paga en electricidad mensualmente? _____ C\$
6b. ¿Le parece justo/bien el precio? Sí No

7. ¿Hay problemas con el servicio eléctrico? (¿En caso de sí, cuales son los dos mayores?)
 No hay Precio alto Cortes Mala administración Otro: _____

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D) Comunicación

1. ¿Ud. y/o los personas en su hogar se comunican por medios de comunicación?
 Sí No

2. ¿Qué medios de comunicación usan Ud. y sus familiares que viven con Ud.?

Celular	Teléfono	Telecentro	Otro (especifique)
Propio	Propio	Llamar a alguien	
De amigos	alquilado	Recibir llamadas	
Alquilado		Internet	

3. ¿Para qué y cuantas veces usa los servicios?


Teléfono y/o Celular	Cada tres meses	Una vez al mes	Cada quince días	Una vez a la semana	Diario	Nunca
Comunicación con la familia y con amigos	En Nicaragua En el extranjero					
Radio/avisos						
Policia						
Emergencias						
Para el trabajo	Precios Pedidos ...					
Otros: (especifique)						

Internet


Internet	Cada tres meses	Una vez al mes	Cada quince días	Una vez a la semana	Diario	Nunca
Comunicación con la familia y con amigos	En Nicaragua En el extranjero					
Para el trabajo	Precios Pedidos ...					
Diversión/videojuegos						
Otros: (especifique)						

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El Naranjo



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	Mujeres	Hombres	Niñ@s
¿A qué hora se levanta?	<input type="checkbox"/> 3am <input type="checkbox"/> 4am <input type="checkbox"/> 5am <input type="checkbox"/> 6am <input type="checkbox"/> 7am <input type="checkbox"/> 8am	<input type="checkbox"/> 3am <input type="checkbox"/> 4am <input type="checkbox"/> 5am <input type="checkbox"/> 6am <input type="checkbox"/> 7am <input type="checkbox"/> 8am	<input type="checkbox"/> 3am <input type="checkbox"/> 4am <input type="checkbox"/> 5am <input type="checkbox"/> 6am <input type="checkbox"/> 7am <input type="checkbox"/> 8am
¿A qué hora se acuesta?	<input type="checkbox"/> 6pm <input type="checkbox"/> 7pm <input type="checkbox"/> 8pm <input type="checkbox"/> 9pm <input type="checkbox"/> 10pm <input type="checkbox"/> 11pm <input type="checkbox"/> 12pm <input type="checkbox"/> 1am	<input type="checkbox"/> 6pm <input type="checkbox"/> 7pm <input type="checkbox"/> 8pm <input type="checkbox"/> 9pm <input type="checkbox"/> 10pm <input type="checkbox"/> 11pm <input type="checkbox"/> 12pm <input type="checkbox"/> 1am	<input type="checkbox"/> 6pm <input type="checkbox"/> 7pm <input type="checkbox"/> 8pm <input type="checkbox"/> 9pm <input type="checkbox"/> 10pm <input type="checkbox"/> 11pm <input type="checkbox"/> 12pm <input type="checkbox"/> 1am

4. ¿Qué hace después de las 6pm hasta que se acueste? [max. 2 actividades]

Mujeres	Hombres	Niñ@s
<input type="checkbox"/> TV <input type="checkbox"/> Trabajar en casa <input type="checkbox"/> Estudiar <input type="checkbox"/> Trabajar en neg. <input type="checkbox"/> Estar en casa <input type="checkbox"/> Estar fuera <input type="checkbox"/> bar/billar <input type="checkbox"/> Otro:	<input type="checkbox"/> TV <input type="checkbox"/> Trabajar en casa <input type="checkbox"/> Estudiar <input type="checkbox"/> Trabajar en neg. <input type="checkbox"/> Estar en casa <input type="checkbox"/> Estar fuera <input type="checkbox"/> bar/billar <input type="checkbox"/> Otro:	<input type="checkbox"/> TV <input type="checkbox"/> Trabajar en casa <input type="checkbox"/> Estudiar <input type="checkbox"/> Trabajar en neg. <input type="checkbox"/> Estar en casa <input type="checkbox"/> Estar fuera <input type="checkbox"/> jugar <input type="checkbox"/> Otro:

E) Negocio

1. ¿Si tiene **ganado**, que hace con la leche?
 No saca la leche La consume La vende La procesa (para vender el producto)

1b. Si la procesa y vende, ¿Qué produce?
 Cuajada Crema Otro: _____

1c. ¿Desde hace cuando lo producen? años

2. ¿Hay una **venta**? Sí No

2b. ¿Qué tipo de maquinas que necesiten electricidad usan en la venta?
 Refri Tele Otro: _____

2c. ¿Desde hace cuando tienen la venta? años

3. ¿Hay un **taller**? Sí No

3b. ¿Qué tipo de taller tienen?
 Taller de soldadura Carpintería Taller mecánico Otro: _____

3c. ¿Qué tipo de maquinas que necesiten electricidad usan en el taller?
 Soldadora Sierra torno eléctrico Lijadora Compresor Otro: _____



3d. ¿Desde hace cuando tienen el taller? años

3e. ¿Qué ha cambiado después de la electrificación?

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Rosa Grande

Investigación sobre la electrificación y la migración

Cuestionario II: Hogares en comunidades sin conexión a la red eléctrica

Datos básicos



Comunidad	Barrio	No. de casa	Nombre del(a) entrevistador(a)	Fecha

1. Material de los muros de la casa: madera ladrillos chapa mixto

A) General

¿Quien vive en la casa?	Sexo	Edad	Nivel de educación	Ocupación principal	Ocupación secundaria	Jefe/a del hogar (Marcar con "X")	Respondió el cuestionario (Marcar con "X")
Padre	m f	años	0: ningún 1: primaria 2: secundaria 2a: distancia 3: formación profesional 4: universitaria *: está estudiando	0: Desempleado@ 1: Agricultor 2: comerciante 3: Estudiante 4: Em@ de casa 5: venta 6: Otro (especifique)			
Madre							
Abuelo							
Abuela							
<i>Hijos (mayor de 5 años)</i>							
1º							
2º							
3º							
4º							
5º							
6º							
<i>Otros (herman@s, tí@s, ...)</i>							

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2. ¿Tiene acceso a tierra? Sí No
2c. Tierra propia Tierra alquilada

3. ¿Tiene ganado? Cabezas

B) Migración

1. ¿Cuántos años tiene viviendo en este caserillo? años



2. ¿Hay personas que vinieron a su hogar dentro de los tres años pasados?
 Sí No

¿Quién?	Sexo	Edad actual	Nivel de educación	¿De dónde?	¿Tenía luz antes?	¿Por qué?
1: Padre	m f	años	0: Ningún 1: Primaria 2: Secundaria 2a: distancia 2b: presencia 3: Formación profesional 4: Universitaria *: está estudiando	1: Waslala 1b: Municipio de Waslala 3: Siuna 4: Matagalpa 4b: Dpto. de MG 5: Jinotega 5b: Dpto. de JG 6: Managua 7: Extranjero 8: Pacífico 9: Otro (esp.)	Sí NO	1: Trabajo 2: Poner un negocio 3: Acceso a tierra 4: Familia 5: Servicios básicos 5a: Agua 5b: Luz 6: Mejor calidad de vida 7: Casamiento 8: Otro (especif)
2: Madre						
3: Hijo						
4: Hija						
5: Todos						
6: Otro (especif.)						

3. ¿Qué importancia tuvieron los siguientes factores para la decisión de mudarse?

	Muy importante	Importante	Poco importante o insignificante	Comentarios
Trabajo				
Acceso a tierra				
Agua				
Electricidad				
Acceso vial /Carret.				
Escuela				
Puesto de salud				
Existencia de comercios				

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4. ¿Hay familiares que se fueron de su hogar dentro de los tres años pasados?
 Sí No

¿Quién?	Sexo	Edad actual	Nivel de educación	¿A dónde?	¿Por qué?	¿Ud. recibe remesas y/o otros aportes de él o ella?
1: Padre	m f	años	0: Ningún 1: Primaria 2: Secundaria 2a: distancia 3: Formación profesional 4: Universitaria *: está estudiando	1: Waslala 1b: Municipio de Waslala 2: Matagalpa 4: Managua 5: Extranjero 6: Otro (esp.)	1: Trabajo 2: Acceso a tierra 3: Escuela 4: Ropa 5: Universidad 6: Casamiento 7: Otro (especifique)	1: Dinero 2: Viveres 3: Electrodomésticos 4: Ropa 5: Otro (especifique)
2: Madre						
3: Hijo						
4: Hija						
5: Todos						
6: Otro (especif.)						

5. ¿Qué importancia tuvieron los siguientes factores para la decisión de mudarse?

	Muy importante	Importante	Poco importante o insignificante	Comentarios
Trabajo				
Acceso a tierra				
Agua				
Electricidad				
Acceso vial /Carret.				
Escuela				
Puesto de salud				
Existencia de comercios				

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C) Electricidad

1. ¿Ud. es conectado a la red eléctrica?
 Sí No

2. ¿Usa algunos equipos eléctricos que necesite pilas y/o batería de carro?
 No Radio linterna Alumbrado Tele Otro: _____

3. ¿Tiene energía eléctrica? Sí No

3b. En caso de sí, ¿de dónde proviene la energía eléctrica?
 Batería de carro Planta Diesel Panel solar Otro: _____

3c. En caso de sí, ¿hay problemas con esta forma de electricidad?
 Alto costo (C\$ _____ por mes) Ruidos Contaminación
 Indisponibilidad de combustible / recarga Otro: _____

3d. ¿Cuánto pagan para la electricidad al mes
C\$

4. ¿Qué usa para el alumbrado en la casa?
 linterna eléctrica bombilla eléctric Candela Candel

D) Comunicación

1. ¿Ud. y/o los personas en su hogar se comunican por medios de comunicación?
 Sí No

2. ¿Qué medios de comunicación usan Ud. y sus familiares que viven con Ud.?


Celular	Teléfono	Telecentro	Otro (especifique)
Propio	Propio	Llamar a alguien	
De amigos	alquilado	Recibir llamadas	
Alquilado		Internet	

3. ¿Para qué y cuántas veces usa los servicios?


Teléfono y/o Celular	Cada tres meses	Una vez al mes	Cada quince días	Una vez a la semana	Diario	Nunca
Comunicación con la familia y con amigos						
Radio/avisos						
Policía						
Emergencias						
Para el trabajo						
Otros: (especifique)						

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Internet		Cada tres meses	Una vez al mes	Cada quince días	Una vez a la semana	Diario	Nunca
Comunicación con la familia y con amigos	En Nicaragua						
	En el extranjero						
Para el trabajo	Precios						
	Pedidos						
	...						
Diversión/videojuegos							
Otros: (especifique)							

	Mujeres	Hombres	Niños
¿A qué hora se levanta?	<input type="checkbox"/> 3am <input type="checkbox"/> 4am <input type="checkbox"/> 5am <input type="checkbox"/> 6am <input type="checkbox"/> 7am <input type="checkbox"/> 8am	<input type="checkbox"/> 3am <input type="checkbox"/> 4am <input type="checkbox"/> 5am <input type="checkbox"/> 6am <input type="checkbox"/> 7am <input type="checkbox"/> 8am	<input type="checkbox"/> 3am <input type="checkbox"/> 4am <input type="checkbox"/> 5am <input type="checkbox"/> 6am <input type="checkbox"/> 7am <input type="checkbox"/> 8am
¿A qué hora se acuesta?	<input type="checkbox"/> 6pm <input type="checkbox"/> 7pm <input type="checkbox"/> 8pm <input type="checkbox"/> 9pm <input type="checkbox"/> 10pm <input type="checkbox"/> 11pm <input type="checkbox"/> 12pm <input type="checkbox"/> 1am	<input type="checkbox"/> 6pm <input type="checkbox"/> 7pm <input type="checkbox"/> 8pm <input type="checkbox"/> 9pm <input type="checkbox"/> 10pm <input type="checkbox"/> 11pm <input type="checkbox"/> 12pm <input type="checkbox"/> 1am	<input type="checkbox"/> 6pm <input type="checkbox"/> 7pm <input type="checkbox"/> 8pm <input type="checkbox"/> 9pm <input type="checkbox"/> 10pm <input type="checkbox"/> 11pm <input type="checkbox"/> 12pm <input type="checkbox"/> 1am

4. ¿Qué hace después de las 6pm hasta que se acuesta? (max. 2 actividades)

Mujeres	Hombres	Niños
<input type="checkbox"/> TV <input type="checkbox"/> Trabajar en casa	<input type="checkbox"/> TV <input type="checkbox"/> Trabajar en casa	<input type="checkbox"/> TV <input type="checkbox"/> Trabajar en casa
<input type="checkbox"/> Estudiar <input type="checkbox"/> Trabajar en neg.	<input type="checkbox"/> Estudiar <input type="checkbox"/> Trabajar en neg.	<input type="checkbox"/> Estudiar <input type="checkbox"/> Trabajar en neg.
<input type="checkbox"/> Estar en casa <input type="checkbox"/> Estar fuera	<input type="checkbox"/> Estar en casa <input type="checkbox"/> Estar fuera	<input type="checkbox"/> Estar en casa <input type="checkbox"/> Estar fuera
<input type="checkbox"/> bar/billar <input type="checkbox"/> Otro:	<input type="checkbox"/> bar/billar <input type="checkbox"/> Otro:	<input type="checkbox"/> jugar <input type="checkbox"/> Otro:

E) Negocio

1. ¿Si tiene ganado, que hace con la leche?

No saca la leche La consume La vende La procesa (para vender el producto)

1b. Si la procesa y vende, ¿Qué produce?

Cujada Crema Otro: _____

1c. ¿Desde hace cuando lo producen? años

2. ¿Hay una venta? Sí No

2b. ¿Qué tipo de maquinas usan en la venta?

Refri Tele Otro: _____

2c. ¿Desde hace cuando tienen la venta? años

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3. ¿Hay un taller? Sí No

3b. ¿Qué tipo de taller tienen?

Taller de soldadura Carpintería Taller mecánico Otro: _____

3c. ¿Qué tipo de maquinas usan en el taller?

Soldadora lijadora Sierra torno Otro: _____

3d. ¿Desde hace cuando tienen el taller? años

4. ¿Ofrecen otros tipos de servicios? Sí No

4b. ¿Qué tipo de servicios ofrecen?

Telecomunicación Molina Medicinal _____ Otro: _____

4c. ¿Qué tipo de maquinas que necesiten electricidad usan?

Molina eléctrica Refri Alumbrado Computador Otro: _____

4d. ¿Desde hace cuando tienen este negocio? años


F) Conclusión

	Ha mejorado	Sigue siendo más o menos igual	Ha empeorado
En comparación con la situación hace 3 años, la calidad de vida...	Para mi familia		
	Para nuestro pueblo		

¿Por qué?

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Ocote Tuma



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Investigación sobre la electrificación y la migración

Cuestionario I: Ocote Tuma

Datos básicos


Comunidad	Barrio	No. de casa	Nombre del(a) entrevistador(a)	Fecha

1. Material de los muros de la casa: madera ladrillos chapa mixto

A) General

¿Quién vive en la casa?	Sexo		Edad actual	Nivel de educación	Ocupación principal	Ocupación secundaria	Jefe/a del hogar (Marcar con "X")	Respondió el cuestionario (Marcar con "X")
	m	f						
Padre				0: ningún 1: primaria 2: secundaria 3: formación profesional 4: universitaria *: está estudiando	0: Desempleado 1: Productor/a 1a: depend. 2: Empleado del estado 4: Em de casa 5: Jubilad@ 6: Otro (especifique)			
Madre								
Abuelo								
Abuela								
Hijos (mayor de 5 años)								
1º								
2º								
3º								
4º								
5º								
6º								
Otros (herman@s, tí@s, ...)								

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B) Migración


1. ¿Cuántos años tiene viviendo en este pueblo?
 años

2. ¿Hay familiares que se fueron de su hogar dentro de los tres años pasados?
 Sí No

En caso de sí:

¿Quién?	Sexo	Edad actual	Nivel de educación	¿A dónde?	¿Por qué?	¿Ud. recibe remesas y/o otros aportes del/ella?
1: Padre	m	f	años	0: Ningún 1: Primaria 2: Secundaria 3: Formación profesional 4: Universitaria *: está estudiando	1: Waslala 1b: Municipio de Waslala 3: Siuna 4: Matagalpa 4b: Dpto. de MG 5: Jinotega 5b: Dpto. de JG 6: Managua 7: Extranjero 8: Otro (esp.)	1: Trabajo 2: Acceso a tierra 3: Familia 4: Escuela 5: Universidad 6: Otro (especifique)
2: Madre						
3: Hijo						
4: Hija						
5: Otro (especif.)						

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3. ¿Hay familiares que vinieron a su hogar dentro de los tres años pasados?
 Sí No

En caso de sí:

¿Quién?	Sexo	Edad actual	Nivel de educación	¿De dónde?	¿Tenía luz antes?	¿Por qué?
1: Padre	m	f	años	0: Ningún 1: Primaria 2: Secundaria 2a: distancia 2b: presencia 3: Formación profesional 4: Universitaria *: está estudiando	1: Waslala 1b: Municipio de Waslala 3: Siuna 4: Matagalpa 4b: Dpto. de MG 5: Jinotega 5b: Dpto. de JG 6: Managua 7: Extranjero 8: Pacífico 9: Otro (esp.)	1: Trabajo 2: Acceso a tierra 3: Familia 4: Servicios básicos 4a: Agua 4b: Luz 5: Mejor calidad de vida 6: Otro (especif.)
2: Madre						
3: Hijo						
4: Hija						
5: Otro (especif.)						

C) Electricidad

1. ¿Tiene luz?
 Sí No

2. En caso de no, ¿Por qué?
 Precio alto No tiene ventajas recién mudado no conectan a más hogares
 la red no llega a las casa Otro: _____

En caso de sí:

3. ¿Cuáles son las dos ventajas mayores de la luz? [Pon 1 y 2]
 Alumbrado Electrodomésticos (cocina) Trabajo Estudios Seguridad
 Desarrollo Televisión / DVD Otro: _____


4. ¿Qué ha usado antes de la energía hidroeléctrica? [Múltiples]
 Nada Batería de carro planta Diesel panel solar Otro: _____

5. ¿Cuánto gasta en electricidad mensualmente? _____ CS

6. ¿Le parece justo/bien el precio? Sí No

7. ¿Hay problemas con el servicio eléctrico? (¿En caso de sí, cuales son los dos mayores?)
 No hay Precio alto Cortes Mala administración Otro: _____

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D) Comunicación

1. ¿Qué medios de comunicación usan Ud. y sus familiares que viven con Ud.?

Celular	Teléfono	Telecentro	Otro (especifique)
Propio	Propio	Llamar a alguien	
De amigos	alquilado	Recibir llamadas	
Alquilado		Internet	

2. ¿Para qué y cuantas veces usa los servicios?

Teléfono y/o Celular	Una vez al año	Cada tres meses	Una vez al mes	Una vez a la semana	Diario	Nunca
Comunicación con la familia y con amigos	En Nicaragua					
	En el extranjero					
Radio/avisos						
Policia						
Para el trabajo	Precios					
	Pedidos					

Otros: (especifique)						

Internet	Una vez al año	Cada tres meses	Una vez al mes	Una vez a la semana	Diario	Nunca
Comunicación con la familia y con amigos	En Nicaragua					
	En el extranjero					
Radio/avisos						
Policia						
Para el trabajo	Precios					
	Pedidos					

Diversión (video)juegos						
Otros: (especifique)						

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Annex III: Photos of the research area



El Naranjo's main street at night

Photo by Wolfgang Diederich



Extended business hours in El Naranjo

Photo by Wolfgang Diederich



Carpintería Blandón in El Naranjo

Photo by Wolfgang Diederich



Tragamonedas in El Naranjo

Photo by Wolfgang Diederich



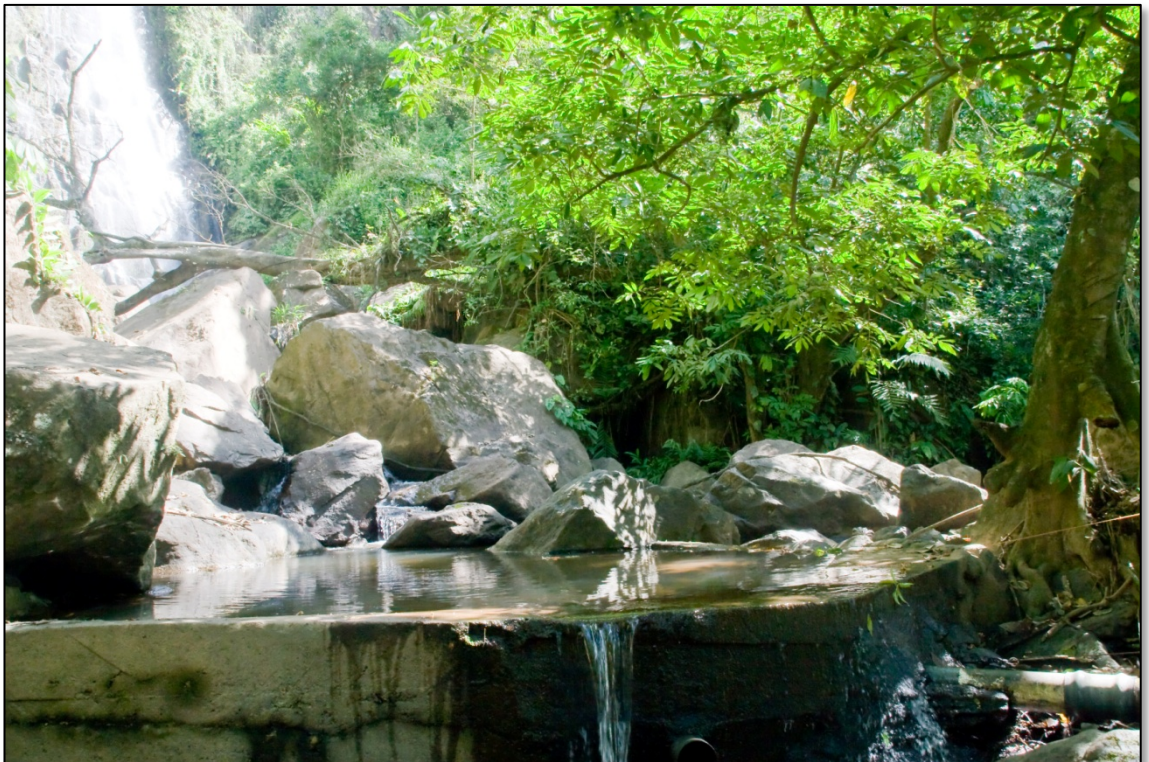
Carpenter's shop in Ocote Tuma



Big shop in Ocote Tuma



Water intake for PCH El Naranjo



Water intake for MCH Ocote Tuma

Hiermit bestätige ich, dass ich meine Diplomarbeit selbständig verfasst und
keine anderen als die angegebenen Hilfsmittel benutzt habe.

Tübingen, den 4. Juli 2011

Ort, Datum

Unterschrift



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