Housing innovations in rural Ethiopia

A case study of how to make innovations accepted and sustainable

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Abstract

A good product does not guarantee its successful adoption. This can be seen in a project in rural Ethiopia, in which a new type of house provides great advantages over current housing alternatives. This thesis, which focuses on the Sustainable Rural Dwelling Unit project in Ethiopia, aims to contribute knowledge about how to implement rural-housing innovations successfully. Interviews with the project’s stakeholders show that although a construction concept is a genuine breakthrough, its diffusion process may stumble. Successful diffusion of a housing innovation appears to depend on wider factors. Two success factors identified here are: (1) to analyse the innovation’s attributes, and (2) to analyse the interests of stakeholders. Furthermore, these successful practices are possible with analysis tools that are exemplified in the thesis. The needs for clear communication among stakeholders, and for identifying contradictory implementation strategies, were identified to be important elements for successful innovation diffusion. Another conclusion of this thesis is that the studied project both has great potential for future rural housing in Ethiopia and is relevant for other developing countries where there is a need for durable, higher-standard, low-cost housing.

Keywords: housing, rural, construction, innovation, diffusion, implementation, success factors, Ethiopia, low-cost housing
Preface

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Summary

Rural housing in Ethiopia is often of low-living standard and is timber consuming. The need for development in rural housing is a clear fact. Also, by presenting a good alternative for building housing in rural areas, these areas can become more attractive to stay in.

In 2010, a project called Sustainable Rural Dwelling Unit was initiated by the Ethiopian Institute of Architecture, Building Construction and City Development, at Addis Ababa University. Two modern prototype houses, designed with a focus on cultural identity, offered a considerably raised living standard. The construction materials consisted of local, sun-dried earth blocks (so-called Adobe blocks) and a bamboo roof-structure. The standard model house was meant to be economical for its users—easy to build, self-generating of energy, and environmentally friendly. The project was, moreover, a possible solution to the problem of deforestation and low-standard rural housing for people with low incomes. Since the initiation of the project, eight of these standard model houses have been built in southern Ethiopia (Guraghe zone).

This thesis evaluates the successfulness of the Sustainable Rural Dwelling Unit project, and it aims to gain knowledge about how to implement sustainable, rural-housing innovations successfully. To do so, interviews with different stakeholders have been performed, and the results have been analysed with the use of innovation theory.

The thesis finds that although the Sustainable Rural Dwelling Unit was a conceptual breakthrough for rural housing, the innovation diffusion was not successful. Reasons have been analysed and discussed on several different levels: object level, implementation level, organizational level, and user level.

The main conclusion of this study is that although an innovation may provide great benefits compared to alternatives, that fact does not guarantee that a successful diffusion will take place. The two key elements of success identified here are:

1. To analyse the innovation’s attributes
2. To analyse stakeholder interests

The analysis can be done through practical tools demonstrated in the thesis project. Additional success factors for innovation diffusion in rural housing are shown to be:

3. Focus on the future user’s own wishes
4. Focus on marketing
5. Consideration of the innovation’s complexity
6. Giving good examples of the house as demonstration buildings
7. To let time test durability, before planning for scaling up, when introducing new building techniques into a market
8. Clear communication among stakeholders
9. Identification of clear stakeholder roles
10. Mapping and speaking openly about each stakeholder’s interests and about which strategy of implementation that should be used
11. Making sure that someone take over the ownership of the project if it, as in the case of Sustainable Rural Dwelling Unit, is initiated by a university

Finally, it was concluded that SRDU has great potential for future rural housing in Ethiopia and is relevant for many developing countries where there is a need for durable and higher-standard low-cost housing.
Abbreviations and explanations

Agena  Village in Guraghe zone. Project site no. 2 (see fig. 6 on p. 13).

EiABC  Ethiopian Institute of Architecture, Building Construction and City Development. Part of Addis Ababa University and initiator of the SRDU-project. Explained in chap. 4.7.1.

ETB  Ethiopian Birr (currency). 1 US Dollar equals app. 21 ETB (March 2016).

ETH Global  One of the stakeholders in the SRDU-project. Described in chap. 4.7.9.

Gubrie  Part of Wolkite town. Project site no. 1 (see fig. 6 on p. 13).

Guraghe  Geographic and cultural zone in Ethiopia. Focus group for the SRDU-project. Guraghe is described in chap. 3.4.

SRDU  Pronunciation: [su:ru]. Means “Sustainable Rural Dwelling Unit”, the focus of study in this thesis. Refers to both the houses themselves (“SRDUs”) and the project of designing and constructing the houses (SRDU-project).

TVET  Technical Vocational and Educational Training. It is a polytechnic college which gives practical education in Ethiopia at different levels and in different fields. See full explanation in chap. 4.7.6.

Wita  Village in Guraghe zone. Project site no. 4 (see fig. 6 on p. 13).

Wolkite  Town in Guraghe zone. Project site no. 3 (see fig. 6 on p. 13).

Woreda  Can be explained as “district”. The Guraghe zone consists of 13 Woredas.


1 Introduction

1.1 Background

Ethiopia has an estimated population of 99 million people, 83% of whom live in rural areas (The World Factbook, 2016). The houses in these areas have often a low standard and are incompatible with the current transformative political, economic and social forces (Yitbarek Alemayehu, 2015).

The issue of rural housing is rarely prioritized. For example, the Millennium Development Goals charted by the United Nations Habitat program only mentions urban housing (United Nations, 2006). The speed of urbanization in Ethiopia is so rapid that at present slum areas are growing (The World Factbook, 2016); mappings of housing demands in urban Ethiopia have been performed (Abelti et al., 2001), and analysis of housing for the poor in Addis Ababa has recently been done (Kelemework Bihon, 2007). However, rural Ethiopia has received little focus in research. Kumie and Berhane (2002) concluded that standard, traditional rural housing in Ethiopia is overcrowded, and that it is therefore important to develop rural housing.

Deforestation, an increasing problem in Ethiopia, is another factor in the need for alternative rural housing (Hjort and Widén, 2015; Petersson and Ström, 2015; Allerbo and Waldemarsson, 2013). Due to shrinking forests, the call for alternative building materials is rising.

In general, there is a need for sustainability based on a triple bottom line (social, economic, and environmental sustainability). In 2010, a project on sustainable rural housing was initiated by the Ethiopian Institute of Architecture, Building Construction and City Development, at Addis Ababa University. The project was called Sustainable Rural Dwelling Unit, and two prototype houses were built in the area of Gubrie, 175 km south of Addis Ababa.

The Sustainable Rural Dwelling Unit offered a considerably raised living standard, and its construction materials consisted of local, sun-dried earth blocks (so-called Adobe blocks) and a bamboo roof-structure. The Sustainable Rural Dwelling Unit would give the rural population a housing alternative that would be inexpensive to build, provide a high living standard, and not contribute to deforestation.

The SRDU concept did not, however, diffuse in the area of Gubrie. Four years after the launch, no new similar houses have been constructed there. On the other hand, four houses of the type are currently under construction 110 km to the east, in the village of Wita, 8 km from Butajira.

This thesis evaluates the SRDU-project as well as the actual standard model houses, so-called SRDUs. It analyses the project’s prospects for the future and draws conclusions about what can be learnt from the project.

1.2 Aims and goals

The aims have been to evaluate the introduction of the innovation, the Sustainable Rural Dwelling Unit, and to gain knowledge about how to implement sustainable rural-housing innovations successfully. To achieve these aims, the goals have been to interview different stakeholders on their impressions and thoughts about the Sustainable Rural Dwelling Unit.
1.3 Method
The main source of information for this thesis is interviews, which were conducted with persons related to the case-study project, Sustainable Rural Dwelling Unit.

People who have been interviewed are:

a) Future owners of the Sustainable Rural Dwelling Unit in the area outside Butajira
b) Neighbours of the future owners
c) Local people in a village outside Butajira
d) Local people in the village of Gubrie
e) Representative for Bete-Guraghe Cultural Centre
f) Trainees who have learnt how to build the house
g) Architects from Ethiopian Institute of Architecture, Building Construction and City Development, who have been developing the design and structure
h) Representatives for TVET Polytechnic College in Wolkite

By analysing the informants’ answers, patterns could be found relating to what is important in the successful implementation of this type of project. A key question being answered is what would be vital in the success of future innovation projects.

1.4 Limitations
The study is firstly limited to analysis of the implementation of the Sustainable Rural Dwelling Unit project, and secondly limited geographically to the Guraghe zone in Ethiopia.
2 Theoretical framework

2.1 What is an innovation?
“Innovation” is a single word, but its meanings are several, including improvements of very different kinds, across areas of diverse kinds. Scientific innovations may be airplanes as well as planning systems that make work more efficient. Household innovations can be complex as self-going vacuum cleaners and as simple as a small spoon with a long handle (to reach into a narrow jar).

Innovations are not only of technical nature. They include new ideas with new ways of looking at issues. When someone found that bread tastes better if salt is added, that was also an innovation. Many innovations are simple, every day “attempts” at improving an activity or making benefits of wider characteristics, like adding a new ingredient to a cake to make it tastier.

Some innovations stay as unsuccessful attempts: for example, making huge wings for humans to fly. However, innovations like electricity and the internet have become hugely successful and revolutionized the world.

Construction innovations are defined by CERF (2000) as:

> “the act of introducing and using new ideas, technologies, products and/or processes aimed at solving problems, viewing things differently, improving efficiency and effectiveness, or enhancing standards of living.”

In the building sector, technical innovations range from new construction techniques to new materials combinations. An example of a huge innovation was the change in construction drawings from paper drawing to 2D computer-based design.

2.2 Innovation diffusion
Some innovations do not spread, or spread very slowly, not because of the quality of innovations themselves, but because they depend on larger structures, and the presence of obstacles that hinder their diffusion. For example, the innovation of computer-based design was hard to diffuse (Harty, 2007). It was found not to depend on deficiencies in the computer programs but rather on the market structure and that the consultant bureaus had to switch systems all at once.

Some innovations are successful and widely diffused, while some are less successful. In order to predict an innovation’s future, scholars have researched to develop innovation theories (Deroian, 2001; Harris and Ogbonna, 2002; Rogers, 2003; Harty, 2007).

2.3 Attributes of innovations affecting the rate of adoption
A key term in innovation science is “rate of adoption” (Rogers 2003). This describes the relative speed and extent with which an innovation is adopted by members of a social system. The rate of adoption may be measured as the number of individuals who adopt an innovation during a specific period of time.
Rogers (2003) finds that the rate of adoption partly depends on the attributes of the innovation. In particular, 5 characteristics may predict the rate of adoption: relative advantage, compatibility, complexity, trialability, observability.

### 2.3.1 Relative advantage

“Relative advantage” describes the benefits of the innovation in comparison with the current alternatives: how much “better” it is. This can be expressed in terms of, for example, social prestige and status, economic profitability, simplification of daily activities, etc. If a new product or idea is introduced to the market, it ought to offer an advantage of some kind. All innovations need to be beneficial compared to the products/ideas they aim to supersede. According to Rogers (2003), diffusion scholars have found relative advantage to be one of the best predictors of an innovation’s rate of adoption.

### 2.3.2 Compatibility

“Compatibility” describes how well an innovation fits potential adopters’ needs within the context of their cultural values. Cultural values include potential adopters’ past experiences and current life situations. An innovation is hypothesised to diffuse more successfully the more compatible it is. An example is from India, where there is a cultural value of considering the left hand as dirty. This derives from many centuries ago: the left hand has been used for functions connected with defecation. Today, this value is still very strong, even though water standards and hygiene conditions in urban India are considerably improved. Another example is that farmers in the US place a strong value on increasing farm production. Innovations for conserving soil have been adopted very slowly, because they are perceived as conflicting with the value of increased production (Rogers 2003).

### 2.3.3 Complexity

“Complexity” describes how difficult an innovation is to understand within the context of how its potential adopters/users/beneficiaries perceive it. The simpler the innovation is to understand the more likely it is for it to be adopted and used. When an innovation is more complex the potential adopters decrease into a smaller number of individuals with specific skills and interests. An innovation is defined on a simple–complex scale based on the phenomena it aims to replace (Rogers 2003).

### 2.3.4 Trialability

“Trialability” focuses on the importance of trying out the innovation. Trying, experiencing and evaluating are high-impact factors for the rate of adoption of an innovation. An innovation that is easy to try out is more likely to be adopted by more users. Time is an important factor in trialability: new ideas that can be tried relatively quickly and at an early stage are generally adopted more rapidly (Rogers 2003).

### 2.3.5 Observability

“Observability” describes how visible the innovation is to potential adopters. When it is visible, widely communicated, and known about by potential adopters the rate of adoption is likely be to higher (Rogers 2003).
2.3.6 Charting innovation attributes

A chart can be filled in to forecast the innovation’s rate of adoption (see fig. 1 on the following page). For each innovation, the following questions may be answered: (1) How much relative advantage does the innovation provide? (2) How compatible is the innovation? (3) How complex is the innovation? (4) How trialable is the innovation? (5) How observable is the innovation to others?

All five questions need to be answered relatively, in comparison with what the innovation aims to replace. On a horizontal scale from lower to higher value, the more to the right the innovation places, the higher the rate of adoption is likely to be.

Figure 1. Chart to predict an innovation’s rate of adoption. The chart is based on theory given in Rogers (2003) but interpreted and designed by Signe Nilsson.

2.4 Adopter categories

Rogers (2001) has classified 5 different categories of adopters, based on the chronological order of their adoption of an innovation. First the “innovators” start to use an innovation. They are few in number, are characterized by a strong interest in new ideas, and are venturesome. If the innovation seems to be successful for the innovators, the “early adopters” join. Early adopters are more integrated in the social system than the innovators. In their turn, early adopters reduce the uncertainty of the innovation for the next potential group of adopters, the “early majority”. The early majority adopt new ideas before the “late majority”, who are significantly more sceptical.
When the first three categories have adopted an innovation, its rate of adoption is predicted to be already 50% of the population/social group. That helps to convince the late majority to adopt it as well. When the innovation has spread through all these categories of adopters, the “laggards” join. They are the last group of people in a social system who accept the change: their point of reference is in the past. Note that the very same person can belong to different adopter groups depending on which type of innovation is in view.

2.5 Radical and incremental innovations

There are many systems of categorisations used to describe innovations. When analysing SRDUs, an important categorisation is to divide innovations into two kinds: either they are of a radical kind or of an incremental kind (Nelson and Winter, 1977; Slaughter, 1998).

A radical innovation has the character of a breakthrough: it can make a revolutionary change in an industry or society. Nelson and Winter (1977) write:

[The radical innovation] creates a new way of understanding a phenomenon and formulating approaches through which to solve problems.

(Nelson and Winter 1977)

A radical innovation can be hard to predict, unlike an incremental innovation. The incremental innovation comes from a smaller change, sometimes just a small experiment. Slaughter (1998) writes:

[The incremental innovation] is a small change, based on the current knowledge and experience.

(Slaughter 1998)

2.6 Stakeholder management

Several theories for successful innovation diffusion have focused on stakeholder management and engagement (Atkin, 1999; Olander, 2007; Olander and Landin, 2005, 2008) The construction sector is characterized by being project-based, and many companies and interests will work together for a short time in order to complete a project (Widén, 2006). Therefore, stakeholder management is crucial. Stakeholders can be defined according to Freeman’s definition, as follows:

[A stakeholder is] any group or individual who can affect, or is affected by, the achievement of a corporation’s purpose.

(Freeman, 1984)

The outcome of an innovation is strongly dependent on the stakeholders, and they want to influence projects based on their needs and interests (Olander and Landin, 2008). The stakeholders can both hinder and assist an innovation’s attempt to diffuse. Widén et al. (2016) argue that a successful innovation diffusion depends on the process of engagement with stakeholders. If a structured stakeholder engagement is included in the innovation process, the outcome is likely to be more successful. An analysis of stakeholder interaction shows that there is a clear connection between a successful diffusion outcome and a high stakeholder-interaction ratio (Widén et al., 2016).
An evaluation of stakeholder influence in construction work has been performed by Olander and Landin (2005) which shows that in planning, implementing and completion of constructions, stakeholders’ demands and influence have to be considered as an important step. Olander and Landin (2005) uses the power/interest matrix as a tool for stakeholder mapping.

Stakeholder index impact is another planning and evaluation tool which can be used for stakeholder analysis, and it has been used by Olander (2007). He argues that a stakeholder analysis should be conducted before each major decision in a project. Another conclusion, made by Atkin (1999), is that suppliers need to be involved in the construction process far more than present. Atkin (1999) presents a check-list for successful innovation in construction (Chapter 8, Awareness generating exercise).

2.7 Related case studies

The type of house, SRDU, that this thesis investigates is constructed with a so-called Adobe technique, using sun-dried earth blocks. The Adobe technique has spread throughout Ethiopia to various degrees; a diffusion analysis of the Adobe technique has recently been written by Petersson and Ström (2015). In the Guraghe zone, where the SRDU project is located, Adobe blocks had been unknown and were an innovation when introduced.

Hjort and Widén (2015) analysed seven case studies from Ethiopia where initiatives to do construction with the Adobe technique have taken place. The findings show that obstacles to adopting the technique can be of various kinds. In two of the cases the Adobe technique was diffused and became successful. One was due to a strong champion, a lot of people being involved, people being trained to build with it, the construction technique being proven to work, etc. In the other successful case, the technique was diffused although no direct action was taken. Further on, one case study showed that an increased diffusion of the technique was due to a demonstration house, arising from a university’s initiative. In four of seven cases, the diffusion of the Adobe technique was unsuccessful. The reasons were of various kinds: (1) No one was championing the technique; (2) There was no market, and people did not see the use in transitioning from something known and safe; (3) Some key stakeholders were not convinced of the Adobe technique’s benefits, which resulted in scepticism among the potential adopters; and finally, (4) A cultural and historical stigma, related to clay as being of low status, hindered the diffusion. The seven case studies show that the rate of adoption is based on varied kinds of factors and not on the innovation’s technical benefits only. (Hjort and Widén, 2015)

Another article written by Hjort et al. (2016) describes important factors for the innovation diffusion of low-cost housing. Also this paper is focused on rural Ethiopia and the Adobe technique; it is based on a case study of a demonstration project. Hjort et al. (2016) describe the project as successful from a technical point of view, but as a failure in regard to the diffusion of the technique. The reasons behind this are argued to be: (1) Lack of a clear relative advantage, compared to traditional building technology; (2) Lack of a champion who, by using the demonstration buildings, promotes the technology, giving the message to the society that the technology is trustworthy; (3) Lack of continuity in the demonstration efforts. (Hjort et al., 2016)
3 Introduction to Ethiopia and Guraghe zone

3.1 Location
Ethiopia is a country in the north-east of Africa with about 99 million inhabitants (The World Factbook, 2016). It has borders with Eritrea, Djibouti, Somalia, Kenya, South Sudan and Sudan (see fig. 2 below).

Figure 2. Location of Ethiopia.

The capital, Addis Ababa, is centrally placed in the country (see fig. 3). It is a considerably large city, with 3.3 million inhabitants compared to the second largest city, Dire Dawa, with 277,000 inhabitants (The World Factbook, 2016).

Figure 3. Addis Ababa (capital) and Guraghe zone (where the SRDU-project is located) are marked in red.
### 3.2 Population, climate and economy

The population of Ethiopia consists of several different ethnic groups, each with its own mother tongue and geographical region of concentration. The largest ethnic group is Oromo (34%), followed by Amhara (27%), Somali (6%), Sidama (4%), Wolaytta (2%), Guraghe (2%), and then approximately 80 other ethnic groups, depending on classifications. The population growth in 2015 was 2.9% which ranks Ethiopia 10th among 233 countries, based on speed of population growth. The country has 87 inhabitants per km$^2$, which can be compared with its neighbour Somalia, which has 17 inhabitants per km$^2$. The population size prognosis for Ethiopia in 2050 is 165 million inhabitants. Today (2016), 83% of the population still live in rural settings and make a living through farming. The difference of lifestyle between urban Ethiopia (Addis Ababa) and rural Ethiopia is very large. In rural Ethiopia, water pipes and electricity are still rare, while in urban Ethiopia modernization is clearly visible. Generally, in Ethiopia 2 persons out of 100 are internet users, which can be compared with 39 out of 100 in neighbouring Kenya (numbers from 2013). Fast urbanisation in Ethiopia is an undeniable fact. (Nationalencyklopedin, 2016; The World Factbook, 2016)

Ethiopia is fully within the tropical zone, but because of high location the climate in several places is temperate. Guraghe region, where the SRDU-project is located, belongs to the highland with a temperate climate. (Nationalencyklopedin, 2016)

### 3.3 Administrative structure

In order to understand the stakeholders of the SRDU-project (see chap. 4.5), the administrative structure has to be described. There are three levels of decision making (see fig. 4 below). (Ethiopian Government, 2016)

![Diagram of administrative structure]

More specifically, the government delegates tasks to eleven regional states (two of them are the city regions Addis Ababa and Dire Dawa; the other nine facilitate the rest of the country). The regional states are divided into several zone administrations, and the zone administrations consist of several Woredas (districts). Guraghe zone consist of 13 Woredas (see fig. 5 and the map in fig. 6, p. 13). (Ethiopian Government, 2016)
The tasks for the zone administrations are, for instance, to facilitate governmentally provided health care and schools. The administration has to follow policies issued from a higher level. One policy is to promote development for the zone and to lift the standard of housing. The local administrations report to a higher instance about how the policies are being followed. (Ethiopian Government, 2016)

3.4 Guraghe zone

Guraghe zone is one of 13 zones in the region SNNPRS (Southern Nation’s Nationalities and Peoples, Regional State). The zone is structured into 13 Woredas and covers $7.76^0-8.45^0$ north latitude, and $37.45^0-38.71^0$ east longitude, approximately 150 km south of Addis Ababa, the capital of Ethiopia. The total land area of Guraghe zone is 5932 km$^2$. (Ethiopian Government, 2016)

The zone is one of the most densely populated areas of the southern region. According to the central statistical agency of Ethiopia the total population of Guraghe zone is 1,280,484 persons
(2007). The population density of Guraghe zone is 216 persons per km², which is more than three times the national average. In the western parts orthodox Christianity is dominant, and in the eastern parts Islam is the dominant religion. In Guraghe, 6 languages are spoken: Inor, Sebat Bet Gurage, Wolane, Kistane, Messqan and Silt’e. These are all Semitic languages and in the popular speech among other Ethiopian tribes the languages in Guraghe zone are called Guraginja (Ethiopian Government, 2016; Ethnolouge, 2016; Initial talk see Method chap. 5.1). Fig. 6 on p. 13 shows the location of the SRDUs in Guraghe.
4 Description of SRDUs

4.1 Aims and goals of the project

The aim of the Sustainable Rural Dwelling Unit project was to contribute to the improvement of rural housing in Ethiopia. It had been observed that rural housing was substandard, and the research team aimed to improve this in terms of house durability, indoor standard, water sanitation opportunity, separation between people and cattle, energy generation through biogas, local materials that will be cheap to access and impact the environment less than current housing. The problem of on-going deforestation led the architects to choose earth blocks (so-called Adobe blocks) for wall construction, and bamboo for both ceiling and roof. The idea was to draw lessons from traditional vernacular architecture to design a new type of unit, with higher standard of living, and sustainable environmentally, economically, and socially, the so-called triple bottom line. Environmental sustainability ensures that the environment will not be harmed by pollution or unsustainable use of raw materials. The economic sustainability consists of making the house affordable for local people in the rural area, so that they can continue to build this type of house in a long-term perspective. The social sustainability focuses on the society aspects—that it suits the aim of the group and that the local people’s needs are fulfilled. (Yitbarek Alemayehu, 2015; Initial talk see Method chap. 5.1)

The project description was based on following headlines (Yitbarek Alemayehu, 2015):

- Innovation and transferability – Progress
- Ethical standards and social equity – People
- Environmental quality and resource efficiency – Planet
- Economic performance and compatibility – Prosperity
- Contextual and aesthetic impact – Proficiency

The process was to study the need in rural Guraghe and to develop a house design that would be an innovation in the geographical area. The house was to be in harmony with the ethical and social aspects of the Guraghe community. In the house design, the future of the planet was taken into account, and local resources were the basis for the building materials. This would also lead to a very economical house, which would be cheap to construct for local farmers, a part of the economical sustainability. Finally, the unit was meant to suit different income groups. (Yitbarek Alemayehu, 2015; Initial talk see Method chap. 5.1)

There were hopes also that the project would create jobs and improved income sources for artisans. To achieve this, the strategy was to construct one prototype house. This was done and comments were gathered from local elders and an association, Bete-Guraghe Cultural Centre (described in chap. 4.7.3). Comments on the design led forward so that a second, improved, house was constructed. One farmer from each district in the Guraghe zone received training in how to construct the house. After the training, the farmer was to go back to his district to construct the house. He could start his own business make a living out of it. Through this, the house innovation would diffuse, the attractiveness of rural living would increase, and the environmental impact would be kept low. The project aimed, in short, to make a foundation for sustainability in the local economy, in social aspects with preserved cultural values, and in reduced environmental impact. (Yitbarek Alemayehu, 2015; Initial talk see Method chap. 5.1)
As the project went on, the aims grew into becoming a plan on the national level: the house was to be adopted in other parts than Guraghe. Also, the strategy of scaling up and diffusing the houses changed. A polytechnic college (so-called TVET, description in chap. 4.7.6) was involved. Their students would be taught to build the house, and a new market for building rural houses would open up. All of this, alongside the problems and successful aspects of the projects, will be described and analysed in the following chapters. (Initial talk see Method chap. 5.1)

4.2 Project locations
The SRDU-project consists so far (March 2016) of eight units in four different locations (see fig. 6). The first two SRDU-houses were built in Gubrie, 175 km south-west of Addis Ababa, project site no. 1. Gubrie is located 15 km from Wolkite, and 500 m from Wolkite University area. The next unit is located in Agena, project site no. 2. Another one was built by TVET (description in chap. 4.7.6) on the TVET compound in Wolkite, project site no. 3. Finally, four houses are currently (March 2016) under construction in the village of Wita, 8 km north of Butajira. This is project site no. 4.

![Figure 6. Map of Guraghe zone. Project sites of the SRDU are marked with numbers; (1) Gubrie at Wolkite University compound, (2) Agena on private family’s compound (3) Wolkite on TVET compound, and (4) Wita, 8 km from Butajira on private families’ compounds. The numbers are put in chronological order of construction.](image)

Geographical marks on the map in fig. 6:

1. Gubrie, location for the first two SRDUs. One rectangular and one circular unit.
2. Agena, location for the family who allowed building one SRDU for private use.
3. Wolkite, location for one SRDU built by TVET graduates on TVET compound.
4. Wita, location 8 km north of Butajira where four SRDUs are currently under construction (March 2016).
4.3 Current houses

In the rural areas of Guraghe there are two dominant types of houses. Based on spontaneous observations of approximately 1000 houses while traveling in the Guraghe zone, these two house types appear to cover 99% of current housings. The first type is the traditional circular house (see fig. 9 on p. 15) and the other type is a more recent house type, with iron sheet roofing (fig. 10 on p. 15). Both of them are equally common, and in the same compound often both are represented (see fig. 7 and 8 below).

Figure 7. Common view in Guraghe zone; one modern rectangular house with iron sheet roof, next to a traditional hut.

Figure 8 shows a common sight in a rural village. The two types are mixed alongside each other.

Figure 8. A typical Guraghe village in 2016; modern houses are mixed in the landscape of traditional houses. Both types of houses are equally common.

4.4 SRDU compared to current houses

The SRDU-house is an innovation of rural housing and differs in many aspects from both modern rural houses and traditional ones. The first thing that can be said is that the first SRDU that was built (SRDU-1) was a rectangular house, but because of opinions from village elders in Gubrie (project site no. 1) and Bete-Guraghe Cultural Centre (explained in chap. 4.7.3), the unit was changed into a circular house (SRDU-2). The elders and representatives meant that
this change would make the SRDUs more similar to the traditional Guraghe houses, which would suit the users better. The remaining SRDUs in the other project sites are all circular.

One change relative to both traditional and modern rural houses is that an SRDU has an upper floor designed for bedrooms. It also has a cattle shed connected to the house, which can be reached from inside. The waste from the cattle is to be used for a biogas energy system, which is installed on the compound. An SRDU brings many changes and the most important ones are described in the following subchapters in comparison to both traditional (fig. 9) and modern (fig. 10) Guraghe houses.

Figure 9. Traditional circular “Goja/Tukul” houses built with the wood-consuming “chicka” method.

Figure 10. Modern rectangular houses with corrugated iron sheet roofs (known as “korkoro houses”).
4.4.1 Materials

**Traditional house:** Walls are built with wood and plastered on the interior with earth. Paint may occur but is uncommon. The roof is thatched with grass. (Fig. 12 below shows a traditional house under construction and the amount of wood that is required.)

![Traditional house](image)

**Modern house:** The walls are made in the same way as for the traditional houses, but rectangular and often higher. The house front is usually painted in bright colours (see fig. 10, the right image). The roof consists of corrugated iron sheets.

**SRDU:** Earth blocks form the walls and bamboo forms the outer roof and inner ceiling. Figure 13 on the following page shows the inner ceiling under construction.
4.4.2 Techniques

**Traditional house:** Vertical wooden poles are put into the ground for the walls; sometimes the wooden elements are extended by nailing them to each other. Horizontal wood is integrated with the vertical, and the walls are plastered on the interior, and to some extent on the exterior with earth-straw mixture (see fig. 14). Many times the external plastering disappears with rain during rainy seasons. The roof-structure is woven in the same way as the walls, and is thatched with grass bundles.

**Modern house:** The walls are built with the same technique as the traditional house. Corrugated iron is bought in sheets and screwed onto the rafters. To compensate for the bad indoor climate that iron sheet roofing brings, the walls are built very tall (see fig. 15). In the urban areas, an indoor ceiling is often used which insulates and keep the house cool during the day and warmer during the night, but this is not common in rural areas.
SRDU: The walls are made out of earth bricks according to the Adobe technique, which traditionally has not been used in the area. The roof consists of multiple layers of bamboo leaves, an alternative to the traditional thatched roof. The ceiling consists of woven bamboo, a technique that has not been used in the Guraghe zone.

The bottom of the walls (up to a half meter in height) have a surface of river stones added in the plastering, of size 10-40 mm. This will protect the Adobe blocks against rain destruction.

4.4.3 Foundation
Traditional house: No special foundation is constructed.

Modern house: Either no special foundation is constructed, or an un-reinforced concrete foundation on stones is casted.

SRDU: The foundation is like that of the modern house with stones, and reinforcement is prepared beneath the coming walls as beam reinforcement (see fig. 16).

4.4.4 Floors
Traditional house: Stamped earth floors. It sinks successively when cleaning it and has to be refilled. For a sleeping place, a carpet is laid out.
Modern house: The floors are covered by a thin layer of concrete, or they are stamped as in the traditional houses. Many times the floor is covered with a plastic or a woven straw carpet.

SRDU: Concrete floors, both the bottom and the upper floor (see fig. 17).

![Figure 17. Picture taken from the upper floor in the first SRDU.](image)

4.4.5 Spatial division

Traditional house: The house consists of one room, although sometimes a wall is present, from the centre pole to the outer wall, which divides the family’s sleeping place from the cows, goats and chickens on the other side (see fig. 18).

![Figure 18. Example of an interior view of a traditional house. The cattle are bound to the right, the fire place is in the middle, and to the left the family sleeps at night on carpets which are laid out.](image)

Modern house: The house is usually divided into several rooms.

SRDU: Separate dwelling areas within the house. One to two bedrooms, one kitchen, one living room, toilet and storage, all separated by walls partly or fully (see fig. 19 on the following page). The SRDU is also usually relatively larger, with its 65 m$^2$ of living space.
Figure 19. Plan and section of SRDU (the circular version). From left to right: The bottom floor, the upper floor, a cross-section.

### 4.4.6 Fire resistance

**Traditional house:** Weak fire resistance, especially the grass roof. The plastering is fire resistant to a small extent.

**Modern house:** The plastering on the walls is fire resistant to a small extent and the roof is fire resistant in the beginning of a fire. Afterwards the iron sheets lose their strength.

**SRDU:** The Adobe blocks are fire resistant. The bamboo leaves are treated with fire resistant products like boric acid and borax according to material tests in October 2010 – January 2011 performed by EiABC.

### 4.4.7 Resistance to pests

**Traditional house:** Weak resistance to termites and rats.

**Modern house:** Partly resistant to termites and rats as they cannot live in the roof.

**SRDU:** The Adobe blocks are fully resistant to termites. The structural bamboo poles, which are connected directly to the concrete foundation, make it harder for termites to reach the structural poles and bamboo roof. However, it is not known how termites and other pests will affect the bamboo roofs.

### 4.4.8 Sanitary possibility

**Traditional house:** Houses usually have a dry toilet as a separate small building on the compound, i.e. an outhouse. Showering is done with a bucket.

**Modern house:** Same as for a traditional house, if it is in town, where the sanitary possibilities are at a higher level. In the rural areas where SRDUs have been constructed, there are no water-based toilets available for anyone.

**SRDU:** Higher standard of hygiene. Drains for an indoor toilet and shower are prepared.

There is still no use of water pipes in any of the project sites (March 2016), and at this stage the water has to be carried from outdoors. Carrying water is part of the daily activity for all households at the project sites. In Wita (project site no. 4) the plan is that water tanks will be provided for the SRDUs. There is also a hope from the local community that there will be a piped water system in Wita within the near future. Until then, a ladder has to be used in order
to fill the water tank manually, or a bucket of water has to be carried into the house to flush the toilet.

The tank will provide water for the kitchen, toilet and shower. The shower and toilet rooms have cement floors to make them as hygienic as possible.

### 4.4.9 Interior designs

**Traditional house:** Decoration exists through items.

**Modern house:** Decoration exists through items such as wall clocks, posters, etc.

**SRDU:** New interior designs. A vault is introduced as a new concept for decoration of inner environment. To have an upper floor is new. Shelves are masoned within the wall (see fig. 20).

![Figure 20. To the left: Interior design with shelves masoned within the wall half-way up the stairs. To the right: A vault forms the ceiling above the kitchen.](image)

### 4.4.10 Environmental impact

**Traditional house:** It contributes significantly to the deforestation problem, due to the large need for timber.

**Modern house:** Iron is usually imported into Ethiopia, where it is processed into corrugated sheets. Concrete is produced in Ethiopia but much raw material, like ballast, comes from abroad. A lot of energy is used for cement production and through this a lot of CO$_2$ is released.

**SRDU:** Reduced environmental impact; marginally contributing to deforestation because of the central pole. Small impact on CO$_2$-emissions (via cement production, and transport of bamboo and adobe blocks when they are not from the area).

### 4.4.11 Energy generation

**Traditional house:** No energy generation.

**Modern house:** No energy generation.

**SRDU:** Generates renewable energy through biogas, which is to be used for lighting and cooking.
The drains for both the toilet and the waste from the animals connect to the underground biogas station. The drains from the shower and kitchen sink are separate and flow through a channel into an immediate cleaning system that uses sand.

At project site no. 1 (Gubrie) and no. 2 (Agena), solar cells have been installed. For the Agena unit, solar cells provide lighting, and no biogas system is used.

### 4.5 Trends for future housing

The present chapter is a description of the present state of rural housing in Guraghe zone. SRDU is one possible alternative for the future. Another, which is expected, is a modern house like the one described above, but with walls made out of concrete blocks. This type of house is common in smaller towns as Wolkite and Butajira, and is considered a durable and good house. The reason that it is not used in rural areas is that the costs of both the blocks and the transport are too high for farmers. If the trend of farmers’ economic situation advancing continues, the standard of rural housing is likely to become higher. But at the same time, the environment would be badly impacted, because of the CO\(_2\) released from cement production and from increased transportation of building materials.

### 4.6 Time line

The following time line shows the development of the SRDU-project, the turns it has taken and the stakeholders that have been involved. The three phases are described, starting with the first unit, and ending with the project of vocational training for students (aimed at making the project self-propelled). In chapter 4.7, the stakeholders are described more in detail.

From June through end of September during all relevant years, no construction work has been done, because that is the rainy season. That time has been used for compilation, reporting, publication and review.
Table 1. Description of the events during the first phase, the rectangular unit.

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SRDU (Phase 1): The rectangular unit</strong></td>
<td></td>
</tr>
<tr>
<td><strong>2009, May</strong></td>
<td>A call for research within the building sector was initiated by EiABC, Ethiopian Institute of Architecture, Building Construction and City Development (explained in chap. 4.7.1), where the best proposal would receive funding from the institution. Three architects were the initial research team. Guraghe zone was chosen to be the geographic area.</td>
</tr>
<tr>
<td><strong>2010, October</strong></td>
<td>The research was officially launched.</td>
</tr>
<tr>
<td><strong>2010, October</strong></td>
<td>Meeting with official Guraghe Zone Administration to discuss the process. Additional funding was given from them.</td>
</tr>
<tr>
<td><strong>2010, October – 2011, January</strong></td>
<td>The design of the unit was developed by the undergraduate students and, in parallel, the core research team (see chap. 4.7.1). Visits to Guraghe and material analyses were made.</td>
</tr>
<tr>
<td><strong>2011, January</strong></td>
<td>The design of the unit was finalized. A biogas system was included in the unit to obtain energy for lighting and cooking.</td>
</tr>
<tr>
<td><strong>2011, February</strong></td>
<td>Stakeholder meeting 1: The core research team met with Bete-Guraghe Cultural Centre. Technical comments were given.</td>
</tr>
<tr>
<td><strong>2011, February</strong></td>
<td>Stakeholder meeting 2: Organized by the Guraghe Zone Administration, for elders in Wolkite town; the goals were to explain what their aim was and to present the design content. Models and visualizations were shown.</td>
</tr>
<tr>
<td><strong>2011, March</strong></td>
<td>Stakeholder meeting 3: Meeting with both the Minister for Urban Development and Construction and the State Minister of Education. The idea was supported and appreciated. Minister of Urban Development and Construction wanted the project to grow into a national agenda.</td>
</tr>
<tr>
<td><strong>2011, January</strong></td>
<td>13 trainees were recruited from the 13 Woredas (Sub-zones of the Guraghe zone).</td>
</tr>
<tr>
<td><strong>2011, January</strong></td>
<td>Construction starts. The elders were invited to the kick-off, “ground breaking day”, Gubrie.</td>
</tr>
<tr>
<td>2011, February – 2011, July</td>
<td><strong>Capacity building and skill transfer.</strong> The core research team made 10 trips during this period to give training and supervision to the trainees on the construction project.</td>
</tr>
<tr>
<td>2011, March</td>
<td>Additional meeting due to site-related issues. Local people in Gubrie raised the <strong>water costs</strong> for the SRDU-project with hopes of making more money. Meeting of elders, Guraghe Zone Administration and the core research team, to solve the issue.</td>
</tr>
<tr>
<td>2011, September</td>
<td><strong>Graduation for the 13 trainees.</strong> They were given certificates, three different-sized Adobe-block moulds and the draft version of the Amharic-language manual for the SRDU-house.</td>
</tr>
<tr>
<td>2011, November</td>
<td>The scientific director of the EiABC presented different projects, including SRDU, <strong>at ETH in Switzerland.</strong> A foundation, <strong>Arthur Waser Stiftung,</strong> was interested to fund a continuation of the project. The Arthur Waser Stiftung agreed to continue to <strong>build a second prototype (SRDU-2).</strong> The foundation also asked the team to come up with a <strong>proposal as to how to scale-up and scale-out the SRDU project.</strong> This would later on become phase 2 and 3, respectively.</td>
</tr>
<tr>
<td>2011, December</td>
<td>The <strong>first housing unit was completed</strong> and inauguration was conducted.</td>
</tr>
<tr>
<td></td>
<td>Already since November the continuation of the SRDU-2 project had been in planning.</td>
</tr>
</tbody>
</table>
Table 2. Description of the events during the second phase, the first circular unit.

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012, April</td>
<td>A plan of research for <strong>the social aspect</strong> was written. The plan was to investigate, during a period of two to three months, the following:</td>
</tr>
<tr>
<td></td>
<td>- General review of the socioeconomic background of the area</td>
</tr>
<tr>
<td></td>
<td>- Perceptions by the immediate community of the built SRDU</td>
</tr>
<tr>
<td></td>
<td>- General acceptance of the built SRDU</td>
</tr>
<tr>
<td></td>
<td>- Human-livestock intimacy</td>
</tr>
<tr>
<td></td>
<td>- Societal values of “traditional” building materials (thatch, bamboo, mud, etc.) vs. “modern” (iron sheet roof, HBC wall, etc.)</td>
</tr>
<tr>
<td></td>
<td>- Societal values of craftsmanship in relation to the SRDU construction technique</td>
</tr>
<tr>
<td></td>
<td>- Social identities and symbolic value of construction features (compare with the second bullet point, chap. 4.8)</td>
</tr>
<tr>
<td></td>
<td>- Socio/cultural space demands and programmatic precision of the built SRDU</td>
</tr>
<tr>
<td></td>
<td>- Social impact of the built SRDU</td>
</tr>
<tr>
<td></td>
<td>Unfortunately, <strong>this research never came to be.</strong></td>
</tr>
<tr>
<td>2011, November</td>
<td><strong>Documentary filmmakers</strong> were hired. They visited the site one day per week from start to completion of SRDU-2. Their payment was funded by the Arthur Waser Stiftung.</td>
</tr>
<tr>
<td>2011, November</td>
<td><strong>ETH-Zurich North-South Centre</strong> came to Ethiopia to follow up the progress of the project and see the first SRDU. Overall the <strong>success of the project was recognized</strong> and its continuation recommended.</td>
</tr>
<tr>
<td>2012, January</td>
<td><strong>Construction of SRDU-2 was started.</strong></td>
</tr>
<tr>
<td>2012, January</td>
<td>A <strong>recorded film</strong> about how to construct a circular SRDU was presented to the trainees.</td>
</tr>
<tr>
<td>2012, October</td>
<td><strong>Completion of SRDU-2.</strong></td>
</tr>
</tbody>
</table>
## Contextualization of vocational training for the building sector in Ethiopia (Phase 3)

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012, May</td>
<td>Agreement between ETH and EiABC was signed for the project period to be 36 months.</td>
</tr>
<tr>
<td>2012, November</td>
<td>Construction of a unit in Agena starts, through an initiative by a local family who heard about the SRDU-project and wanted to live in this kind of house. The construction was financed by the house owner himself, who hired some of the 13 trainees.</td>
</tr>
<tr>
<td>2012, November</td>
<td>A program, about how to construct the SRDUs, starts in TVET Polytechnic College (see full explanation of TVET in chap. 4.7.6). One unit is constructed within the TVET compound, in order to facilitate practical skills in building the unit.</td>
</tr>
<tr>
<td>2013, May</td>
<td>Completion (except plastering) of the Wolkite TVET unit.</td>
</tr>
<tr>
<td>2013, May – 2014, June</td>
<td>The research work continues, as well as the training at TVET.</td>
</tr>
<tr>
<td>2013, September</td>
<td>Completion of the Agena unit.</td>
</tr>
<tr>
<td>2015, March</td>
<td>Former team member, an architect from EiABC, changes role and acts as a coordinator and contractor on behalf of EiABC in order to continue the project. The housing units change name from “Sustainable Rural Dwelling Unit” into “Rural Housing”. The size of the original unit is reduced to save cost and space.</td>
</tr>
<tr>
<td>2015, April</td>
<td>Construction of four units is started in the rural area Wita, 8 km northeast of Butajira, through the local farmers’ association. Families in the association can now make an application to get a house built for them. Fourteen applications were submitted. From them, three families and one school were chosen. Local workers from the village were employed to make Adobe blocks, and the house construction itself was done by hired workers from Arba Minch, 300 km south of Butajira. The families are to pay parts of the costs back to the farmers’ association, to provide water and to participate in the construction.</td>
</tr>
<tr>
<td>2016, April</td>
<td>Planned completion of the four units in Wita.</td>
</tr>
</tbody>
</table>
4.7 Stakeholders
In the process of creating a Sustainable Rural Dwelling Unit there have been many groups and organisations involved (see fig. 21). In order to understand the results and analysis it is important to describe their interests in the SRDU-project, one by one.

Figure 21. The stakeholders of the SRDU-project, numbered in chronological order of involvement. Direct communication is described by arrows. EiABC is the mediator between many stakeholders and notably most involved.

Eleven key stakeholders have been identified and described, yet it must be noted that there are usually always stakeholders on the periphery who may impact the project, be impacted by it, depending on how it develops. The media and the timber salesmen are two examples. EiABC,
Ethiopian Institute of Architecture, Building Construction and City Development, was the project’s initiator and so the first stakeholder.

### 4.7.1 EiABC - Ethiopian Institute of Architecture, Building Construction and City Development

In Ethiopia there are 8 institutes of technology. EiABC is one of them, and it is itself under Addis Ababa University. The Government expects these 8 institutes to research, to provide consultancy services, and to teach. The aim of the institute is to provide university-level knowledge to meet Ethiopia’s needs. (EiABC, 2015)

The team that designed and developed the SRDU, referred to as “the core research team”, consisted of 4 architects, one civil engineer and two research assistants. EiABC’s interest in relation to SRDU is both the functionality of the unit and the good perception of it by the people of Guraghe and all Ethiopians’. (Initial talk, see Method chap. 5.1)

### 4.7.2 Local people in Guraghe

People in the Guraghe community are the end users of the houses: the aim of the whole project was to give an opportunity to rural residents of Guraghe to raise their standard of living. Full benefits for the local people are described in chapter 4.1 Aims and goals of the project, and chapter 4.4 SRDU compared to current houses.

The local people in general have been involved through site visits and studies from the EiABC. Elders have taken part in the official openings and inauguration ceremonies, and have given comments on stakeholder meetings (see time line).

### 4.7.3 Bete-Guraghe Cultural Centre

For the EiABC it was important to involve Bete-Guraghe Cultural Centre (an association promoting Guraghe culture) because the project risked not being approved by the community unless it was approved by that association. The aim of the Bete-Guraghe Cultural Centre is to develop, preserve and study the Guraghe culture, language, heritage and tourism resources. (Interview no. 8)

The cultural centre is a non-governmental organization initiated by local people from Guraghe and was established 14 years ago. The association is currently involved in constructing a Guraghe cultural building in Addis Ababa. It will have a Guraghe cultural restaurant, Guraghe archives, Guraghe documentation centre, Guraghe multi-purpose hall and gymnasium, a gallery, and a training centre for traditional music and Guraghe language, financed by a fund-raising program and international donors (Guraghe people who are living abroad). They also regularly publish a booklet in Amharic of news connected to Guraghe. Structurally it consists of 150 members of a general assembly, and its head office is in Addis Ababa. (Interview no. 8)

The Bete-Guraghe Cultural Centre was the third party involved in the SRDU-project, and sees many benefits in its association. They view SRDUs as making life much better for rural people, and they have been eager to see the SRDUs spread throughout the region. The General Manager of Bete-Guraghe Cultural Centre explains that as soon they heard about the project they were very enthusiastic and joined without any hesitation. (Interview no. 8)
4.7.4 Guraghe Zone Administration
This is the local administration for the government (see fig. 4 and 5 on p. 9 and 10 which describe the governmental structure in Ethiopia). It is in the administration’s interest to make the Guraghe zone attractive so that people choose to remain there. The Guraghe Zone Administration gave additional financial contributions for the SRDU-project (see time line on p. 23, October 2010). (Initial talk see Method chap. 5.1)

4.7.5 Wolkite University
Wolkite University is a new general university, opened in 2012, with different departments (social science, technology, business, etc.). Wolkite University was invited by EiABC to work with the project for future scaling up. If the unit was to be diffused on a national scale, there would be a need for a research institute in or near the area of the units, for continuous improvements, correction work, to supervise the project, and to work with the community. Research for the unit’s continuous improvement would entail research on materials, techniques and social dimensions. The idea from EiABC was that Wolkite University would take over these tasks. (Initial talk see Method chap. 5.1, Interview no. 8-11)

For EiABC it was not important that specifically Wolkite University would be involved; the need was essentially that a university would take on the above responsibilities. Wolkite University was invited for its own benefit from taking a role in the project and because it is located in the Guraghe zone. By taking over the research work it would create a profile for the university, get a more widely spread reputation, and attract guests; furthermore, EiABC could continue with other projects. (Initial talk see Method chap. 5.1, Interview no. 10-11)

4.7.6 TVET Wolkite - Polytechnic College
TVET stands for Technical Vocational and Educational Training. This is a college that trains students for work in different areas. The Ethiopian Ministry of Education defines the vision of TVET as follows:

Technical and Vocational Education and Training (TVET) in Ethiopia seeks to create competent and self-reliant citizens to contribute to the economic and social development of the country, thus improving the livelihoods of all Ethiopians and sustainably reducing poverty.

(TVET 2008)

In Ethiopia there are around 2000 TVET institutions. They transfer technology knowledge to the local community level, at the same time as they equip students for occupational work in different sectors, such as construction work, metal work, automotive technology, electro-technology, etc. There are five levels of training, each achieved by one year of education; after graduating, the students receive a TVET certificate. Electricians, plumbers and other higher-skills professionals usually need to have a TVET certificate to get employed. The government wants to transform the population with more semi-skilled and skilled manpower, so that the population will be benefited and the unemployment level will be reduced. (Interview no. 9)

In Wolkite TVET College there are seven sectors, each of which supplies 9 to 10 occupational areas. In total, the college provides 46 occupational training programs. Masonry, which is related to the SRDU-project, is one of them. Fita Ayalew, Human Recourse Development Officer at TVET Wolkite, says:
The purpose of the college is also, besides producing middle-level manpower, to create jobs for the graduates. Human Resource Development Officer at TVET Wolkite.

In relation to SRDUs, he has been one of the main supporters of the project, and sees SRDUs as a great potential for future TVET graduates. When asked who the main beneficiaries of the project are he specified the local community as the first beneficiary, but TVET College as strongly in second place. (Interview no. 9)

4.7.7 Regional State
The regional state has the same interest as Guraghe Zone Administration in making the area attractive so that people choose to remain, and in seeing higher standards of rural housing help the region’s general development. The regional state was invited to the inauguration of the units in Gubrie but was not present (see fig. 4 and 5 where the governmental structure is described). (Initial talk see Method chap. 5.1; Ethiopian Government, 2016)

4.7.8 Government
This is the national level of the Ethiopian government. Their interests lie in overall benefits for the country. Both work opportunities, and increased attractiveness of village living, are advantages for the government available through the SRDU-project. This is in line with their policies on rural development. (Initial talk see Method chap. 5.1; Ethiopian Government, 2016)

H.E. Mekuria Haile, Minister of Urban development and Construction, and H.E. Wondwossen Kiflu, State Minister of Education, were present at stakeholder meeting 3 (see time line on p. 23). There they were supportive and wished the SRDU-project to diffuse nationally. H.E. Mekuria Haile was also present at stakeholder meeting 2 where he was enthusiastic about the change SRDUs could achieve for rural housing in Ethiopia (see fig. 4 and 5 where the governmental structure is described). (Initial talk see Method chap. 5.1; Ethiopian Government, 2016)

4.7.9 ETH Global
ETH stands for Eidgenössische Technische Hochschule and is located in Zürich, Switzerland. A section of the Swiss university (ETH Zürich) is ETH Global. They became interested in the SRDU-project through a presentation by the then scientific director at EiABC (see time line on p. 24, November 2011). On their website they write about themselves:

\[ \text{ETH Zürich is one of the leading international universities for technology and the natural sciences. It is well known for its excellent education, ground-breaking fundamental research and for implementing its results directly into practice.} \]

(ETH Zürich, 2016)

Their interest is mainly academic, but as they put it in the citation above they have a great interest in being involved in ground-breaking research and implementing its results into practice. (ETH Zürich, 2016)

If the SRDU-project’s diffusion succeeds and increases, it puts ETH in a good light. Through ETH Global, stakeholder Arthur Waser Stiftung, became involved.
4.7.10 Arthur Waser Stiftung

Arthur Waser Stiftung (foundation) provides financial capability for the SRDU-project (Phase 2 and 3). The Arthur Waser Stiftung is founded in Switzerland with the aim of supporting social projects particularly in Africa, as well as cultural projects in Switzerland. In their own words they say:

_Ein Schwerpunkt der Stiftungsaktivitäten liegt in der Unterstützung von umfangreichen sozialen Projekten insbesondere in Afrika._

(Arthur Waser Stiftung, 2015)

The interests of Arthur Waser Stiftung in the SRDU-project lies in seeing the benefits for the local community of Guraghe, and also in presenting successful results of the SRDU-project to donors in Switzerland. The foundation is therefore expecting that the intended aims stated in the project application are fulfilled, and it is also expecting regular reports of the project’s success, through audio-visual documentation of the progress. (Arthur Waser Stiftung, 2015)

4.7.11 Farmers’ association in Wita

The farmer’s association was involved in Phase 3, when the project started to be out-scaled. Classified as a non-governmental organisation, the association was formed on a local initiative, as a cooperative association. One of the main tasks was to store seed in a seed storage. This association has been involved with the SRDU-project in Wita (project site 4, see fig. 6 on p. 13) by the initiative of EiABC, and aims to be a fixed point for the project and to make it sustainable for the future. (Interview no. 11)

4.8 How cultural aspects were taken into account

Cultural values have been of great importance in the development of SRDUs. It was important for the core research team at EiABC that future users would associate the new house with their own tradition and culture.

The first unit’s physical appearance was constructed to connect with traditional housing. Elders and people from Bete-Guraghe Cultural Centre gave comments and some aspects were changed:

- The rectangular unit became circular. This would connect more to the traditional way of living and represent a Guraghe house in a better way.
- The central pillar in the first unit consisted of four thinner pillars standing together as one, because the availability of thinner wood is greater than that of the traditional thick pole. However, it became understood that this pillar represents the father of the house, as the one holding up the home. He cannot be divided into four; therefore, it was important to keep a single, central pole. In the first unit, these four poles were covered with a tightly tied rope so that it was not visible that there were actually four pillars.
- In the first unit the cattle shed was reachable only from the outside, but after comments the cattle shed was changed for it to be reached from inside. The elders claimed that they had to be able to see how the cattle were doing during night.

(Initial talk see Method chap. 5.1; Interview no. 8-11)
After the corrections were made, EiABC, Bete-Guraghe Cultural Centre, Guraghe Zone Administration, and TVET Polytechnic College all agreed that SRDUs had taken cultural values into account fully. Human Resource Development Officer at TVET Wolkite concludes:

*Every cultural value is already included. The local people have accepted the house. (...)*

*Culturally there is no problem, we can conclude.*

Human Resource Development Officer at TVET Wolkite.
5 Method

The foundation for this research has been a case study approach. Eisenhardt (1989) states:

“[Case studies can be used to accomplish various aims: to provide description (Kidder 1982), test theory (Pinfield 1986), or generate theory (Gersick, 1988; Harris and Sutton, 1986).]” (p. 535)

(Eisenhardt, 1989)

The case study is partly descriptive and partly generating of theory. It was initiated through the cooperation between Ethiopian institute of Architecture, Building Construction and City Development (EiABC), Ethiopia, and Halmstad University, Sweden.

There have been different methods used to investigate the project. In order to gain information about the project’s past, present and potential-future status, the following approaches have been used:

1. Initial talk with the EiABC about the project’s past events, the involved parties, and the EiABC’s view on present and future events. Access to documents connected to the SRDU-project was obtained.
2. All project sites (four locations) have been visited, and all existing SRDUs (8 houses) have been observed, both via their surrounding contexts and internally.
3. Qualitative interviews have been conducted in different ways:
   a) In-depth interviews.
   b) Open interviews.
   c) Informal interviews.

All interviews and discussions have been voluntary, and no payments have been given.

5.1 Initial talk

The initial talks with the EiABC, where a member of the core research team was represented (see chap. 4.7.1), were not recorded; they were meant to give a base for the investigation. With this information, the time line was written, and the stakeholders and the comparison of the SRDUs with other houses were described.

The documents that were studied were non-confidential documentation: pictures of material testing, project applications, project descriptions and a descriptive film on how to construct a SRDU.

5.2 Visited project sites and observations

There are four project sites where one or several SRDUs have been built or are in the process of being built (see fig. 6). The sites in Wita, where the SRDUs are in the process of being built, have been visited twice, in total for 4 days. The sites in Gubrie and Wolkite have also been visited twice on separate trips, and the house in Agena has been visited once. Technical and aesthetic observations, as well as observation of the surrounding environment, have been done. This includes what impression the houses give technically and aesthetically, and to what extent other house types are present in the area. The physical environment has been observed, such as
soil standards, water access, plants that are being grown, everyday activities of local people, and current houses under construction.

5.3 In-depth interviews

The stakeholders have been defined in chap. 4.7, and the interviews that have taken place are described in table 1 below:

Table 4. List of performed interviews.

<table>
<thead>
<tr>
<th>No.</th>
<th>Stakeholder</th>
<th>Month, Year</th>
<th>Interview language</th>
<th>See questions in attachment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Future owner of an SRDU, no. 1</td>
<td>Jan., 2016</td>
<td>Amharic</td>
<td>A4</td>
</tr>
<tr>
<td>2</td>
<td>Neighbouring women and future owner of an SRDU, no. 2</td>
<td>Jan., 2016</td>
<td>Amharic</td>
<td>A4</td>
</tr>
<tr>
<td>3</td>
<td>Young men, neighbours of future SRDU owners</td>
<td>Jan., 2016</td>
<td>Amharic</td>
<td>A4</td>
</tr>
<tr>
<td>4</td>
<td>Member of the core research team, architect no. 1</td>
<td>Feb., 2016</td>
<td>English</td>
<td>A5</td>
</tr>
<tr>
<td>5</td>
<td>Member of the core research team, architect no. 2</td>
<td>Feb., 2016</td>
<td>English</td>
<td>A5</td>
</tr>
<tr>
<td>6</td>
<td>Future owner of an SRDU, no. 3</td>
<td>Feb., 2016</td>
<td>Amharic</td>
<td>A4</td>
</tr>
<tr>
<td>7</td>
<td>TVET graduate (see stakeholders chap. 4.7.6)</td>
<td>Feb., 2016</td>
<td>Amharic</td>
<td>A9</td>
</tr>
<tr>
<td>8</td>
<td>General Manager at Bete-Guraghe Cultural Centre (see chap. 4.7.3)</td>
<td>Feb. 2016</td>
<td>Amharic</td>
<td>A7</td>
</tr>
<tr>
<td>9</td>
<td>Human Resources Development Officer at TVET Wolkite</td>
<td>Feb., 2016</td>
<td>English</td>
<td>A8</td>
</tr>
<tr>
<td>10</td>
<td>Member of the core research team, architect no. 1 (complementary interview)</td>
<td>Mar., 2016</td>
<td>English</td>
<td>A6</td>
</tr>
<tr>
<td>11</td>
<td>Member of the core research team, architect no. 2 (complementary interview)</td>
<td>Mar., 2016</td>
<td>English</td>
<td>A6</td>
</tr>
</tbody>
</table>
The interviews have been semi-structured, in-depth interviews. Questions have been based on semi-structure as a starting point but the interview structure was open for new ideas as they came up. At times, an interviewee spoke freely in order to describe a situation more properly, which tends toward an in-depth type of the interview. Follow-up questions to the responses were asked; the time of each interview has been between 30 and 75 minutes. Questions have been adapted to the recipient (see attachments A4-A9). Additional questions have been asked when an answer has been unclear or ambiguous. Leading questions have been avoided. All interviews have been recorded and transcribed in order not to miss information.

The interviews which have been held in Amharic with the help of an interpreter were back-translated into English during the interview. Thereafter, they have been transcribed in English with the help of another native Amharic speaker, by listening to the recording together and translating sentence by sentence.

### 5.4 Open interviews

Open interviews were performed in the village of Gubrie outside Wolkite to ask local people about their opinions of the two first units. The open questions, “What do you think of these units?”, and, “Why don’t people prefer to build this way around here?”, were the starting points for a conversation, with follow-up questions based on responses. (See attachments A1-A3 for the questions that were used.)

<table>
<thead>
<tr>
<th>No.</th>
<th>Stakeholder</th>
<th>Month, Year</th>
<th>Interview language</th>
<th>See questions in attachment</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Neighbour to SRDU owner in Agena</td>
<td>Feb., 2016</td>
<td>Amharic</td>
<td>A3</td>
</tr>
<tr>
<td>13</td>
<td>Key keeper for SRDU at Wolkite University</td>
<td>Feb., 2016</td>
<td>Amharic</td>
<td>A2</td>
</tr>
<tr>
<td>14</td>
<td>Local people in Gubrie, Person 1 &amp; 2</td>
<td>Mar., 2016</td>
<td>Amharic</td>
<td>A1</td>
</tr>
<tr>
<td>15</td>
<td>Local people in Gubrie, Person 3</td>
<td>Mar., 2016</td>
<td>Amharic</td>
<td>A1</td>
</tr>
<tr>
<td>16</td>
<td>Local people in Gubrie, Person 4, 5 &amp; 6</td>
<td>Mar., 2016</td>
<td>Amharic</td>
<td>A1</td>
</tr>
<tr>
<td>17</td>
<td>Local people in Gubrie, Person 7 &amp; 8</td>
<td>Mar., 2016</td>
<td>Amharic</td>
<td>A1</td>
</tr>
</tbody>
</table>
Interviews no. 12-17 have been back-translated into English during the interview, and they have been checked with another Amharic speaker during transcription. Six out of the 8 interviewed local people in Gubrie wished to be anonymous, and therefore all of them were given a number instead of name. All interviews except no. 13 have been recorded. All have been transcribed.

5.5 Informal interviews
Spontaneous conversations have at times led to informal interviews. This has been the case with a waitress in Addis Ababa who was born in the Guraghe zone. She talked about what she thought about village life, compared to city life. A conversation about houses and their symbolism was also held with a social anthropologist, and conversations with architectural students in Addis Ababa gave information on their views of people from rural areas. There was also a discussion with one of the foremen of the construction of the first and second units, on his impressions of the SRDUs and the project.

These interviews were not recorded, but quotes were written up immediately after the conversation. They have agreed to these quotes being used in this thesis.

5.6 Discussion on method
When interviews are conducted, especially by a foreigner in a context where interviews as a scientific method are not common, many aspects may influence responses: language barriers; expectations of payments of different kinds; unclear understanding of why the interview is taking place; how the interviewer carries him- or herself through behaviour, attitudes and clothing; whether trust has been built; what other people are present at the time of interview; location of interview; who the interpreter is, given the context; etc. Each of these aspects has been considered when producing this thesis, alongside the fact that when the interviews took place in the village, the distancing factors were many already: foreign, other-ethnic interviewer, digital equipment, necessity for translation. Due to this it was important not to add extra factors that created distance. The interviewees from the villages were not taken aside individually, as that possibly would make the situation tenser. Therefore, some interviews have been with several people at once, and at some interviews the target person has been changed during the interview itself. This applies to interviews number 3-6.

For interview number 6, “Future owner of an SRDU no. 3”, the questions were pre-translated into Amharic to facilitate for the interpreter. The mutual understanding with the interpreter was inadequate: when transcribing with another Amharic native speaker, it was revealed that the interpreter’s back-translation into English was not proper. The interview anyway gave important information based on the answers the interviewee was giving.

In spite of these challenges the interviews are considered reliable. The influencing aspects have been reduced because they have been considered in advance. When one person gave information concerning another stakeholder this has been checked with the stakeholder in question. Thanks to two months’ time in Ethiopia for the researcher, the data had time to be double-checked and are to be considered reliable.
6 Results

In this chapter the results are presented in categories: object level, implementation level, organizational level, and user level. The chapter ends with a summary of the different stakeholders’ views of the SRDU-project’s present problems and their solution. First, an introduction is given about the breakthrough that SRDU was and still is considered to be, for Ethiopia’s future housing.

6.1 Breakthrough in rural housing

The SRDU was considered a breakthrough in rural housing. It was praised and made a great impact on ETH Global (see stakeholder description in chap. 4.7.9). This is also how Arthur Waser Stiftung came in contact with the project; they were amazed about the potential change it would bring to people in rural areas of Ethiopia. The Guraghe Zone Administration was impressed and inspired, and the Bete-Guraghe Cultural Centre was very enthusiastic about the benefits that this house and project would bring to their people.

When the Minister of Urban Development and Construction, H.E. Mekuria Haile, heard about the project he praised it and wanted to work on a national strategy to diffuse it to other regions across Ethiopia. Also the Minister of Education, H.E. Wondwossen Kiflu, was inspired to create a national standard and curriculum for an education, through TVET, focused on how to build SRDUs.

A definite success story was formed by several elements, including: the considerably higher standard the SRDU would give rural people; the high aesthetic values of the interior and exterior design; the obviously lower environmental impact, and even energy generation; the very low construction cost; and, the availability of materials. Furthermore, the cultural identity was kept, the local people were positive, the governmental institutions were positive, the cultural association was positive, and the EiABC was positive. The project had no obstacles against making a great success.

In the later sections the outcomes are described from different levels’ perspectives.

6.2 Object level

The SRDU-house itself was an impressive sight to the present stakeholders on the day of inauguration. Four years later, some visible technical failures showed up. Compare the condition of the first SRDU on the day of inauguration (fig. 22) and 4 years later (fig. 23).
Figure 22. The very first SRDU (the only rectangular unit). Photo taken in December 2011.

Figure 23. The first SRDU, the same house as in figure 22. Paint has fallen off and the bamboo roofing starts to fragment. Photos taken in March 2016.
6.2.1 Technical failures of the first units
The present dilapidated condition of the units in Gubrie (March 2016) is not contributing to inspiration for local villagers to implement the idea of building houses like the SRDU.

- Too little bamboo in the roof structure of the first unit allowed deformations from wind loads. Wind has also been deforming the roofs of all finished units (Gubrie, Agena and TVET unit).
- Ground movements were creating cracks in the bottom of the walls of the first unit. For the other units, a bottom ring beam was constructed, and thereby this phenomenon was avoided.
- The paint has been falling off in the first unit, because proper paint was not used.
- The roof for the cattle shed blew off, on the second unit.
- The roof structure is not tight in the first and second unit; the outer bamboo leaves are torn, leaving holes. From the inside it is possible to see small light spots, through both the ceiling and the outer roof.

In addition to the technical issues, other aspects of the current state give a bad representation of an otherwise attractive housing. Due to lack of maintenance, all spaces were covered by dust. Grass had started to grow in the biogas station, and indoors cobwebs covered most of the ceiling and many corners.

I don’t know if it looks older because of the failures of the project or if it is due to the negligence of taking care.

Human Resource Development Officer at TVET Wolkite

6.3 Implementation level
The implementation level deals with the strategies used for diffusing an innovation. During the SRDU-project, the strategies for spreading, up-scaling and out-scaling the SRDUs have changed. By up-scaling it is meant that the houses will be constructed in larger numbers, and out-scaling means that the concept will spread to other geographic regions apart from Guraghe zone. Three strategies have been identified and are described below: (1) teaching a limited number of local people as trainees; (2) teaching students at TVET Polytechnic College; (3) sponsoring a few buildings for families to use.

In interviews and conversations, these different strategies for up-scaling were not defined; rather, only one strategy was talked about in each interview or conversation, as the only strategy. In conversation with TVET Polytechnic College, strategy (2) was talked about as the way the SRDUs are to be disseminated, and as though it had been the only way. In conversation with EiABC, the historical events were discussed, but there has not been a clear statement that these events were actually huge changes of strategy. Both EiABC and other stakeholders, such as the Bete-Guraghe Cultural Centre, have been combining strategies (1) and (2) when discussing up-scaling.

In fact, the three ways of up-scaling are very different. To understand this, it is important to know that in rural settings houses have traditionally not been built with employed labour, nor
by the family itself. The whole community has been involved, and the family whose house is being built provides food for the community labourers during the time of construction. The less time the house takes to construct, the cheaper it is for the family to provide food for the workers. Nowadays, however, labourers are sometimes hired, by locals who have the financial capacity, and the more society changes (e.g. with people having employment and new expectations), the more likely it is for the traditional way of obtaining labour to fade away.

6.3.1 Farmers from different districts as trainees
When the SRDU-project was first initiated, the idea was to train and teach one person from each Woreda (district) in the Guraghe zone, about how to construct the SRDU. The intention was for them to go back to their Woredas as a resource person and to teach this technique. The people who were chosen did not have a formal education, but did have some construction experience. Most of them were farmers.

Furthermore, the plan was that when the trainee went back to his Woreda, labour would be obtained in the traditional way, with unpaid workers from the community, whom the resource person would guide. In this way, the cost would remain low, and the materials cost would be cheap due to the availability of local materials.

However, it turned out that the 13 trainees expected to be paid to do the training. They did not see it as a free education but as an effort and work. Furthermore, after finishing the training, they expected the EiABC to provide jobs.

6.3.2 Training workers at TVET Polytechnic College
The EiABC concluded that in order to achieve sustainability for the project, another strategy had to be used. This would involve TVET, the polytechnic college (see stakeholder description in chap. 4.7.6). The TVET students would learn how to construct the house and build them in rural areas. TVET graduates are not farmers and their interest is to work as contractors. They do not have an interest in teaching rural farmers for free, but want employment and job opportunities. In the view of TVET, this strategy was a sustainable and good way of up-scaling. What was not clear was how the local farmers would have the economic capacity to pay hired TVET students to build their houses. The labour cost is high compared to the traditional way of constructing houses through community cooperation.

The Human Resource Development Officer at TVET Wolkite, Fita Ayalew, has been very enthusiastic about the project and the benefits it has for TVET. As noted in the stakeholder description, he believed that this would be a huge opportunity for TVET’s graduates to obtain jobs. After the question (Interview no. 9) about the farmer’s financial situation, he agrees that it is a little bit expensive for them to hire professional workers. The next question was: “Or was the idea that the TVET graduates would be employed as experts and guide the local farmers, so that the labour costs wouldn’t be so high for them?” To this he agrees, but during all interviews (TVET, EiABC, Bete-Guraghe Cultural Centre) the involvement of the TVET graduate was explained in a way that they would get opportunities to build the house, not to direct others on how to do it.
6.3.3 Sponsoring sample buildings for a few families

The third strategy was applied to the houses under construction in Wita, the village outside Butajira. Four houses were in the process of being constructed with the financial support of Arthur Waser Stiftung. The families were chosen based on their current living standard, their income and amount of children. It was done in cooperation with the farmers’ association (see stakeholder description in chap. 4.7.11), in order for it to be sustainable; also, the benefited families were to pay parts of the costs to the Farmers’ association. The amount was for the Farmers’ association to choose, and was not yet specified, although the houses were under construction.

The construction work itself is done by hired workers: a majority are locally employed from the village, but others come from other parts of the country with the specializations of bamboo and masonry work. The benefited families have to participate and learn during the construction. This project is viewed as continuous research, to see how people relate to the house and how the technical and design aspects of the house can be improved later on.

6.3.4 Opinions about the three strategies

The opinions about the strategies are divided. An interviewed graduate from TVET clearly expressed the need for professional skills. The general manager of Bete-Guraghe Cultural Centre approved of the second strategy (educating TVET students), but later on also saw the problem of local people not being able to afford to hire them.

Professionals are needed to build these houses. There are parts of the house that need professional attendance like the roofing system and the masonry.

TVET graduate

So the fact that there is an institute [TVET] that will take over the project is a good thing. And since the students are energetic, they want to earn money, they want to create jobs, so strengthening the TVET is a very good thing.

(...) I think there is a high chance that the young graduates from the college will have a great opportunity to work, but the problem is whether or not the villagers will hire them; is it economical for them to hire someone, are they capable of doing so?

General Manager of Bete-Guraghe Cultural Centre

6.4 Organizational level

6.4.1 Stakeholders’ attitudes

The opinions of stakeholders’ have been very positive. Below, the most central ones from key stakeholders are given. These are important as they show the positive foundation for the project’s success.

The SRDU-project contributes to the improvement of rural housing in Ethiopia. It gives a higher standard of living and is sustainable in environmental impact, economy and with social sustainability.

Member of the core research team, EiABC
It created many job opportunities such as when they went to buy the bamboos, it became another opportunity to create business. So if the project continues to grow it will have an impact not only on the houses but also by creating job opportunities for the people.

General Manager of Bete-Guraghe Cultural Centre

The positive part about the bamboo is that it really decreases the deforestation, and how we’re going to decrease the deforestation is by using our own soils. This really decreases the actual use of wood. This is what we were told during the training.

TVET graduate

As I’ve said it’s a very very nice project. (...) Even if they [the houses] started in here [Gubrie/Wolkite], they can be modified; they can be adapted to other regions also. (...) Every region, based on its cultural interests, can adapt it. That is our aim.

Human Resource Development Officer at TVET Wolkite

6.4.2 Low involvement of Wolkite University

When the project grew to include up-scaling, the discussion among EiABC, Bete-Guraghe Cultural Centre, Guraghe Zone Administration and TVET Polytechnic College led to an invitation for Wolkite University to join.

We realized that major stakeholders were necessary for this project, we [EiABC, Bete-Guraghe Cultural Centre, Guraghe Zone Administration and TVET] came to a general consensus that Wolkite University should join because the EiABC can’t always monitor the growth of the project by going all the way there. Another body should take over, so we decided on Wolkite University.

General Manager of Bete-Guraghe Cultural Centre

As is explained in chap. 4.7.5, the idea was to do research on continuous improvement, to do correction work, to supervise the project, and to work with the community. But the level of involvement by Wolkite University was much lower than anyone had expected.

But finally, their [Wolkite University’s] involvement was not as we had assumed, as the project assumed. They would not participate even at the meetings.

Human Resource Development Officer at TVET Wolkite

Practically they are not doing anything connected to the project right now. The research work is covered by the EiABC.

Member of the core research team, EiABC

The main reason behind this is probably that Wolkite University is a new university. It is not more than five years old and there have been management changes from time to time. A lot of people would leave the post only after some months, and other people would replace them. At this stage, March 2016, almost all the members of the management staff who were involved in the initial meetings have been replaced with new ones.

From the EiABC side, the hope was that Wolkite University would take over the responsibilities of facilitating the project, and communication with TVET, Guraghe Zone Administration and
Bete-Guraghe Cultural Centre. This would also include future improvement of the units and research about this. None of these tasks was done by Wolkite University.

*In reality this university did not take part in the SRDU-project more than taking over the ownership of the two first units in Gubrie, and being invited to meetings where they often failed to join.*

Member of the core research team, EiABC

There are still hopes that the university will take a larger part. Human Resource Development Officer at TVET Wolkite says:

*Fortunately, from now onwards they can be involved because the president of this college [TVET Polytechnic College] is now transferred to be the vice president of Wolkite University. He wants to see the project realized.*

Human Resource Development Officer at TVET Wolkite

### 6.4.3 Empty Gubrie units

The intention for the two test units was that they would be used. But this did not take place. One of the reasons is that they are not suitable for farmers, since the land provided for the units is too small. Cattle and farming need larger space. If it would have been an urban setting the houses themselves would have been enough, but for rural use more land is required.

Some attempts were made to get the houses to be used. A man owning a shop close by was offered to live in one house. However, he had additional demands to use land outside the compound for agriculture. Two cows were offered to him, but the shop owner still had the land-use demand. Another man from Agena was interested in using the houses for living, but was stopped by the Bete-Guraghe Cultural Centre due to an issue of personal reputation. An employee at Wolkite University was also interested in using the houses and wanted to start a small cafeteria. But this never came to be. As nobody has maintained the houses their condition has fallen, as is described in chap. 6.2. Now they are owned by Wolkite University but the land belongs to Bete-Guraghe Cultural Centre. Wolkite University are the ones to decide if anyone (and in such case who) will be allowed to live in the houses.

### 6.4.4 No community demand

Originally it was thought that the project would create a lot of work opportunities, through both the first strategy and the second. About the first strategy, Tesfaye Goite, General Manager of Bete-Guraghe Cultural Centre, says:

*So they [the 13 trainees] went back and this is a knowledge transfer and as well as job opportunity. (...) They were given materials such as concrete block machines which in turn created for them job opportunities.*

General Manager of Bete-Guraghe Cultural Centre

The expectations for the dissemination of the SRDU were very high.

*I don't think that the two houses built in Gubrie are enough, there need to be more; it's going slower than we expected.*

General Manager of Bete-Guraghe Cultural Centre
In the second strategy, the vision was that TVET graduates would get a lot of work opportunities in rural areas. In reality, the relation between supply and demand was not balanced. There was no demand from society, because the local farmers had not seen the house and could not evaluate it.

The EiABC had expected the 13 trainees, and later the TVET graduates, to start a business themselves for constructing the houses. However, one TVET graduate expressed:

*And since the training they [EiABC] didn’t put in any jobs that related to the houses.*

TVET graduate

The community demand was not there, and that was something that many stakeholders had taken for granted: that local people would like to obtain this type of house when they heard of it and its benefits.

### 6.4.5 Weak communication between stakeholders

The interviews have shown that the communication between the stakeholders was weak at times. During the interview with TVET in Wolkite, it turned out that they were not informed about what the present status of the project was in Wita (project site no. 4), nor about how the construction was financed. There were indications that there is a tense relationship between EiABC and TVET due to a past misunderstanding about who would pay for what in the construction of the TVET unit.

There have also been different views on what the project’s aim was. From TVET’s side, the main aim of the project is to create a market demand for SRDUs and working opportunities for their students. This conflicts with the aim of making the house very affordable for farmers.

When EiABC focused on the SRDU as a third, “middle” alternative type of house, they meant that the traditional house type can be improved and renewed into a modern form. But TVET interpreted this middle way in an economical sense:

> 150 000 ETB (Ethiopian Birr) is the general cost for a traditional house. And there are semi-modern houses just constructed out of the corrugated sheet of iron. They were around 200 000 [ETB]. So the difference, what they were planning was to make an average of these two. Which means around 180 or 170 [thousand ETB]. But when you finally calculate the [cost of the] construction of this house: until now it cost us more than 350 000 [ETB]. So it is almost more than double. And to finish the house it will add [i.e. sum] up to 400 000 [ETB].

**Human Resource Development Officer at TVET Wolkite**

Further on, TVET graduates felt betrayed by EiABC and TVET, because they were expecting job offers and employment. Both EiABC and TVET had expected the job opportunities to come naturally and also through the efforts of the TVET graduates and 13 trainees, but this was not communicated well enough, apparently.

*They [EiABC] train us and then they leave. The ones that have been trained are not working on it [the new houses in Wita]. And when we try to participate they don’t let us.*

TVET graduate
A comment on this argument, from the present project coordinator in Wita, is that the TVET graduates have demanded double the salary of what other workers are willing to be paid. He therefore employs untrained workers.

EiABC concluded that other involved parties’ expectations of EiABC had apparently been too high. EiABC had expected all stakeholders to do their part. One member from the core research team, who has been present throughout the project development, says:

*One of the weaknesses from EiABC side was that we did our part and simply assumed that the other stakeholders would do their part. TVET is still waiting for EiABC to offer training, but they can open a new department themselves without EiABC. The Ministry of Education expects all TVETs to open a local competence department. TVET is waiting for the project to continue with EiABC leadership instead of taking over the project and continuing it as a local competence department for the college. For Wolkite University’s part, the house was transferred to them but they consider it simply as a facility and not a research project that can be continued. The Guraghe Zone Administration including the Woredas—they should have introduced the trainees to the community as graduates and new entrepreneurs with this skill. The trainees are graduated but still wait for guidance from us.*

Member of the core research team, EiABC

### 6.4.6 Focus on short-term benefits

When the SRDU-project was launched in Gubrie (project site 1), local people wanted to make profits by raising the water costs. This seemed to be a common reaction when workers from international non-governmental organisations did projects in a rural area. However, at a meeting with Guraghe Zone Administration and Bete-Guraghe Cultural Centre, local people were informed that this project was for their own benefit and should not be taken advantage of. One member from the core research team concludes in general terms:

*There are so many aid organisations that are working in rural areas, so when there is a new project the local people rather focus on the short-term gain than the long-term gain and impact.*

Member of the core research team, EiABC

A similar event happened with the local administrator from Bete-Guraghe Cultural Centre, who was supposed to guide and accompany people from EiABC when visiting the Guraghe site. He got a regular salary from Bete-Guraghe Cultural Centre, but despite that he expected contributions from EiABC.

The 13 trainees who were given the training of constructing the SRDU were expected to see this as a free educational gift and opportunity to make a living from the skills they gained. However, the trainees on the contrary expected to get paid a professional worker’s salary.

### 6.5 User level

#### 6.5.1 Attitudes towards SRDU

Local people’s attitudes have been mixed. In Wita (where the houses were under construction), the main attitudes were very positive. They saw the benefits of using local material, and that
termites would not destroy the house. But there were also suspicions about both the bamboo roof and the earth walls. People were afraid that the earth walls would not withstand the rainy seasons, and that bamboo will not be strong enough.

In Agena, only an SRDU that was initiated by a private family was constructed. This family paid labourers (some of the educated trainees) to build it. However, they live in Addis Ababa and only use the house occasionally, so it stands empty most of the time. A neighbour who lives close by initially expressed her positive attitudes to the SRDU. But during the interview other opinions showed up. She was asked which house she prefers to live in: the SRDU, a traditional house or a modern house with iron sheet roof. She answered: either traditional or modern, but not an SRDU.

\[
As \ you \ can \ see \ from \ inside \ [the \ SRDU], \ the \ wind \ has \ affected \ it \ a \ little \ bit. \ It \ has \ started \ to 
deform. \ The \ other \ fact, \ and \ you \ are \ not \ seeing \ it \ since \ the \ house \ has \ been \ cleaned, \ but \ the 
\textit{bamboo ceiling keeps falling apart and substances keep falling. It's ruining the furniture}. 
\]

Neighbouring woman to the Agena unit

The woman also expressed her fears about how water might damage the Adobe blocks. “\textit{What if accidently I drop some water on it?}”, she asked. To the question of why she thinks the SRDU or similar building techniques have not spread in the area, she claims that nobody knows how to build with that technique.

In Gubrie, where the first units were constructed, people have experience of how the houses’ conditions have changed over time. This has led to a negative attitude toward the house, in regard to durability. They do not think that the bamboo roof is a material that is durable enough to be used for their own future houses. However, apart from that most people were positive to the houses. They saw the advantage of the indoor climate, and said that if bamboo was grown and they had the training for it, they would build their own houses like the SRDU (the second unit).

In addition to interviews about SRDUs, a small survey was made about which attributes of a house the local people in Gubrie thought were most important. Out of 9 attributes they were to choose the three most important ones. The result was as follows:
Table 6. Answers to the question “Among these 9 attributes of a house, which three are the most important ones according to you?”. This question was asked to 8 local people in Gubrie (project site no. 1), where the two first units have been constructed.

<table>
<thead>
<tr>
<th>Attribute of the house:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Chosen attribute in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is large</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 %</td>
</tr>
<tr>
<td>Has a fridge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 %</td>
</tr>
<tr>
<td>Has water access</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>100 %</td>
</tr>
<tr>
<td>Has a TV</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13 %</td>
</tr>
<tr>
<td>Is fire proof</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13 %</td>
</tr>
<tr>
<td>Has good indoor climate*</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13 %</td>
</tr>
<tr>
<td>Is long-lasting</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>38 %</td>
</tr>
<tr>
<td>Has lighting</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>100 %</td>
</tr>
<tr>
<td>That cultural values are preserved</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25 %</td>
</tr>
</tbody>
</table>

*By good indoor climate the explanation was given “that it keeps cold during daytime and is warm during night”

6.5.2 Local people’s attitudes according to other stakeholders

According to other stakeholders, attitudes have only been positive. There is a gap between the locals’ attitudes and what the other stakeholders think are the locals’ attitudes. Nobody from the other stakeholders has asked the local people specifically. Instead they have trusted the opinions of the elders and Bete-Guraghe Cultural Centre as being representative. The interviews clearly show that the elders’ and Bete-Guraghe Cultural Centre’s interests and views regarding SRDU do not equate with the interests and views of the local people. The General Manager of Bete-Guraghe Cultural Centre explains how happy the locals were when the house was being built:

The attitude of the people while the houses were being built was amazing.

General Manager of Bete-Guraghe Cultural Centre

When talking about the locals’ attitudes today, he describes the positive attitudes again and the gratitude they have about the difference it brings to their current condition. The Human Resource Development Officer at TVET Wolkite was also assured of the locals’ positive opinion:
It is totally accepted because almost every cultural value is maintained. (…) This house [SRDU] is the best one: It includes all they need in one house, and at the same time it is more durable. And the project assumed it also to be less expensive. They [the local community] accepted it and we appreciate that.

Human Resource Development Officer at TVET Wolkite

6.6 Present state of SRDU-project according to different stakeholders

In this part, a summary of different stakeholders’ views of the present state (March 2016) of the SRDU-project is given. Furthermore, their views on SRDUs’ problems, and on solutions to these problems, are presented.

- EiABC had expected the project to be self-continuing, and that continuous improvement and research would be done with the leadership of Wolkite University. EiABC also expected only to take part in the architectural and technical aspects. They expected community demand, job opportunities, and growing of bamboo to evolve naturally, through inspiration by involved parties.
- From the local farmers’ perspective, the problems include: the technical failures of the house (wind deformation on the roof, falling-off paint, cracks in the walls and fragmenting bamboo-roof), the inaccessibility of the materials, and the cost for hiring skilled labourers. However, many have expressed a positive attitude to the houses if bamboo plants would be provided.
- Bete-Guraghe Cultural Centre concluded that the project’s stakeholders do not have clearly defined roles, and that the solution to the present situation of standing still would be to sit down all together and talk it through. They also want Wolkite University to start cultivating bamboo plants, so that bamboo will be accessible for the farmers, who can then start building their own houses.
- Guraghe Zone Administration was waiting for the project to diffuse through the training of TVET students and the supervision of EiABC.
- For Wolkite University’s part, nobody has taken responsibility for the project and since the university still is very new the employees change frequently and the regular tasks are still in an early stage. Therefore, nobody was found for an interview, and their view of the project’s present state is described based on the analysis of the author.
- TVET Wolkite believed that the only problem was that the house was too expensive to build, and that the solution was to find a way to minimize the cost. They were also very focused on the importance of creating a curriculum for SRDU-construction, believing that hereby the project would certainly make progress. TVET graduates believed that the project has failed to fulfil promises: the jobs that were promised were not there, and so their skills are neglected. This should be solved by their being employed where SRDUs were then under construction, as well as in future construction.
- The regional state has been invited to inaugurations and meetings but not shown up. Most likely, the regional state expects the project to be organized and facilitated without their cooperation.
- The government has promoted the SRDU-project as a good example of future rural housing. Their involvement and initiatives have stopped for now.
• ETH Global saw success in the project when it was presented in Switzerland (Nov. 2011), and they wished it to remain successful, as they are involved with the construction of the units in Wita.

• Arthur Waser Stiftung, like ETH Global, only saw benefits of the project and success, and expected positive results to be reported.

• The farmers’ association in Wita were positive to the initiative (as no representative from the association has been interviewed, these are assumptions from the author). It is unclear how they will take a leading role in continuing the project, once EiABC, ETH Global and Arthur Waser Stiftung leave the project site.
7 Analysis

7.1 Analysis of attributes of SRDUs affecting the rate of adoption

7.1.1 Relative advantage
The relative advantage of SRDU can be argued to be both high and low. According to the comparison in chap. 4.4, the SRDUs give a huge amount of relative advantage. In 11 areas (materials, techniques, foundation, floors, spatial division, fire resistance, resistance to pests, sanitary possibility, interior designs, environmental impact and energy generation) it is the more preferable alternative to at least one of the other current housing alternatives. It is still unclear what advantage the SRDU has in social terms (e.g. what social status it gives the user): this can only be found out after continuation of the project.

The relative advantage is also to be evaluated in view of the costs to build the SRDU. With hired labour, the relative advantage of SRDU was very low. It was very expensive compared to both the traditional and modern houses. Even if this would be a more economical alternative considering longer-term cost, the initial cost is too high for the average farmer. This topic was raised by many local people in Guraghe themselves (Interview 1-3; 14-17).

We see that there is a great advantage for SRDUs, but also a disadvantage via the high cost for the farmer. This thesis concludes that SRDUs must still be considered as giving much relative advantage, based on the chart in fig. 24 on p. 52.

7.1.2 Compatibility
Compatibility is defined as the fit with adopters’ needs, in connection to cultural values (explained in chap. 2.3.2). The SRDU-project has, since its initiation, been focused on cultural values, the project’s hallmark. EiABC and other stakeholders (see chap. 4.7 and 6.5.2) have agreed about the importance of designing the new house based on traditional architecture. What contradicts this view are the results from the small survey in Gubrie (project site no. 1). The local people there did not value the traditional look of a house as being as important as the practical attributes related to lighting and water. The SRDU is designed for the installation of water pipes, and for lighting to be provided from the biogas system. There is a difference between tradition and culture, and the present culture of the Guraghe community may not be prioritising tradition.

The reasons for valuing lighting so highly need to be investigated further. The SRDU-project is not planned for the use of computers and internet, and if lighting is a chosen attribute due to a desire for “catching up” with urban standards, or a desire for electricity to charge electronic items, the compatibility’s SRDU’s is less. A key to understanding the compatibility of SRDUs with the Guraghe community is to investigate their wishes for the future.

7.1.3 Complexity
Due to the many innovations which are combined in the SRDU, the house must be considered complex. The Adobe technique itself is relatively simple and easy to use, and so is the idea of dividing living space into separate units. But the bamboo roof technique, the biogas system, the upper floor, the vault and the casting of a reinforced concrete foundation were aspects that were
perceived as highly complex. Especially the bamboo roof was a topic that locals, independently of each other, regarded as so complex that they would not learn to do it themselves.

### 7.1.4 Trialability

The SRDUs have been tried out to various extents. Generally, it can be said that the SRDUs require time to be tried out; they have to be used in order to be evaluated. This has failed for the two first units in Gubrie (project site no. 1) (see results in chap. 6.2). For project site no. 2 in Agena, the SRDU has been used relatively little, as nobody used it as a permanent dwelling unit. The TVET unit (project site no. 3) has not been used and not even finished because of its exceeding the budget. Finally, Wita (project site no. 4) with its 4 SRDUs, can be predicted to have SRDUs that will be both used and tried out very well. But it is likely to take time: one local farmer in Wita said that he will wait for at least two years of trial before he will consider building an SRDU for himself, and this is for him to evaluate the durability of the house and to weigh the risks against the benefits.

New building techniques for houses are innovations that by their nature should be considered to demand a long period of trial. If the life-span of a house is estimated to be for instance 50 years, then potential adopters are likely to require more than a few years to be convinced.

### 7.1.5 Observability

The SRDUs are very observable when placed centrally where people live. At Gubrie (project site no. 1), they are placed 200 m from the closest settlement of local people. In Agena, it is placed in a rural setting, with few houses in the neighbourhood, and approximately 5 km to the small village Agena. In Wita (project site no. 4), the houses are considered very visible to the neighbourhood. The Ethiopian culture of visiting friends and relatives should play a big part in how observable new innovations will be. Once SRDUs are used and proven to be good, the word is likely to be spread easily in local neighbourhoods.

### 7.1.6 Summary of innovation attributes

Based on the questions presented in chapter 2.3.6 and the analysis in the above sub-chapters, SRDU is placed according to fig. 24 on the following page.
7.2 Adopter categories

The adopter categories that Rogers describes in *Diffusion of Innovations* (2003) are relevant, to some extent, to the SRDU-project. The private family in Agena is an obvious “innovator”. A venturous character is displayed, alongside a special interest in the new idea and a larger “opportunity mind-set” than the rest of the population. Of course, that family also had a clearly higher financial strength than average locals, which made it possible to build the SRDU.

The next group of adopters in Agena, according to Roger’s theory, would be the early adopters, who never came to be. One reason could be, as the neighbour to the SRDU in Agena says, that people around do not have the knowledge or skills to construct an SRDU. But it could also depend on other reasons that interviewee expressed: that the SRDU unit is easily affected by wind, that small fractions of bamboo regularly are falling down from the ceiling, and that there is a suspicion of how water resistant Adobe blocks really are.

The project sites nos. 1, 3 and 4 are harder to fit into the diffusion pattern that Rogers describes. The SRDUs there were not constructed on the initiative of an innovator. The SRDUs in Gubrie and at the TVET compound (site no. 1 and no. 3, respectively) were constructed for demonstration, training and to test the construction on a 1:1 scale.

The SRDUs in Wita (project site no. 4) are only partly built from local innovators’ initiatives. They have applied for SRDUs to be built on their compounds, but the real rate of adoption will be judged by whether, after the completion, there will be any early adopters.
7.3 Radical and incremental innovations

In chapter 2.5, radical and incremental innovations were described. If the SRDU is analysed as one concept, it is clearly a radical innovation. In line with Nelson and Winter’s (1997) definition, clearly the SRDU-project has created a new way of understanding the phenomena of rural housing and of how to solve it in an environmentally, economically and socially sustainable way.

As has been described in chapter 4.4, the SRDUs consist of several different innovations. Some of them may not be considered radical innovations, for example the spatial division, the inner designs, and the Adobe-block technique, which historically has been used commonly in other parts of the country (see diffusion analysis by Petersson and Ström, 2015). Separately, some of the innovations in SRDU can therefore be considered to be of incremental nature. But on the whole, the SRDU is classified as a radical innovation, and this is likely the reason for the huge success it was judged to be (according to the thesis data) by Bete-Guraghe Cultural Center, TVET Polytechnic College, and EiABC, and (from second-hand information) by the government, ETH Global, Arthur Waser Stiftung, and Guraghe Zone Administration.

7.4 Stakeholder management

The stakeholder management may be a central reason for a small diffusion. As Olander & Landin (2008) claim, the stakeholders of a project want to influence its development in line with their own interests. This is clearly visible in the SRDU-project. TVET Technical College wished to develop a national curriculum for SRDU houses, and Bete-Guraghe Cultural Center wished to preserve the cultural identity. These are just two examples of interests which may stand against the local user’s interest in affordable housing combined with modernity. This complexity of stakeholder interests with SRDU, and the outcomes to date of the project, are supportive of the view Widén et al. (2016) take, that there is a clear connection between a successful diffusion outcome and a high stakeholder interaction.

In the SRDU-project, all stakeholders have not been listed and the separate interests have not been specified. The stakeholders have not been analysed using any check-lists, as Atkin (1999) suggests, or using Stakeholder index impact (Olander, 2007).

A proposed mapping according to level of power and interest of the SRDU-project’s stakeholders, according to Johnson and Scholes (1999), is done in fig. 25 on the following page. The matrix shows in rough terms the main stakeholders’ power and level of interest (based on their interests as presented in chap. 4.7).
Figure 25. Proposed mapping of stakeholders of the SRDU-project, based on the level of interest (x-axis) and the power of decision-making (y-axis). The numbering is taken from chap. 4.7: 1. EiABC, 2. Local people in Guraghe, 3. Bete-Guraghe Cultural Center, 4. Guraghe Zone Administration, 5. Wolkite University, 6. TVET Polytechnic College, 7. Regional State, 8. Government, 9. ETH Global, 10. Arthur Waser Stiftung, and 11. Farmers’ association in Wita. Figure made by Signe Nilsson from the model in Johnson and Scholes (1999).

7.5 Related case studies

The case studies explained in Hjort and Widén (2015) are highly relevant for the SRDU-project: they are cases of diffusion of the Adobe technology, and SRDU includes some extra components. If many of the Adobe-technique projects failed to diffuse, it would be relevant to analyse reasons for the failures, before projecting SRDU to become a success.

In one of the case studies, the initiative is described as being very successful due to a strong champion, a lot of people being involved, people being trained to build Adobe houses, and the construction technique having been proved to work. In the SRDU-project, the strong champion was missing, and although many people were involved, they were only at an organizational level, with not many people from the local community. Also, although people were trained to build the SRDU, the responsibility was perhaps overwhelming, as they individually were to represent their district. Furthermore, in the area where the prototype buildings (project site no. 1) were constructed, there were no local people trained. Finally, the SRDU was not proved to work, since a period of trial was not given before up-scaling, and the prototype units at project site no. 1 were discouraging. When the SRDU-project is to be compared with this successful case of diffusing the Adobe technique, it is not surprising that SRDU did not diffuse at a fast speed. On the contrary, it appears as an expected result that it would not spread at all.

Four of the case studies describe unsuccessful diffusion of the Adobe technique. This was attributed to several factors: (1) No one was championing the technique; (2) There was no
market, and people did not see the use in leaving something known and safe, (3) Some key stakeholders were not convinced of the Adobe technique’s benefits, and hence neither were the people convinced; and finally, (4) A cultural and historical stigma related to clay as being of low status hindered the diffusion. Reasons (1) and (2) are identifiable in the SRDU-project, and reason (4) can be identified to some extent in interviews with some people in Wita, although it did not seem to be a major obstacle.

It is noticeable that the SRDU-project, compared with some of the other case studies, was lacking a strong champion, which, along with a market need, was a key element of success for the Adobe technique in the case study of a success. It can be argued that the SRDU would have had greater success if it had been championed better.

Other connections can be drawn between the SRDU and related case studies. In one case, demonstration buildings contributed to success, it showed the Adobe technique to work. In the SRDU-project, the opposite was almost the case. The demonstration buildings in Gubrie (project site no. 1) showed the house not to work (results chap. 6.2 and locals’ attitudes chap. 6.5.1).

The three factors identified for why demonstration buildings with the Adobe technique (Hjort & Widén, 2016) did not succeed can be found in the SRDU-project as well. The three factors were: (1) Lack of clear relative advantage compared to traditional building technology; (2) Lack of a champion who, by using the demonstration buildings, promotes the technology, giving the message to the society that the technology is trustworthy; (3) Lack of continuity in the demonstration efforts. The first factor is analysed and discussed in chapter 7.1.1 and 8.1.1. The second and third factor, lack of a champion and lack of continuity, are also found in SRDU. The demonstration buildings were not used and the continuity was unsuccessful (see chap. 6.4.2 - 6.4.6).
8 Discussion

The discussion will, in its first part, follow the structure of the analysis in chapter 7. The second part discusses results. The discussion aims to generate ideas about how the SRDUs could have been diffused better, with a higher rate of adoption. Likewise, it discusses how the SRDU-project, if the organisation and communication were performed in another way, could itself have become more successful. Finally, there is a discussion about the future for the SRDU-project and rural housing in Ethiopia in general.

8.1 Discussion of the attributes of SRDU

8.1.1 Relative advantage

The relative advantage that the SRDU provides compared to the current housing situation (the cost being excluded), is more than clear. In all aspects described in chapter 4.4, its benefits and advantages over either the traditional houses or the modern ones, or both, are clear. The SRDU’s advantages might have been what made all stakeholders relaxed and sure about its future success. It seems that the clear advantages made the stakeholders too sure of a success story. If the advantages had not been as obvious, the project might even have had a greater chance of becoming successful, if it had led to a more active focus on aspects like those that follow below.

8.1.2 Compatibility

The compatibility of the SRDU is both high and low. It is high in the regard that cultural values were a central point from the beginning, but might have been mistaken for traditional values. It is low in the regard that local people in Gubrie did not prioritize these values according to table 6 on p. 47.

It seems that there has been some kind of misunderstanding about what the cultural values consist of, and about what the local people’s needs and wishes are. When the SRDU-project entered its third phase, the core research team at EiABC had the intention to let sociologists accomplish a survey on social aspects (see timeline April 2012). This survey would have given feedback on social and cultural conditions and provided information on how to improve the house design. Unfortunaly, this survey never came to be. Probably this was a major mistake, and if the survey would have been done the focus group’s needs and wishes would have been much clearer. One question that has arisen and increased in importance during the researching of the present thesis is whether the local people were well enough represented. They were represented during the initial visits by teams from EiABC, when designing the model house, but then only by elders and Bete-Guraghe Cultural Center. The elders and Bete-Guraghe Cultural Center were seen by EiABC, Guraghe Zone Administration and TVET Polytechnic College as fully representing the Guraghe community. However, it can be argued that both of these groups are relatively conservative by nature. Their interests lie in preserving the Guraghe culture and conserving traditional values. This is not necessarily what the local people wish for their future. Based on the interviews in Gubrie (project site no. 1), people valued traditional architecture highly, but modernity possibly even higher. Further research is needed before finalising conclusions about the local people’s preferences, but the representation by elders and Bete-Guraghe Cultural Center alone must be questioned.
The technical improvement of the SRDU is also a relevant topic of discussion within the area of compatibility. Two questions are whether bamboo roofing is at all a future technique for the Gurage people, and whether biogas will be a future energy generator for rural Ethiopia. The bamboo roof shows signs of weakness to weather and wind after some time. The prototype houses in Gubrie were not older than five years; in that period of time the deformation/deflection and loss of resistance to rain and termites should not turn the houses into the state they are in today (March 2016). The houses in Wita (project site no. 4), have doubled the number of bamboo beams for the roof, and time will tell if this will prevent the deformation. If the maintenance need is the same for a bamboo roof as for a grass roof, then it is doubtful that potential adopters will choose bamboo as roof material, especially when the other option that rural farmers have is corrugated iron sheets, which are free from maintenance for a considerably longer time.

The biogas system is, from western and urban perspectives, a good option. But, the question is whether if it will be sufficient for future needs. Biogas is sufficient for lighting but not for running electrical items, e.g. computers. It is also unsure whether it will work very well, because for a biogas energy system to work, the need for water flow is high. This might not be guaranteed during the dry seasons.

8.1.3 Complexity
The design of the SRDU was advanced, as analysed in chapter 7.1.3. It can be argued that the SRDU would have been more successful if it had been simpler. This was asked during the interviews in Gubrie (project site no. 1), and discussed with some stakeholders. Some felt that the complexity gave the project extra status and showed the capacity, but at the same time some others felt that it was too complex. One idea would be to make the prototype houses complex, but then also make some demonstration houses in a simpler way. The trainees could have been taught to build the simpler house version, and then innovators, with a little bit of construction skill, would be able to build houses for themselves.

8.1.4 Trialability
The up-scaling was very fast. The decision for up-scaling the project and building a lot of SRDUs was made before local people had been using the house for living. When a research and development project for a new, standard-model house is on-going, one can argue for letting people use these houses to live in, before up-scaling is planned. What this thesis argues ought to have been done is to let families live in the houses and to evaluate the results before starting the third phase (up-scaling). Houses are normally very hard to try out, because the time required is very long. Therefore, it is even more important to close the research circle fully, before starting the up-scaling phase. The user’s opinions must be fully investigated, but were not in the SRDU-project, because there was nobody using the first units. If that had been done, the designers would know that the bamboo ceiling deposits bamboo flakes as dust on the furniture, and that the doors do not close well enough (Interview no. 12). For similar projects in the future, it is important to make sure that the house/innovation is tried out as much as possible, before up-scaling.

The environmental aspects also become relevant here in the trialability part. Due to the local building materials, the SRDUs are very environmentally friendly, which was one of the main
objectives. The bamboo would be grown locally, and the earth blocks would be sun-dried locally. Transport would not be needed, other than for the concrete and reinforcement for the foundation. However, for the house to be proved environmental friendly, an investigation period is needed. The bamboo is treated with termite-resistant products, and their environmental impact has not been investigated fully. The products must be tested, and time must tell the environmental impact.

8.1.5 Observability
The importance of maintaining the first units was underestimated. Local people got a bad impression, which made them judge the houses as not durable. For similar projects in the future, it is important to make sure that the demonstration houses are in very good condition.

8.2 Stakeholder management
A full stakeholder analysis was not performed in the SRDU-project. The stakeholders’ interests were not described, nor were the stakeholders mapped, with any of the methods described here, or with any other tools. If stakeholder mapping had been done, the success would probably have been much higher. Contradictory interests and strategies (see chap. 6.3) would have become clear. Furthermore, if the mapping of the stakeholders’ interactions with each other had been drawn (as in fig. 21 p. 27), it would probably have become clearer that EiABC was bearing a too-heavy role in mediating among a great number of stakeholders.

If the power/interest mapping (see fig. 25 on p. 54) had been done, greater focus would possibly have been given to the local people of Guraghe, the users. If the strategies for implementation of the SRDUs had been specified, including the different gains for different stakeholders, then a decision could perhaps have been made to either (1) focus on future work for TVET graduates, or (2) simplify the unit so that local farmers would have the capacity to build the houses themselves.

8.3 Lessons for the future, based on the SRDU-project
Lessons for the future based on the SRDU-project are discussed separately below, in brief. If the mistakes (no. 1-2 below) would not have occurred, the rate of adoption might have become higher.

1. A mapping, according to Rogers’ (2003) theory of innovation attributes, of the SRDU house would have anticipated risks of the project. A mapping of a type such as fig. 24 on p. 52 would have shown that the SRDU is a relatively complex innovation and will take time to try out. That knowledge might have prioritised users to try out the house before scaling up the project.
2. A mapping of the stakeholders’ interests and relations would probably have foreseen implementation strategies, and these could have been addressed. One such example is that “SRDU will be cheap for the farmers and create work opportunities for TVET at the same time”. TVET Polytechnic College has been in the process of developing a curriculum for students to construct SRDUs, this before the market need has become clear. A stakeholder mapping, again, might have foreseen this development. If the mapping had been done, it is also possible that EiABC could have avoided being put in the role of mediator among many stakeholders, which was never its intention.
The mapping would also have clarified the roles of stakeholders, and avoided unrealistic expectations. One example of this is that Bete-Guraghe Cultural Center, up to this day (March 2016), expects Wolkite University to grow bamboo plants for the locals in Gubrie. According to the stakeholder analysis in chap. 4.7.5, this is not an activity for an academic institution.

Further lessons for the future, apart from the above-mentioned aspects, have also been identified. They are described separately below, in brief.

3. In the SRDU-project, marketing was missing. The project is likely to have been more successful if marketing had been planned and carried out.

4. The continuing ownership of the SRDU-project was lacking. Initially, the ownership belonged to EiABC, but when it tried to transfer ownership to Wolkite University, it did not succeed (see results chap. 6.4.2 about Wolkite University). The ownership of a project is a foundation for its continuation.

5. Clear communication is better than ambiguous. In the SRDU-project, some visions were taken as promises. EiABC presented the visions for the SRDU-project for the 13 trainees and the TVET graduates, who were viewing sentences like “You will get a lot of work opportunities” as promises from EiABC. But EiABC meant these as visions. This can be a learning for the future, when similar processes are carried out.

6. The expectations of foreign organisations have been and still are (March 2016) very high, but the foreign organisations were only in communication with EiABC (see fig. 21 on p. 27). A question to be asked is whether it would have been better if the project were continued through the national government. If this would have happened, the number of stakeholders with different views would have been fewer, and perhaps also the ownership transfer would have been easier. If the project would have been financed by the government or regional state, it can be argued that the project would more likely have been continued. One hypothesis is that international donors’ tend to be more interested in single projects which give good results, while a government’s interests for rural development do not stop just because a project stops. This hypothesis might be challenged by some; it is based on my personal experiences of working in the field on a project basis, in different countries and organisations.

8.4 Future of the SRDU

Many of the problems in the discussions above, and many criticisms of the SRDU-project, are currently being corrected through the units that are under construction in Wita (project site no. 4). In Wita, the four SRDUs will be tried out fully, by many families, and the project will be visible to the whole village. The people who are making the blocks are local people, so if the users are impressed by the cheap and durable Adobe technique, there would already be locally available skills for making more blocks. Probably, the coming houses in Wita will not be like the other SRDUs, likely with corrugated iron sheet roofing, because bamboo is still not grown in the area. Even so, the population has received an alternative to present housing.
If the SRDU-project is to be continued after these 8 units, a fresh new start is suggested, with the previous mistakes in view and new optimism. This is because the SRDU is, in fact, a breakthrough in rural housing.

8.5 Suggestions for future research

Suggestions for future research include conducting a more systematic, deep investigation of local people’s needs, and their wishes for their future in rural Ethiopia. This is suggested to be performed with a wider perspective than on only housing. A question such as, “What would make you stay here?”, would be good to have answered and more deeply investigated, as urbanisation is rapid. It would be good to investigate further the prioritising of modern-looking houses versus the preservation of traditional architectural values, as the two values seem to be prioritized at the same time.

It would also be good to define different social groups in rural areas and their different wishes and needs. Surface answers might be that people in rural areas need a higher-standard house. But with a deeper social and anthropological investigation, the need might very soon be revealed to include also internet access; a possible change from being a farmers’ community into a trading community may develop in rural areas. If that would be the case, then the housing must be developed to meet those needs, and a cattle shed and biogas station (as in the SRDU) would not be optimal for that future. Preferably, this research would be performed by a sociologist, anthropologist, or someone in a similar field.

From an environmental perspective, the products boric acid and borax (different product names might be used in some circumstances), should be fully investigated. This would preferably be made by a biologist, environmental scientist, or from a similar field.

The durability of the SRDU from a structural point of view would be good to investigate more deeply. Deformation of the bamboo roof due to wind has taken place in all SRDUs except in Wita (project site no. 4), where they are currently under construction. Bamboo is a very light material, and according to the interviews for this thesis, the structural performance, including roof size, amount of rafters, and connection points, have been planned based on experience rather than calculations.

The option of switching from bamboo roof to corrugated iron sheets would provide benefits, if the products applied on the bamboo leaves is proved to be toxic, of not jeopardizing the environment. Results from the interviews in rural areas showed that local people had a tendency to prefer corrugated iron sheets over both bamboo and grass because of the lower maintenance, the modern look, and the resistance to termites and other pests. A further investigation into how to make the iron sheet management environmentally sustainable is suggested. How can the sheets be collected after having fulfilled their purpose, and how would this be managed with a structural perspective on who will be responsible and finance the process? An investigation could lead to suggestions about a strategy and identify challenges and benefits.
9 Conclusions

The main conclusion of this thesis is that the complexity of the innovation diffusion for the Sustainable Rural Dwelling Unit is greater than the complexity of the innovation itself. The reasons that an innovation becomes successful or not are dependent on several aspects at different levels. Two key elements of success are:

1. To analyse the innovation’s attributes
2. To analyse stakeholder interests

The analysis can be done through practical tools which have been exemplified in the thesis. Further success factors for innovation diffusion in rural housing are:

3. Focus on the future user’s own wishes
4. Focus on marketing
5. Consideration of the innovation’s complexity
6. Giving good examples of the house as demonstration buildings
7. To let time test durability, before planning for scaling up, when introducing new building techniques into a market
8. Clear communication among stakeholders
9. Identification of clear stakeholder roles
10. Mapping and speaking openly about each stakeholder’s interests and about which strategy of implementation that should be used
11. Making sure that someone take over the ownership of the project if it, as in the case of the Sustainable Rural Dwelling Unit, is initiated by a university

Finally, it is to be concluded that the Sustainable Rural Dwelling Unit-project was both very successful and unsuccessful. The Sustainable Rural Dwelling Unit has great potential for future rural housing in Ethiopia and is applicable in many developing countries where there is a need for higher-standard and durable low-cost housing. By learning from the SRDU-project, similar projects in the future can become more successful.
10 Bibliography


Widén, K. 2006. Innovation Diffusion in the Construction Sector, Division of Construction Management, Lund University, Lund.


**Interviews**

All interviews are done by Signe Nilsson, interpretations according to description in chapter 5.

1. Future owner of a SRDU, no. 1.
2. Neighbouring women and future owner of a SRDU, no. 2.
3. Young men, neighbours of future SRDU owners.
4. Gebrewold, Berhanu. Member of the core research team, architect no. 1.
5. Member of the core research team, architect no. 2.
6. Future owner of a SRDU, no. 3.
7. TVET graduate (TVET Polytechnic College).
11. Member of the core research team, architect no. 1 (complementary interview).
12. Neighbour to SRDU owner in Agena.
13. Key keeper for SRDU at Wolkite University
14. Local people in Gubrie, Person 1 & 2.
    March 2016, Gubrie, West Guraghe, Ethiopia.
15. Local people in Gubrie, Person 3.
    March 2016, Gubrie, West Guraghe, Ethiopia.
16. Local people in Gubrie, Person 4, 5 & 6.
    March 2016, Gubrie, West Guraghe, Ethiopia.
17. Local people in Gubrie, Person 7 & 8.
    March 2016, Gubrie, West Guraghe, Ethiopia.
Figures

Questions asked of the different informants. Overview:

A1 Local people in Gubrie, project site no. 1
A2 Key keeper for SRDU at Wolkite University, project site no. 1
A3 Local people in Agena, project site no. 2
A4 Local people in Wita, project site no. 4
A5 Members of the core research team, EiABC
A6 Complementary interview of the members of the core research team, EiABC
A7 General Manager of Bete-Guraghe Cultural Center
A8 Human Resources Development Officer at TVET Wolkite, project site no. 3
A9 TVET graduate, project site no. 3
A1 Local people in Gubrie, project site no. 1

Introduction of myself and why I am here.

Questions about SRDU:

1. What do you know about these houses [the SRDUs]?
2. Were you here when they were being built?
3. When they started to build these houses what did they tell you about them?
4. Have you seen the inside of the SRDU? What are your impressions?
5. How do you like the way the SRDU looks?
6. What were people’s opinions about the houses when they were under construction?
7. Did people see it as something that can benefit you—the people that live here as well?
8. How do you think the houses can benefit you now when [they are] built?
9. What are two good things about these houses?
10. Are there any bad things about them?
11. The SRDU is made out of earth blocks and bamboo leaves; is that something that attracts you?
12. Are there certain positive or negative attitudes to building with earth blocks?
13. Do you think these types of houses could also be spread here and that people will start building their own houses like this?
14. If you could, and if the material was provided for you, would you build the house?
15. What would be needed so that you would like to build a house like this?
16. Is there anything you would change with the SRDU, if it was to be built for you to live in?
17. Do you think the house is too advanced to build, so that professionals are needed, or do you think that people here can learn how to build them?
18. Would it be better to make it less complicated, for example by skipping the upper floor and the vault in the kitchen, or do you think it is good that they are advanced?
19. If there are bamboo seeds provided to this village, do you think that people will start growing bamboo?
20. When you see the SRDUs, do you think they are good examples of preserving the culture, or are they bad examples in some way?

The SRDU in comparison to modern and traditional houses:

21. Which house would you prefer to build, an SRDU, a modern house, or a traditional house with grass roof? Explain why.
22. If the houses [an SRDU, a modern house, and a traditional house] were already built, and you were ready to move in, which one would you prefer then?
23. If you would choose among roof covers, would it be the bamboo, grass or iron sheets?
24. Why are so many people building rectangular houses with iron sheet roofs?
25. What are the benefits of modern houses with iron sheet roofs compared to traditional houses?
26. What are the benefits of traditional houses compared to modern?

General questions about houses:

27. How important is it that new houses preserve the [traditional] cultural look?
28. If the [traditional] cultural look is important, why are all new houses here rectangular modern houses with iron sheet roofs?
29. How important is it that houses look modern?
30. If it’s important to be modern, and if it’s important to live in an urban house, then what do you think about the SRDU houses? Do they look modern to you?
31. What are the most important attributes of a house? Can you choose the three most important from these nine: being large in size, having a refrigerator, having water access, having a TV, being insulated from fire, having a good indoor climate so that it is cool during the hot hours and warm during a cold night, having lighting, or that the house preserves the [traditional] cultural appearance? Out of all the options can you choose the three that are most needed?
32. Explain why, and why are the others not as important?
33. Which do you prefer: to build your house yourself or to hire someone? Which are the pros and cons? What do other people prefer?
34. What are your thoughts about the future of houses? What do you think this village will look like in 20 years’ time?

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**A2 Key keeper for SRDU at Wolkite University, project site no. 1**

Introduction of myself and why I am here.

1. Do you know much about this project? Have you been involved?
2. There were some local people participating in the opening ceremony of construction. Do you know who they were?
3. Do you know what they thought about the house when they saw it?
4. What do you think yourself about these two houses?
5. Do you know if anyone around here was inspired to build a similar house?
6. Do you know why / why not?
7. Has anybody among the locals here tried the technique with earth blocks?

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**A3 Local people in Agena, project site no. 2**

Introduction of myself and why I am here.

1. How are you connected to this house? Are you a member of the family who owns this house?
2. Where do you live?
3. Does anybody live in this house [the SRDU]?
   Follow-up questions:
   Do you know why nobody is living in it?
   When they come to visit, do they stay in this house?
   Do they have more houses around here?
4. What do you think about this house yourself?
5. If you would compare it with modern and traditional houses, what do you think about this house?
6. If you would choose between living in this kind of house [the SRDU] and the modern type with iron sheet roof, which would you prefer? Why?
7. Do you know the opinions of this house [SRDU] of other people in the neighbourhood?
8. Do you think it [the SRDU] has greater benefits than other types of houses?
9. Does it have any disadvantages?
10. What do you think about the materials? The earth blocks and the bamboo roof?
11. What about the walls [Adobe blocks]: which one is better between earth walls and traditional walls?
12. Have you seen any other neighbours who started to build a house with these kind of blocks? Do you know why /why not?
13. If you would make the house [SRDU] better somehow, what would you like to change?

A4 Local people in Wita, project site no. 4

Introduction of myself and why I am here. Asking for an introduction of the person, name, age and who he/she is in the context (neighbour, relative, future owner, visitor).

Questions about the SRDU:

1. Tell about how you heard about this house/project.
2. What was your first impression?
3. Describe your current condition. How do you live now?
4. What benefits does the SRDU have?
5. Are there any specific elements you are impressed by?
6. Any things you are not so impressed by / suspicious about (/negative towards)?

Construction material:

7. Not many people in this area build with earth blocks. Do you know of any? Have you seen it before in other places?
8. What is your opinion about houses made of earth blocks?
9. Why do people here not build with earth blocks?
10. Bamboo roofing, have you seen it before?
11. What do you think about it?
12. Why have people never used bamboo for their houses before?

Others’ opinions:

13. Do people from the village come here to look? Who are they? (Close neighbours, unknown people…?) What do they say?
14. What do they say is good about the house?
15. What do they think is not good about the house?
16. What do they say about the project itself, or the way it is done?
17. What could be better?
18. Have any of the neighbours expressed that they would like to build a similar house?
19. How does the community look upon you (the ones who allowed building an SRDU)?

In a positive light, as innovators, as contributing to the society, or as fools?
20. What do other people say about building with earth blocks?
Stakeholders:

21. Which people do you listen to and trust?
22. Whose opinion is most valued, from among Bete-Guraghe Cultural Center, Farmers’ Association, Academics from the University in Addis Ababa, Officials in the Guraghe Zone Administration, and Elders in the village?
23. In what way have you been involved in this project?
24. Do you wish to have been made more involved? Should someone have asked you more about what you think? (If yes, who?)
25. What do you think about the workers who are doing the construction? Does it matter that they are not from Guraghe?

Future:

26. What do you think about the future for this type of house?
27. How do you see the future for this building technique in Wita?
28. Do you think it will spread? (If yes, who will spread it / build with this technique?)
29. Can making blocks and growing bamboo become an industry that people will work with? (If yes, who do you think will take the initiative for that?)
30. What is needed for this technique to spread? Which are the biggest obstacles?
31. How can this house be even better?

A5 Members of the core research team, EiABC

Presentation of aim, background, goals… Previous knowledge

1. Immediate comments.
2. What was your vision for the project?
3. Who else have been the driving forces?
4. How would you describe the present status of the SRDU-project?
5. In the beginning, the EiABC thought that local people (farmers) could learn the technique and build their own houses. That’s why they chose the 13 trainees from the different Woredas to build the first two units. Then they could go back to their Woreda and teach others in the village how to build a similar house, or give inspiration. What do you think about that strategy?
6. It seems it didn’t work out quite as the EiABC thought it would. Why didn’t it work so well?
7. Could that strategy have worked if something was different?
8. After the two first units there was a change of strategy because that’s when TVET got involved. Then the plan was to teach the technique to construction workers, who would be future contractors, rather than people building for themselves. They would perhaps get hired by local farmers and others who wanted a house like this. Whose idea was that?
   What do you think about this strategy compared to the first?
9. When did it start to stumble?
10. What other reasons were there for the strategy not working out the way it was planned?
11. What local people think about the house? Which opinions have you heard?
12. Why do you think it has not had spread around Gubrie? Do you think some farmers would like to try to build the house [SRDU] for his own family?
13. Why hasn’t it spread in Agena?
14. Do you think the project would have become more successful if something would have been done differently?
15. What are your comments on the roles? EiABC got the main role of coordination; how did that impact the project? Should somebody else have gotten that role instead?
16. What do you know about the projects in Wita?
17. Three families and one school got the house built for them, through the sponsorship of the Arthur Waser foundation. What do you think about this third strategy of making the houses spread?
18. Are you interested in being involved again?
19. If you would be at step one, once again, what would you do differently?
20. The six steps: Capacity building, context, dissemination, participation, research and technology transfer. Which steps were strong and which were weak?
21. What holds it back now? What hinders the SRDUs to spread now?
22. What do you think about the future of the SRDUs?

A6 Complementary interview of the members of the core research team, EiABC

To the project coordinator:

1. Do SRDUs have the capacity to become larger than traditional houses? Which size limitations are there?
2. Where are the iron sheets that can be bought here usually produced? Are they imported? Raw material importation?
3. Where does the concrete come from, are all raw materials found here in Ethiopia?
4. In the SRDU, is the upper floor also made out of concrete?
5. Is it true that earth floors usually sink and have to be refilled?
6. How is the foundation of the SRDU different from that of the modern houses here?
7. In the project description it says that "traditional houses are substandard and are of inferior quality". What is meant by that? How are they substandard and what is meant by inferior quality?
8. Is bamboo roofing easier to repair than grass roofing?
9. How would you describe the differences between wood and bamboo?
10. What is the life-span of the different houses—SRDU, traditional and modern?
11. Who built the Agena-unit?
12. Where are the construction workers who work in Wita from?
13. Please explain about the Farmers’ association in Wita
14. What is the idea for the houses in Wita? If the people are happy with them, who will continue to build them?
15. Why did you have to change position and step out of the core research team?
16. Would you say that something has held the project back? What has hindered it to grow?
17. Was there a problem with the first strategy of training the 13 trainees?
18. Why are the trained people not employed to work in Wita?
19. How do you describe the SRDU-project? Do you view it as a failure?
20. If you would be where you were 5 years ago but with your experience and knowledge of today, would you do something differently?
21. What would be the solution for a successful out-scaling and up-scaling at this point? Is the “Rural housing” project the solution?
22. How do you see the future for SRDU?
23. Do you think the project would have been more successful if the house would be simpler, easier to construct for somebody without formal education in construction?
24. Why doesn’t TVET in Wolkite know what’s going on in Wita?

To one of the initiators:

1. Describe more about the farmers’ association in Wita. How was it started, what is their aim, what are their activities?
2. What would you say has hold the project back? What has hindered it from growing?
3. If you would be where you were 5 years ago but with your experience and knowledge of today, would you do something differently?
4. What was the problem with the first strategy and the 13 trainees?
5. Do you think the project would have been more successful if the house would be simpler, easier to construct for somebody without formal education in construction?
6. How do you describe the SRDU-project? Do you view it as a failure?
7. What would be the solution to a successful out-scaling and up-scaling at this point?
8. Can you help me complete the unsure dates in the Time Line?

A7 General Manager of Bete-Guraghe Cultural Center

Introduction of myself and why I am here.

1. Tell me about Bete-Guraghe Cultural Center! Who are the members? What is the aim of the association? What are your activities? What is your role?
2. What interests does Bete-Guraghe Cultural Center have in the SRDU-project?
3. What is your experience with the project? How did you become involved? How have you been involved since it started?
4. What are your impressions and thoughts about the house? What have you seen of it?
5. What are your impressions of, and thoughts about, the project and the way it has been organized?
6. Which stakeholders, people or groups are affected either positively or negatively by the SRDU-project?
7. To which stakeholder do you think this project is the most important?
8. Who has been the driving force for the project?
9. What prevents the spread of these houses? What holds the use of SRDUs back?
10. Could anything have been done better?
11. What do local people in Gubrie think about the house? Have you heard any opinions?
12. Who were the elders who have been involved? How were they chosen to participate in the project?
13. In the beginning, EiABC thought that local people, farmers, could learn the technique and build their own houses. That is why they chose 13 trainees from the different Woredas to build the first two units. Then they could go back to their own Woreda and teach others in the village how to build a similar house, and to give inspiration. What do you think of that strategy?
14. It seems it didn’t work out quite as well as the EiABC thought it would. Why didn’t it work so well?
15. Do you think that the farmers are capable of learning how to build this house or do you think it is necessary to have skilled professionals?
16. How do you view the future for this project and the spread of SRDUs?
17. What is needed for this project to succeed?

A8 Human Resources Development Officer at TVET Wolkite, project site no. 3

Introduction of myself and why I am here.

1. Tell me about TVET!
2. Can you tell me about your experience with SRDU? How did you become involved?
3. What are your impressions of the project; what do you think about it?
4. What benefits for TVET did you see with the SRDU-project?
5. Who would you say have been the driving force for this project?
6. Who (org./person) will benefit most if the SRDUs spread and become more commonly used?
7. Who will lose if the project spreads?
8. What holds it back? What hinders it from growing?
9. (Which organisations/groups/authorities/associations/people are affected by the outcome of the project?) This is a question for me.
10. To which organisations are this project the most important?
11. Do you think the project would have become more successful if something would have been done differently?
12. In the beginning, the EiABC thought that local people (farmers) could learn the technique and build their own houses. That’s why they chose the 13 trainees from the different Woredas to build the first two units. Then they could go back to their Woreda and teach others in the village how to build a similar house, or give inspiration. What do you think about that strategy?
13. It seems it didn’t work out quite as the EiABC thought it would. Why didn’t it work so well?
14. These trainees were paid. Would anything be different if instead they had not been paid, it had been an education program, and they had received a certificate after finishing?
15. After the two first units, there was a change of strategy, because that’s when TVET got involved. Then the plan was to teach the technique to construction workers, who would be future contractors, rather than people building for themselves. They would perhaps get hired by local farmers and others who wanted a house like this. What do you think about this strategy compared to the first?

16. Do you have any ideas about what local people think about the house? Have you heard some opinions?

17. What do they think about learning a new construction technique and building their houses themselves? Do you know?

18. The 13 trainees from the different Woredas—did you have any contact with them? Do you know anything about who they are, what they do, where they are now?

19. The approximately 20 TVET graduates who built the SRDU house in TVET, do you know where they are, what they do?

20. What do you know about the projects in Wita outside Butajira?

Three families and one school got the house built for them, through the sponsorship of a Swiss foundation. What do you think about this third strategy for making the [SRDU] [diffuse]?

21. What do you think about the future of the SRDUs?

A9 TVET graduate, project site no. 3

Introduction of myself and why I am here.

1. How would you explain your experience with SRDU?
2. What do you think about the house?
3. Do you think of it as a future house, or more like people can use it if they want to? What is your personal impression of the technique?
4. Do you think that the farmers will be able to build these houses?
5. Do you think in the near future more people will be educated on how to build it or professional workers will build houses for the local people?
6. What’s more realistic? (Question 4 or 5?)
7. The original thought was of training trainees and letting them go back to their Woredas to train others. What do you think about that idea?
8. Do you have any contact with the 13 trainees now? Do you know what they are doing?
9. Do you have contact with the other TVET graduates? What are they doing now?
10. What do you think of the future for these houses? Do you think the houses will continue to be used?
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