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‘‘AN ANALYSIS OF THE MAIN ISSUES FOR SUCCESSFUL TECHNOLOGY TRANSFER IN SHEA ALMOND PROCESSING AND TRADING IN BENIN’’

by

Amina IBRAHIM BABA

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Thesis submitted in partial fulfilment
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Contents

List of Acronyms

APIDeV	:	Association pour la promotion des initiatives de développement durable
BAA	:	Bureau d'appui aux artisans
CAMF	:	Centre des arts et métiers des femmes
CASPA	:	Composante d'appui au secteur privé agricole
CECI	:	Centre canadien d'étude et de coopération international
CED	:	Centre d'éducation à distance
COBEMAG	:	Coopération Béninoise de matériel agricole
CV	:	Coefficient of variation
DDC	:	Direction de développement et de la coopération
DDIC	:	Direction départementale de l'industrie et du commerce
DIAS	:	Direct investment advisory services
DOI	:	Diffusion of Innovation
DSCRP	:	Document de stratégie de croissance pour la réduction de la pauvreté
EDI	:	Electronic data interchange
FDI	:	Foreign direct investment
FNPEJ	:	Fonds national de la promotion de l'emploi et des jeunes
FSA	:	Faculté des sciences agronomiques
GDP	:	Gross domestic product
GRET	:	Groupe de recherche et d'échanges techniques
INSAE	:	Institut national de la statistique et de l'analyse économique
IT	:	Information technology
M	:	Mean

MPME	:	Ministère des petites et moyennes entreprises
Msc IPED	:	Master of Sciences in Investment promotion and economic development
PADSA II	:	Programme d'appui au développement du secteur agricole phase 2
RGPH2	:	Recensement général de la population et de l'habitat n°2
ROI	:	Return on investment
SD	:	Standard deviation
SE	:	Standard error
SECO	:	Swiss State secretariat for economic affairs
SMEs	:	Small and medium-scale enterprises
TA	:	Technology acquirer
TAM	:	Technology acceptance model
TM	:	Technology maker
TR	:	Technology regulator
TT	:	Technology transfer
TU	:	Technology user
U.S.	:	United States
UAC	:	Université d'Abomey Calavi
UK	:	United Kingdom
UNCTAD	:	United nations conference on trade and development
UNIDO	:	United Nations industrial development organisation

List of Tables & Figures

List of tables

List of figures

List of charts

Abstract

Women have traditionally played an important role in Small and Medium-Scale Enterprises, as owners, managers and workers. In Benin, shea almond processing and trading, mostly carried out by women, is one of the greatest opportunities in terms of wealth creation in rural and urban areas, particularly for women, and a source of currency for the country. The sale of shea butter provides women with money in order to assure the well-being of their family. During the last twenty years, technologies have been allocated to processors of shea almond, notably women, by successive governments, technical and financial partners in order to increase shea butter production and develop shea almond channel. Unfortunately, the channel remains at a low stage of development in term of production level, quality, diversification, trading, technical and management capacity. Up to now, the results of technology transferring to those micro entrepreneurs are not yet satisfactory.

So, the present work aims to identify, analyse and discuss the issues for successful technology transfer from stakeholder group's perceptions in this sector. To response to the question the Delphi Method has been used. Two round Delphi are realised with a sample size of 45 persons. Four groups of stakeholders are identified and interviewed. Those concern the technology acquirers, the technology makers, the technology users and the technology regulators.

As for analysis techniques, a coding approach, qualitative and quantitative analysis are used to explain issues identified and to comment quantitative data. The coefficients of variation are calculated and have helped to rank issues inside of each group of stakeholder. The confidence intervals are also calculated and have led to get charts illustrating the dispersion's degree of responses both inside a stakeholder group and among stakeholder groups.

As for issues, nine (09) issues are identified related to technology identification, two (02) for technology evaluation, height (08) for technology

attraction, seven (07) for technology absorption, five (05) for technology application and two (02) for technology monitoring. It is pointed out that the four groups of stakeholders concur with most of the issues apart from isolated cases (see Chapter 5). As far as commercialisation is concerned, height issues are identified but not ranked due to the lack of appropriate information.

This study provides useful insights to the field of technology transfer in shea almond processing. Recommendations are formulated to improve technology transfer process and to boost the sector.

To improve the reliability and validity of findings, Delphi survey, face-to-face interviews and methodological triangulation are items used.

The originality of this dissertation is that issues are identified and ranked both according to technology transfer steps and stakeholder groups. This package of issues should serve discussions and constructive interactions to stakeholders namely government authorities, technical and financial partners, in technology transferring in any similar sector and notably in the channel of shea almond processing.

Chapter 1: Introduction

Globalisation presents formidable challenges to developing countries as a key struggle to compete in world market. The extent to which firms in developing countries are able to enter the global market depends on their ability to acquire and use new technology, and on how they can foster knowledge-based competitive advantage, (Hipkin 2004).

The inevitable and crucial questions faced by developing countries in determining the ‘‘success’’ of the transferred technology, according to Meshkati (1989), are: which technology should be acquired, how it can be mastered, how it can be adapted and adjusted to its specific sources and the environment of a given country, how it can be maintained, and how it can be built upon. These questions point out the issues of appropriate technology. Indeed, the latter has generally and traditionally been viewed in terms of labor-intensive technologies primarily employed in small-scale production and has often been concerned with marginal improvements of traditional technologies used in developing countries (UNIDO, 1979).

In Benin[1], during the last twenty years, technologies have been allocated to processors of shea almond by successive governments, technical and financial partners in order to increase shea butter production and develop shea almond channel. In fact, shea almond and shea butter present economic advantages for the country**.** As for CECI (2000), Benin has a great potential of production which is however difficult to estimate. Production quantities vary around 85,000 tons of shea nuts per year. Part of the production would be utilised locally for the rural households’ current needs in food, personal cares and also in semi industrial production of soap. The exportation of almonds and butter reaches up to respectively 65,000 and 15,000 tons per year. As far as the prices of almond and butter are concerned, they vary relatively with crops fluctuations, international exporters and local opportunities.

[1] Benin is presented in detail in sub section 2.7

Shea almond sector, through women organisations, is one of the greatest opportunities in terms of wealth creation in rural and urban areas, particularly for women, and a source of currency for the country with an increasing demand at export. The sale of shea almond or shea butter provides women with money that helps them assure the well-being of their family.

Conscious of its economic importance, shea almond processing and trading in Benin, carried out mostly by women and groups of women, is up to now at a low stage of development in terms of production increase, quality, diversification, trading, technical and management capacity of production (Briard, 2005). The results of technology transfer to those micro entrepreneur women are not yet satisfactory.

The economic challenges which the shea butter channel displays nowadays notably a competitive and quality positioning of shea butter in the growing market on the one hand, and the wish of Benin government to promote the channel as means of economic diversification (DSCRP, 2007) on the other hand, requires that one think of some aspects of production process and commercialisation of this product.

But a key question is whether long-term and sustainable growth of shea almond processing, in Benin, is possible with women who frequently abandon technology, and rely on hand tool technology (powered entirely by their muscle). Besides, can these women compete with those in other parts of Africa, notably Ghana, Burkina Faso, who have introduced advanced technologies to increase and improve the production of shea butter and also to diversify it into other products? Furthermore, the actual organisation of the channel on the one hand, and the lack of private firms and foreign direct investments on the other hand are further issues that the channel is confronted with.

Technology Transfer is not an end in itself, but a means of development. It constitutes one of the most utilised means of production of goods and services for domestic use and/or export, and of processing raw materials and minerals

by developing countries (Meshkati, 1989). However, the history of technology transfer has not been one of unqualified success, a lot of failures have occurred, the causes of which have not always been clear Cohen**,** (2004).

This study seeks to identify a list of issues that affect the success of technology transfer in shea almond processing and trading in Benin. From this, the main research question is the following: What are, from stakeholder groups' perceptions, the issues for successful technology transfer on shea almond processing and trading in Benin?

Specific questions are:

- What are, following the key steps of technology transfer developed by Boris 2008, the issues affecting the successful technology transfer faced by each stakeholder groups?
- What is the relative importance of these issues according to stakeholders?

To answer those questions, an exploratory research has been carried out to gather articles and writings on the topic. The reading of those documents has helped to comprehend the topic and make sure that the topic is worth investigating. Besides, appropriate approaches and methods have been searched leading to the adoption of the Delphi Method as the approach to answer the questions. In addition, stakeholders have been identified, questionnaire elaborated and submitted to pilot study to facilitate a codification of data analysis. Furthermore, an overall survey is realised and the collected data analysed.

Thus the dissertation is structured as follows: Chapter 2 presents the literature review of issues in technology transfer. A case study of shea almonds and technology transfer is emphasised in chapter 3. The research methods are described in chapter 4. The study findings are presented in chapter 5. Finally conclusions and implications are discussed in chapter 6.

Chapter 2 : Literature Review on Issues in Technology Transfer

The literature review is structured around the following aspects: how technology transfer occurs, the advantages and disadvantages of technology transfer, obstacles or issues to technology transfer.

2.1. How technology transfer occurs

Technology transfer has been analysed both theoretically and operationally. In the first part, some theories related to technology transfer are described and in the second part, other authors' views of technology transfer notably at operational level are presented. But, before developing the above-mentioned points, it would be interesting to define beforehand what technology is.

Technology may be defined as the knowledge of how to perform tasks, solve problems and provide products and services in organisations. Technology denotes not only the sum of knowledge, experience, and skills necessary to establish an enterprise manufacturing and marketing a product economically. It also refers to other types of knowledge necessary for the planning, establishment, and operating of a firm (UNCTAD 2001:6). This definition of technology is exploited to conduct the present research.

Furthermore, as the topic is about natural product processing, the definition of Storper and Walker, (1989), of technology as the capability of human society to transform natural resources into useful products for human consumption seems useful in this study. This definition helps to focus on issues in transforming natural resources.

A particular definition in terms of characteristics of technology considers that it is intangible/soft (knowledge and skills) and tangible/hard (products) and, as such, both characteristics are taken into account together without separating one from the other in analysing issues for successful technology transfer.

2.1.1. Theories of technology transfer

- ✓ **Nonaka's theory of Technology Conversion**

From Boris (2008), the theory can be summarised as follows. The two forms of technology (explicit and tacit technology) play an important role in the process of technology transfer. Four different patterns of interaction between explicit and tacit technology are identified. Each pattern formulates ways in which existing technology can be transferred and converted into new technology. Those patterns are ''socialisation'', ''externalisation'', ''combination'', and ''internalisation''. If managed correctly, the interaction between the patterns leads to a continuous growth in both types of technology, creating a ''spiral''.

In the frame of this study, the question is not the analysis of how the conversion of technology during the processing of shea almond happens, but rather an effort to get the issues related to technology conversion from stakeholders.

- ✓ **Cohen and Levinthal's theory of Absorptive Capacity**

Technology requires efforts to absorb and adapt; it has strong ''Tacit'' elements that cannot be embodied in equipment or codified in instructions or blueprints. This issue is analysed by the theory of absorptive capacity, developed by Cohen and Levinthal (1990) and summarised by Boris, 2008 as followed.

The absorptive capacity of an individual, firm, industry, or region is defined as the ability to recognise the value of new technology and to assimilate it. Absorptive capacity is mainly influenced by two factors. The first is ''accumulated prior related technology'' which increases the ability to make sense of and to assimilate and use new technology. The second is ''external and internal structures'' which includes the existing communication channels across firms/industry or between subunits.

The study has envisaged highlighting issues related to absorptive capacity of women processors of shea almond in Benin.

To complete the literature review on technology transfer, other theories and models, such as 'Diffusion of Innovation' theory, Models of technology acceptance are also examined and summarised below.

- ✓ **Rogers's theory on Diffusion of Innovation (**DOI**)**

As the name suggests, DOI theory deals with innovations and their diffusion into organisations. It is based on the assumption that people decide independently whether they will accept new things or new ways of doing things.

According to Rogers, (1962: 5–11) an innovation is: ''the idea, practice, or object that is perceived as new by an individual or other unit of adoption'' and the diffusion is: ''the process by which an innovation is communicated through certain channels over time among the members of a social system''. According to the author, the DOI theory is influenced (i.e. affected) mostly by the characteristics of the technology and the characteristics of organisation.

In this theory, technology is referred to as innovation, and diffusion could be referred to as transfer process. As such, issues related to diffusion of innovation could contribute to respond to issues to successful technology transfer.

- ✓ **Models of technology acceptance**

From Greenfield and Rohde, (2009), numerous models exist to understand the process of acceptance of a new technology by an individual (e.g., Fishbein and Ajzen, 1975; Davis, 1989; Thompson et al., 1991; Davis et al., 1992). The majority of these models focus on an individual's ability to accept new technology within specific circumstances. Of the Intention Models, or Behavioural Decision theories, the most popular and well-supported are the

Theory of Planned Behaviour (Ajzen, 1985, 1991) and the Technology Acceptance Model (TAM), Davis et al., (1989).

The basic conceptual framework of TAM is that an individual's reaction to using technology, in terms of his perception of ease of use and usefulness, affects his intention to use technology. His intention to use technology ultimately affects his actual usage.

As the dissertation topic is focused on women activities, women's reactions to using new technology could be highlighted in the frame of this study.

All things considered, both theory of Diffusion of Information, and Technology Acceptance Model deal with technology absorption and technology application as developed by Cohen and Levinthal, (1990) and Boris, 2008.

The exploration of those theories and models has fostered the comprehension of the theoretical framework for the management of technology transfer at the individual, firm and national levels.

The elements of those theories appear implicitly or explicitly in the definition provided by the following operational authors.

2.1.2. Operational view of technology transfer

Brooks (1966) provided the first definition of technology transfer as a process by which science and technology are diffused through human activity. This definition explains technology transfer as any activity by which systematic, rational knowledge developed by one group or institution is embodied as a way of doing things by other institutions or groups.

Cohen (2004) identified technology transfer as a dynamic process, where there is a technological movement from one physical or geographical location to another - through acquisition, adaptation, utilisation and development - of technical and technological knowledge in a country other than the one in which this knowledge has originated from.

So, issues related to geographical considerations during a technology transfer process in the case of this study are taken into account.

Boris (2008) suggested beforehand to formulate technology strategy before implementing it. As for implementation, the following steps are necessary: technology identification, technology evaluation, technology attraction, technology absorption, technology application and the monitoring of the implementation. Divers issues can occur at each step of the process. For that reason, the present study will try to identify issues related to each step.

2.1.3. Success in technology transfer

It is interesting in the frame of this study to know where and perhaps when there is a successful technology transfer before analysing the related issues.

According to Meshkati (1989: 102), the objectives and perspectives of "success" in technology transfer process are defined differently by the different actors and agencies involved in the transfer process, i.e. technology suppliers, technology acquirers' firms, and governments.

So from this definition, it can be concluded that success is related to stakeholders. Then, this gives reason to identify and analyse issues from stakeholders' views.

For Derakhshani (1984), due to the complexity of issues, and the variety of objectives, criteria, and perspectives, a universal definition of a successful transfer of technology is not possible. However, he considered two levels in a hierarchy of performance that could define the (criteria of) success of technology transfer transactions. So, the first level is the operational level. At this level, one is concerned with traditional economy and economically-related measures of a firm's performance. Examples are Return on Investment (ROI), market share, and production efficiency. The second level, which is concerned with the nature, characteristics and potentials of the technology, includes

international competitiveness, degree of reliance on domestic personnel and inputs, and innovativeness.

This clarification of success in technology transfer has contributed to qualify the level of development of shea almond processing in Benin as above-mentioned in chapter 1.

2.2. The advantages and disadvantages of technology transfer

Technology transfer is an emerging field of knowledge. It is the key to development and competitiveness. Firms use it to improve their competitive advantage. It is also used to enhance the competitiveness of an entire industry, a region within a nation's boundaries and an entire nation-state. Besides, it can enhance the development of a multi-nation geographic region. Furthermore, it is a means toward economic progress, social development, quality of life, and even of culture and of value systems, Reisman, (2005). Indeed, the development of new technologies such as new transport and telecommunications techniques has speed up the circulation of goods and services, and markets are getting more and more international, or global. The Internet and associated telecommunication services such as teleconferencing and electronic data interchange (EDI), electronic banking, and resulting improved logistics have created more open environment for companies to operate globally. As a result companies significantly globalise their operations and manage shortened technology life cycles through international technology transfer, Nahar et al, (2006). As a consequence, there is easy access to needed goods in the other parts of the world and there are diverse possibilities for consumers.

Technology transfer does not occur without disadvantages. The levels of disadvantages could be economic, environmental, health, human life and social. At economic level, by enhancing economic progress, technology development facilitates in the same time unfair practice inducing the drop of firm profits for example, it also increases the debt of firms by accumulating or

renewing technologies. One of the most disadvantages is the dependence between acquirers and providers when the transferors keep some parts or key elements of the technology. At environment level, the use of advanced technologies causes issues such as global warming, water and air pollution, deforestation, discharge of noxious effluents, the excessive use of chemicals (fertilizers and pesticides) in agricultural. Those facts degrade human life quality and their health. At social level, there is a risk of copying bad habits, acceleration of wrong information.

Particularly, blind technology transfer not only may result in economic inefficiency and environmental disasters, it also increases the risk and potential of occupational accidents and diseases for local workers (Meshkati, 1989). To finish, technology transfer may lead to the waste of human and material resources.

2.3. Obstacles to or issues related to technology transfer

Studies of technology transfer have traditionally cited the following major factors as the ones affecting the success of the technology transfer process: environmental characteristics of the technology transferor and acquirer, the mechanism of technology transfer, and the nature and sophistication of the technology itself, (Derakhshani, 1984).

The descriptive analysis of each of the foregoing factors has revealed that in addition to economically-related variables, the technology transferor's and acquirer's environmental, physical, social, and psychological characteristics are also instrumental (sub-) factors. They include, among others, infrastructure, social value systems, working traditions and habits, attitudes of mind, skill levels, and taboos of the acquirer populations.

- ✓ **Gender, age and education on new technology implementation in developing countries**

Making a focus on gender, age and education on new technology implementation is due to the specificity of our dissertation field. In fact, the processing of shea almond in Benin is realised by women of advanced age, most of whom are illiterate. Considering this fact, it seems useful to focus on these cultural and social characteristics with technology transfer. The available results are the ones of the information technology (IT) sector.

Many studies show how gender, age and level of education affect IT adoption and usage, although most were conducted within developed nations (Ahuja, 2002; Ford et al., 1996; Rhodes, 1983; Woodfield, 2002).

The understanding of how social and cultural factors such as gender, age and level of education can influence the adoption of IT is useful in promoting the organisational diffusion of IT in non-Western cultures. In a study simultaneously conducted in three nations characterised by differing cultural beliefs and norms, Gefen and Straub (1997) demonstrated that gender roles represent an important social factor influencing perceptions and behaviors with respect to IT adoption. Their results indicate that gender does have an effect on the IT adoption process and provide a rationale to investigate whether gender moderates the effects of predictor variables in existing models of IT adoption and usage.

Contrary to study conducted in Saudi Arabia, demographic variables (e.g. gender and age) that have been reported to be significant moderators of the influences of attitude, subjective norm, and perceived behavioral control on behavioral intention in other cultural samples (Morris et al., 2005; Venkatesh et al., 2000) were found to be non-significant in the Saudi Arabian sample, Baker et al (2007).

In short, the literature review showed that authors have identified issues affecting the success of the technology transfer. Without being exhaustive,

those are, according to Derakhshani (1984), Rogers (1962 and 1983), Greenfield and Rohde (2009), etc., environmental characteristics of the technology transferor and acquirer, the mechanism of technology transfer, and the nature and sophistication of the technology itself. In addition to those factors, they are the ones including infrastructures, social value systems, working traditions and habits, attitudes of mind, skill levels, and taboos of the acquirer populations. Furthermore, gender, age and level of education are factors that could affect the success of technology transfer, Gefen and Straub (1997).

However, the present study is necessary not only by giving particular attention to those factors but to expect additional issues or obstacles notably listed from stakeholders' perceptions in shea almond processing sector. Besides, the additional contribution of the study is the fact that issues are identified and listed according to the steps of technology transfer, Boris (2008).

Chapter 3: A Case Study of Shea Almond and Technology Transfer In Benin

This chapter is structured around three parts as follows: technology transfer in shea almond production and trading in Benin, report on how others have researched these areas and the presentation of Benin.

3.1. Technology transfer process in shea almond channel

Two types of technologies are generally given to women: both hard and soft technologies. In addition, production centres have been built for women exerting in group.

At strategic level, up to now the technology transfer process is driven by a 'top down' approach instead of a 'bottom up' one. In fact, the introduction of improved technologies in this sector is driven from the government, research institutes, financial and technical partners to women involved in shea almond processing.

At the operational level, it is done through either training on the spot or in centres equipped with identical or similar technologies outside their place of living. This mode of transfer is the most common for women involved in shea almond processing and corresponds to 'Socialisation' as developed by Nonaka, 1994.

The figure below presents the steps of shea almond processing in Benin and table 3.1 points out technologies introduced to improve the traditional methods.

Figure 3.1: The steps of Shea almond processing

Source: Adapted from Briard , (2005)

Table 3.1.1: Technologies introduced to improve the traditional methods in processing shea almond by Benin women

Processing steps	Traditional	Improved
Shea almond washing up	No washing up	Mixing of the shea almond in the mortar full of water
Drying up of shea almomd	Spreading on a cloth under the sun	
Grinding	In the mortar (hand tool, powered by muscle)	• In the mortar / grinder with recovery of tiny pieces on a piece of cloth under the mortar • Motorized crusher
Roasting	In the pots	Use of improved hearths Not developed motorized roaster
Grinding or milling	Grinder / crush in the grinder or the millstones of the village	Improved equipment
Churning	Manual in the pans Addition of the bottom of the pans	Motorized churning
Washing of the mixture	No Washing	Washing with clean and lukewarm water
Cooking	In the pots	Use of improved hearths
Washing up the butter	Washing with lukewarm water	Addition of water to the cooking pot
Decanting	Let impurities go down to the bottom of the pot	
Straining or sieving	Nothing	On cloth or sieve
Packaging	Wrap in the teck leaf or canary	Nylon boxes or drums for exportation

Source: Adapted from Briard , (2005)

As for trading, study offices and trading intermediation centres start entering in the sector to help transformers sell their products at national and international markets. They help transformers to make quality control of products and identify potential buyers. This study will help to gather issues related to shea butter trading.

3.1.1. Issues for technology transfer

One of the issues highlighted by technology transfer remains the above-mentioned approach. In fact, women, who are the real actors of the sector, are not involved in technology strategy elaboration. In addition, identification, evaluation and attraction of technologies are carried out without women. As a result, there are problems of absorption and application of the transferred technology. Precise examples are that the majority of women abandon the transferred technologies, and are unable to maintain them.

The GRET, a research and technological exchange group, (2005) points out the issues that should be taken into consideration while providing women with new technologies. Those issues are: affordable cost of equipment, simplicity of technologies to be used, possibility of adaptation, and absorption capacity.

Besides, there have been problems with the implementation of a harmonised strategy in the management of knowledge and the improvement of innovation system.

Available documents related to the topic do not raise issues related to the elaboration of internal strategies for the development of technology transfer, and also ones of identification, evaluation and attraction of technologies. Thus, the present study will help to identify detailed and specified issues to those steps.

3.1.2. Obstacles to technology transfer in the shea almond processing

Traditional technology that has been practiced so much over a long period does not make it possible to satisfy the growing demand of butter. Practical problems lie in the non-matching between the habits which are considered common and the newly introduced technologies.

The new technologies are not part of the cultural habits of the stakeholders. The sector is mainly handled by women, most of whom are unschooled, old and poor. Indeed, Viyou (1999: 2) emphasised the difficulties related to shea almond processing into butter. According to Viyou, ‘‘it is difficult for women to pay, on the basis of their own financial capacity which is very low, for trainings in the up-to-date techniques or buy raw materials and quality equipments. In addition, international firms and the private sector are absent, and the current organisation of the sector is not appropriate’’.

3.2 Report on other research in the sector

Many authors and studies have been interested in the shea almond processing channel. Most of the studies deal with production, conservation, processing, and trading. However, scientific works using a Delphi Method to tackle the topic are scarce.

Historical factors and characteristics of the shea almond sector are summarised in the literature review of the CECI, 2000 and GRET, 2005.

3.2.1. Shea almond processing and trading

According to the CECI (2000), ‘‘In Benin, two ways of extracting shea almond butter are used: the traditional method by hand called the churning and the improved method of extraction through centrifugation’’.

As for traditional processing, it is an arduous and repetitive task, involving manual crushing, and then removing the crushed shells from the butter. Village women often spend ten or more hours a day in such work, (UNIDO, 1994).

Other methods are also developed in Burkina Faso, Ghana and Mali. Those are methods by press either by manual press or motorised press. Especially in Burkina Faso, as regard the quality of the butter, it depends, according to GRET, 2005, on many parameters: the ecological zone, harvest conditions,

storage, transformation and packing. In fact quality criteria vary according to the uses of butter (as food or as cosmetics) and the region of origin.

As far as trading is concerned, the CECI (2000) reveals that shea butter purchasing criteria seem to be established by large purchasing firms**.** The following items are noticed from the analysis of various purchasing contracts: basic acidity, maximum acidity, humidity and impurities. That means that the price of the butter is based on the acidity level. Besides, the good conservation of the shea butter accelerates its trading. As a result, it must be conserved well.

Furthermore, the issues of trade intermediation, sales process, mastering of the local, national and international market that is little developed make one wonder whether the current organisational level of women stakeholders is able to bear all technological innovations that should be brought to them for mastering trading.

What is obvious is that a successful transfer of technology at each processing level can increase women income.

3.2.2. Advantages of technological supports to women

Innovations proposed by the government and technical and financial partners are gradually improving the quality of Benin shea butter in order to meet the requirements of the international market. In addition, the capacity of extraction of shea butter with the introduced technologies has increased well enough, Briard, (2005).

The final result is that women that devote their time to the activity can improve their living conditions. In fact, authors have established a relation between the mastering of technologies and the fight against women poverty. That is the case of Kouagou (2007) which stipulates in ‘‘Le Matinal’’, a daily paper, of 6th December 2007 that ‘the more transformed the shea butter is, the higher the income it generates and the contribution to the fight against poverty’.

3.2.3. Other issues for shea almond processing channel

Apart from a few women's organisations which specialise in shea almond processing as an economic activity, the majority of women carry out that activity as temporary source of income for satisfying the growing needs of the family.

In short, the problems that impact on the success of technology transfer in the processing of shea almond and trading of the shea butter are covered at random in the literature review. What will make the present work different from the previous is that issues will be identified according to each stakeholder and classified, on the one hand, following the steps of technology transfer, on the other hand, from most important to least important within a group of stakeholders.

In order to achieve that, many methods and approaches have been analysed and the Delphi method has been chosen. The next chapter, the one of the research methods, states the reasons, the context and the conditions of application of the method. But before developing this chapter, an economic and geographic overview of Benin will be presented.

3.3. Presentation of Benin and the area of study

Benin is a francophone Africa country bordered by Niger in the North and Burkina Faso in the North-West, by the Atlantic Ocean in the South, by Nigeria in the East and Togo in the West.

Its population was estimated at 7,770,690 inhabitants in year 2006 (INSAE, RGPH2, 2006), with 52% of women. This population represents a small market. But on the other hand, Benin gives access to over 200 millions of other consumers due to its geographic position. Among those consumers, the ones of Nigeria amount 100 millions of inhabitants.

Benin's social and political situation has been peaceful for over a decade. The wide-ranging national consultation held between 19 and 28 February 1990 brought an end to the profound socio-political and economic crisis that the country suffered. This consultation, the so-called 'National Conference of Dynamic Forces' resulted in a number of important resolutions, notably *i)* to establish a liberal democracy based on respect for fundamental human liberties, *ii)* to promote the rule of law and *iii)* to adopt free-market principles. Since, Democracy has continued to gain strength in Benin by the renewing of institutions managers.

Economically, real growth increased from 2.9 per cent in 2005 to 3.8 per cent in 2006 and 4.2 per cent in 2007. However, the last two years, growth has decreased due to a number of crises namely energy crisis, financial crisis, food crisis faced by most of the countries in the world and nobly developing countries.

Benin's economy shows a marked lack of diversity and is largely focused on agriculture. This sector generates around 22 per cent of GDP and employs almost 60 per cent of the working population.

Apart from food crops (cassava, beans, yams, sorghum, maize, millet and rice), farmers primarily grow cotton, the main export crop. The country is one of Africa's leading producers of cotton, which provides livelihoods for 2 millions of Benin's inhabitants and accounts for about 40 per cent of its exports, (DSCRP, 2007). Other export crops – palm oil, cashews and pineapples – make up only around 10 per cent of exports.

Agriculture is the main driver of growth in Benin, but this sector is highly dependent on the level of rainfall and is not competitive due to the high cost of agricultural inputs and the low level of mechanisation. The country has huge potential in terms of farmland that is well-suited to the needs of diversified agriculture. Efforts to diversify into other export sectors are under way. It is important to point out that, among new channels identified to diversify Benin economy is found one of the shea almond channel, DSCRP, 2009:64. For

that reason, Benin government and partners work to develop the shea almond sector with a high involvement of women.

Benin also has considerable potential underground, with gold, offshore oil, marble, limestone, phosphate and iron deposits, but these resources are not extensively exploited.

As for the secondary sector, this contributes only to 13 per cent to Gross Domestic Product (GDP). Industrial production is dominated by the food, textile and cement industries. Building and energy, which are essential to industrial development, contribute very little to GDP, at 4.4 per cent and 1.1 per cent respectively. Efforts are being made by current the government to improve overall environment of investment, (DSCRP, 2009).

As far as the tertiary sector is concerned, it accounts for almost half of GDP. Benin's geographical location in relation to countries in the hinterland such as Nigeria, Niger, Burkina Faso and Mali offers extensive opportunities in transport, transit and tourism.

Like other developing countries, Benin's women contribute to economic development. They have traditionally played an important role in the Small and Medium-sized Enterprises (SMEs) sector, as owners, managers and workers. They also perform most agricultural work in rural areas, where they act as micro entrepreneurs and traders of agricultural produce, UNIDO, (1994). Improve the working conditions of those women, generally poor, will certainly contribute to improve their living conditions. Thus, it is obvious that the findings of the present study would serve Benin authorities and other actors involved in promoting and developing shea almond processing.

Chapter 4: Research Methods

4.1. Exploratory research

A variety of secondary sources of information on technology transfer has been used as cited in chapters above.

As for sources, notice that the great part of exploited articles is provided by the dissertation supervisor. Besides, the work papers and documents of the centres of documentation of ‘‘Faculté des sciences agronomiques (FSA)’’, ‘‘Bureau d’appui aux artisans (BAA)’’, the Ministry of microfinance and job creation, the Ministry of agricultural have been exploited in the frame of the literature review. Furthermore, Internet has contributed as a source of research documents mainly in shea almond processing and trading.

The exploitation of those documents results in the identification of the research method called the Delphi method. The following section presents the method.

4.2. Presentation of the Delphi Method

4.2.1. Overview of the Delphi Method

From Skulmoski et al, (2007), the Delphi method is an iterative process used to collect and distill the judgments of experts using a series of questionnaires interspersed with feedback. The Delphi method has its origins in the American business community, and has since been widely accepted throughout the world in many industry sectors including health care, defense, business, education, information technology, transportation and engineering.

In short, it is a method of structuring group communication in a series of rounds in order to obtain a consensus of group opinion (Linstone and Turoff, 1975). This method uses a panel of experts who have experience and/or

knowledge of the subject being studied. It is necessary to precise that, in the frame of this study, the term stakeholder is preferred to expert.

4.2.2. Application of Delphi Method

From Khalid and Jeffrey, (2009), eight steps are used when applying the Delphi method in the research process. Those are:

a) identification of the research topic and the problem;
b) determination of the experience required for substantial involvement in the investigation area;
c) selection of the experts/stakeholders in the area;
d) preparation and development of the Delphi survey instruments;
e) contacting the selected experts/stakeholders through survey instruments or other appropriate media to reach opinions or specific issues of interest;
f) computing and coding the answers of the respondents;
g) contacting the selected experts/stakeholders again to provide the consensus, additional information and feedback in the second Delphi survey instruments; and
h) analysing the data of the respondents' revised answers and comments.

In the frame of this study, all these steps will be applied.

4.2.3. Typical Delphi process

Typically, a non-anonymous three-round Delphi-type is carried out as follows, Okoli and Pawlowski (2004):

a) round-one: initial collection of issues (identification);
b) round-two: confirmation and narrowing down of the issues (confirmation); and
c) round-three: ranking the list of important issues (ranking).

The questionnaires are designed and each subsequent questionnaire is developed based on the results of the previous questionnaire. The process stops when the research question is answered: for example, when consensus is reached, theoretical saturation is achieved, or when sufficient information has been exchanged.

As for this study, at least two rounds have been carried out.

4.2.4. How others used the Delphi Method?

From Skulmoski et al, (2007), it is noticed that the Delphi method had been used in a variety of studies (Adler and Ziglio, 1996; Linstone and Turloff, 1975; Rowe and Wright, 1999) and a range of Delphi possibilities had been established. The method had been used in researches to develop, identify, forecast and to validate in a wide variety of research areas.

While a three round Delphi is typical, single and double round Delphi studies have also been completed. Finally, the sample size varies in their studies from 4 to 171 "experts". One quickly concludes that there is no “typical” Delphi. Rather the method is modified to suit the circumstances and research questions.

4.2.5. Critics of the Delphi Method

Commonly called Expert Opinion, the Delphi Method is one of the best-known methods of forecasting. It attempts to obtain a consensus of opinion among experts in a certain field independently on whether experts are meeting or separate. Besides, it allows searchers to get update information from different stakeholders about a given subject.

However the method is not without limits. Indeed, a major criticism related to the Delphi Method is the identification of experts – who are the experts. What makes them an expert – especially when thinking about the future? Besides, the so-called experts do not explain clearly and fully their viewpoints in

general because they are busy people and often unwilling to give much of their time. In addition, some are unwilling to share their knowledge for distinctive reasons, (Boris, 2008).

Hence, it is clear that Delphi results depend on the nature and the relevance of questions asked to the experts on the one hand and the choice of so-called experts on the other hand. So, Delphi results are highly sensitive to the formulation of the questions asked and also the involved stakeholders.

Considering the level of development of shea almond processing in Benin, the term ‘expert’ is not appropriate. ‘Stakeholder’ is used instead.

4.3. Selection of the Delphi Method

Three reasons explain the choice of the Delphi method.

First, time-wise the targeted approaches cannot be studied thoroughly for the most appropriate choice. As the Delphi method has been comprehended, it has thus been chosen.

In addition, an analysis of the Delphi methods reveals that it fits the present work. In fact, making a link with the research questions in the frame of the present dissertation topic, it is a methodology for a rigorous enquiry/opinion of experts/stakeholders (Chang, 2006; Okoli and Pawlowski, 2004). It does not apply to a specific scope. Some critics made on Delphi Method could be overcome. So, the improvements are envisaged.

Furthermore, past studies in this sector have scarcely applied it, Skulmoski et al, (2007). Thus, it will fulfill the gap on literature.

Outlined in the following section is how the Method is applied in the frame of this study taking into consideration the critics.

4.4. Delphi Method to the present study

4.4.1. Identification of target and sampling

4.4.1.1. Identification of target

Selecting experts/stakeholders is a critical component of Delphi research since the output of the Delphi method is based on their opinion (Ashton, 1986; Bolger and Wright, 1994; Parente et al, 1994). There are four requirements for "expertise": i) knowledge and experience with the issues under investigation; ii) capacity and willingness to participate; iii) sufficient time to participate to the Delphi; and, iv) effective communication skills (Adler and Ziglio, 1996). Since expert opinion is sought, a purposive sample is necessary where people are selected not to represent the general population, rather their expert ability to answer the research questions, (Fink and Kosecoff, 1985).

Taking into consideration those characteristics, a target is constituted by key stakeholders of technology transfer in shea almond processing. Indeed, further to precedence with a team of a study office, called BAA (Bureau d'appui aux artisans), supporting shea almond processors, the targets mentioned in the table below have been identified. As for the interviewees, they are the people effectively involved in using technology, designing technology, and the people in charge of promoting shea almond processing.

Systematic type of sampling is under considered. The table below gives details of targeted interviewees.

Table 4.4.1.1.1: Table of targets

Nature/Function	Targets
Technology users (TU)	- Two leaders of women group - Three members which are not a leader
Technology designers/ makers (TM)	- Manager of organisation of technology designer or a co-worker involved in the process
Technology acquirers (TA)	- Manager of study office or co-worker in charge of technology transfer - Manager or co-workers of technical and financial partners involved in supporting shea almond processing - Person in charge of technology transfer in public organisations
Technology regulator (TR)	- Person in charge of technology transfer in public organisations

4.4.1.2. Sampling

The size of sample is mainly determined taking into consideration the level of stakeholders' involvement and their vitality in the channel of shea almond processing and trading. It is also determined taking into account the real availability of target. Furthermore, the size of sample is influenced by the financial capacity available to conduct the survey. Last, the time available before the submission of the dissertation is relatively short to interview all the relevant stakeholders. So, considering those facts, the tables below present the forecast and interviewed target.

4.4.1.2.1. Forecast and effective sample size of technology users

The target is oriented only to women in group instead of women exerting individually. Besides only the women of beneficiary group of technology have been interviewed. The sample is constituted by the most dynamic woman groups. Thus, for technology users, thirty people are interviewed at the rate of five people per targeted group.

Table 4.4.1.2.1.1: Forecast and effective Sample size of technology users (TU)

Name of woman groups		Sample		Name of area
		Forecast	Realised	
Technology users: woman groups	Antii soua	3	5	Komiguèa
	Su dom sé	3	5	Korobororou
	An temmana	3	5	N'Dali
	An koua anmon	3	5	Pèrèrè
	Sukianna	3	5	Bembèrèkè
	CAMF	3	5	Parakou
Sub Total 1		**18**	**30**	
		166. 66%		

The rate of 166.6% is due to the availability of women to answer the questionnaire.

4.4.1.2.2. Forecast and effective sample size of technology makers

Shea almond technology makers are identified as stakeholders because it is important to know the issues that they are confronted with while designing appropriate technology for users. In Benin, there are two kinds of technology providers: national providers notably craftsmen and technical schools on the one hand and foreign investors on the other hand.

Table 4.4.1.2.2.1. Forecast and effective Sample size of technology designers/makers (TM)

Name of the organization			Sample		Name of area
			Forecast	realised	
Technology designers/ Makers	National providers	COBEMAG	1	2	Parakou
		ALAFIA	1	2	Bembéréké
		FSA	1	0	Cotonou
		Steimeiz Centre	1	0	Parakou
	Foreign Investors	Association Sino Béninoise de Développement	1	0	Cotonou,
Sub Total 2			**5**	**4**	
			80%		

The rate of 80 percent can be explained by the non availability of some interviewees during the survey period.

4.4.1.2. 3. Forecast and effective sample size of technology acquirers

As mentioned in chapter 3, women are so poor that they can not use their money to acquire technology. Thus, Benin government and mostly technical and financial partners via non government organisations (NGOs) and study offices located in the country together support those women by providing them with the technology. They acquire directly technology from technology designers to give to women. Thus, in the frame of this study, it would be useful to involve them among the stakeholders in order to get issues that they are confronted with while acquiring technology.

Table 4.4.1.2.3.1: Forecast and effective sample size of technology acquirers

Technology acquirers	Name of the organisation	Sample		Name of area
		Forecast	Realized	
Technical and Financial Partners, Study offices and NGOs	BAA	2	0	Cotonou-Parakou
	Apidev	1	1	Parakou
	UGKAP	1	1	
	GAPAB	1	0	
	CASPA	1	0	
	Helvetas	1	0	
Public Institutions as acquirers	MPME	1	1	Cotonou-Parakou
	DDIC	1	1	
	FNPEJ	1	1	
	DPQC	1	1	
Sub total 3		**11**	**6**	
		54.54%		

Only 54.54% of target has been interviewed. This is due to the non availability of targeted people.

4.4.1.2.4. Forecast and effective sample size of technology regulators

The Government of Benin plays two roles as acquirers and as regulators through its organisations. The managers of those organisations are interviewed.

Table 4.4.1.2.4.1: Forecast and effective sample Technology regulators

Name of the organization	Sample		Name of area
	Forecast	Realised	
MPME	3	2	Parakou and Cotonou
DDIC	2	1	
FNPEJ	1	1	
DPQC	1	1	
Sub total 4	**6**	**5**	
	83.33%		

As for this sample, **83.33%** some targets have been interviewed.

4.4.1.2.5. Summary of sampling

The table below recapitulates the sample of stakeholders. Even if the number of people per stakeholder group held for interview appears low, the stakeholders affected in the channel of shea almond processing are fully covered.

Table 4.4.1.2.5.1: Forecast and effective sample size of the study

Nature/Function	Forecast sample size	Realised sample
Technology users	18	30
Technology designer/makers	5	4
Technology acquirers	11	6
Technology regulators	6	5
TOTAL OF SAMPLE	**40**	**45**
	112.5%	

4.5. Data Collection Techniques

A questionnaire, face to face interviews, e-mail and observation are data collection techniques. Detailed questionnaire which includes each step of technology transfer process is designed and illustrated to interviewees. Due to the deadline for submitting the report, two rounds Delphi survey are adopted for all the stakeholder groups. As far as observation is concerned, it is used to acquaint with hard technologies provided for women.

The first round is one of the study pilot from which the first findings are found. From that, the research instrument (questionnaire and stakeholders sample) has been refined and the way to analysis data has started.

4.6 Data analysis techniques

As for data analysis techniques, a coding approach is adopted and it has begun with the pilot study findings. After a global data gathering, a quantitative and qualitative analysis of responses are carried out. The following way is adopted:

- Issues are grouped for each step of technology transfer
- Issues are numbered within each step of technology transfer
- Issues related to shea almond processing are identified and listed following the steps of technology transfer but issues related to shea butter trading are only listed without taking into account the steps of technology transfer. This is due to the low level of development of shea butter commercialisation.

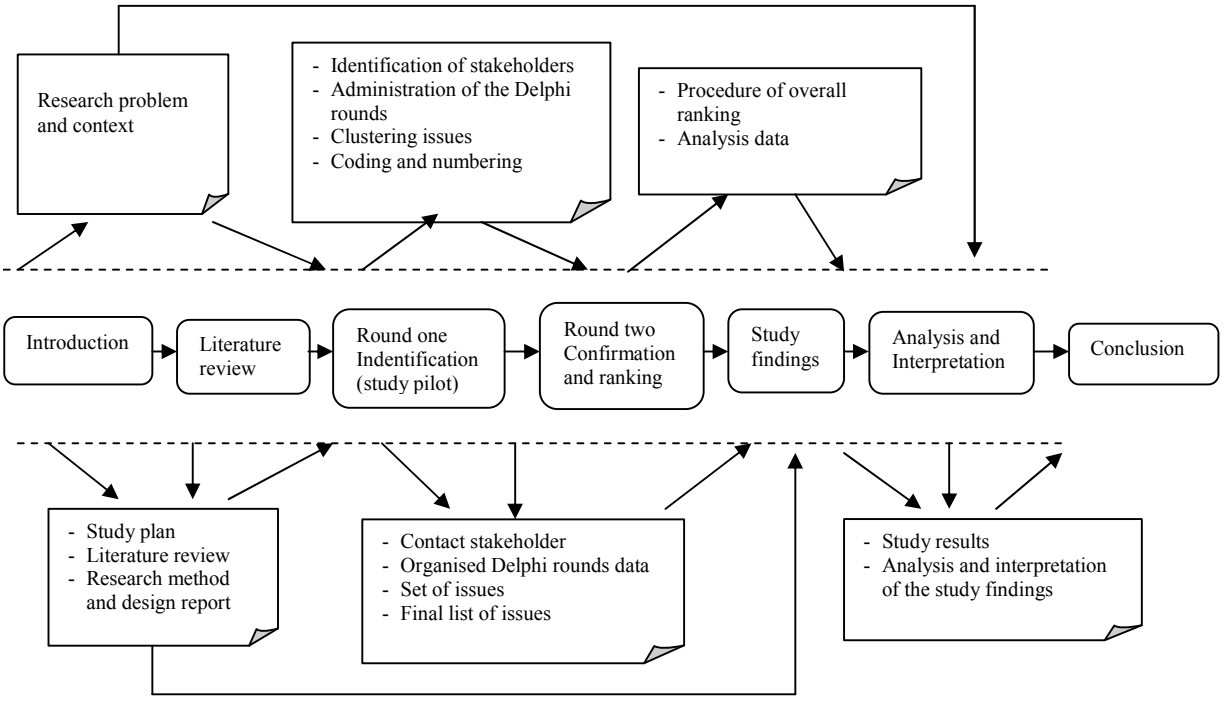
After the overall survey, they are additional issues that have been taken into consideration. Those additional issues have got successive number. So, the number preceding an issue is not related to a rank but is only a coding number.

As for the ranking, for the same issue numbered, each interviewee gives a rank according to his perception of the issue. Consequence, the same issue can get different rank from one interviewee to another within the same stakeholder group and also from one stakeholder to another.

It is useful to point out that the application of the Delphi Method in the case of this study has been difficult because the available time is short. However, efforts have been made to get some relevant data as presented in the following chapter.

To sum up this chapter, figure 4.1 below describes the research method of this study.

Figure 4.1.Study design



Chapter 5: Study Findings

The objective of this section is to report on the analysis of the data and findings from the study survey about issues affecting the success of technology transfer in shea butter channel in Benin.

The study has separated issues related to technology transfer in shea almond processing from the ones of trading. Thus, two parts constitutes this chapter. Besides, the issues are formulated in terms of problems which affect the success of technology transfer in the sector but not in terms of needs to successful technology transfer.

Furthermore, the importance of issues is analysed, inside a stakeholder group on the one hand, and among stakeholder groups on the other hand, from parameters of dispersions. The standard deviation (SD), Standard error (SE) and Coefficient of variation are calculated. Some comments are given to explain the results.

5.1. Issues affecting the success of shea almond processing in Benin

Issues are collected according to the steps of technology transfer as developed by Boris, 2008. From the survey, the number of fields of issues per technology transfer step varies from two (02) to nine (09) as presented in tables below.

First, issues related to each step are presented and ranked from statistical data and analysis. The coefficients of variations (CV in percentage %) are calculated to let a better comparison of the distribution of data series.

Besides, to have a visual idea of the dispersion of values inside a group of stakeholders and simultaneously among the groups of stakeholders, charts are produced from a 95% confidence interval for each question. The formula is:

CI = Mean plus/minus 1.96*standard error.

5.1.1. Issues related to technology identification's steps

Nine fields of issues are identified by interviewees. The Mean (M), and dispersion parameters are calculated for each question related to stakeholder groups as illustrated in table 5.1.1.1 below.

Table 5.1.1.1: Ranking of the issues related to technology identification

Indicators per stakeholder group	Technology acquirers					Technology makers					Technology users					Technology regulators				
Issues	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**
1. Length of technology identification process	3	1,581	0,707	52,705	**2,00**	2,5	1,291	0,645	51,640	**2,50**	4,1	1,929	0,352	47,425	**5,00**	5,4	2,793	1,249	51,719	**5,00**
2. Difficulty in getting information on the available technologies (varieties of technologies, substitutes, parts, providers, environmental impacts and health measures)	3,2	0,837	0,374	26,146	**8,00**	2,5	1,291	0,645	51,640	**2,50**	2,9	1,461	0,267	49,793	**4,00**	5,4	3,050	1,364	56,474	**4,00**
3. High cost of technology (suppliers located far)	2	1,000	0,447	50,000	**3,00**	3,25	0,957	0,479	29,459	**7,00**	2,9	1,552	0,283	52,914	**2,00**	3	2,000	0,894	66,667	**1,00**
4. Lack of technology identification facilitators	3,8	1,304	0,583	34,312	**7,00**	3	0,816	0,408	27,217	**8,00**	8,5	1,196	0,218	14,123	**9,00**	4,6	3,050	1,364	66,295	**2,00**
5. Lack of local technology makers and suppliers	4,6	1,673	0,748	36,377	**6,00**	7,5	2,887	1,443	38,490	**5,00**	5,7	1,953	0,357	34,473	**6,00**	3,4	1,673	0,748	49,215	**6,00**
6. Meeting users' deadline	2,4	1,140	0,510	47,507	**4,50**	7	2,160	1,080	30,861	**6,00**	2,2	1,117	0,204	51,542	**3,00**	6,8	2,683	1,200	39,460	**7,00**
7. Inappropriate production units	9,6	0,548	0,245	5,705	**9,00**	7,5	3,000	1,500	40,000	**4,00**	7,7	2,139	0,391	27,898	**8,00**	4,4	1,517	0,678	34,468	**8,00**
8. Lack of trustworthy facilitators/intermediaries	2,2	1,304	0,583	59,265	**1,00**	2,5	0,577	0,289	23,094	**9,00**	4,6	2,671	0,488	57,658	**1,00**	9	1,732	0,775	19,245	**9,00**
9. Lack of official frame communication among the stakeholders does not help identification process	2,4	1,140	0,510	47,507	**4,50**	1,75	0,957	0,479	54,710	**1,00**	7,4	2,112	0,386	28,414	**7,00**	2,2	1,304	0,583	59,265	**3,00**

- ***Comments***

- Issue 1: This issue is the consequences of issue n° 2 explained below.

- Issue 2: According to the interviewees, to get information on desired technology, takes a lot of time because the local makers do not get the technology wished and furthermore, most of technology makers are outside the country. It is not easy to identify them and get appropriate technology. Besides, technology makers do not provide acquirers with full information on the characteristics of technology. That results in their dependency on providers and overcost.

- Issue 3: According to technology acquirers, regulators and users, the high cost is often due to the non- proximity of technology makers. As for local makers, they often depend on outside providers for either raw material or parts; it is obvious that it can induce additional cost.

- Issue 4: There is not in Benin an organisation specialised on technology identification notably in shea butter production. The acquirers conduct the process on their own way.

- Issue 5: Officially, the number of organisation providers of technology is not sufficient. All of them do not make the desired technologies by acquirers. According to technology makers, they do not get appropriate productions units to satisfy acquirers' needs. According to users, technology makers are not often available to respond to their solicitation when the provided technology stops working. This could explain the reasons why women abandon the technology.

- Issue 6: According to technology users and acquirers, technology makers notably the local ones do not often respect deadline. The reasons, according to technology makers, are the dependence on outside

providers, and also internal factors, like the problems of productions units.

- Issue 7: According to the managers of ‘‘COBEMAG’’ and ‘‘ALAFIA COMPLEX’’, which are both technology makers, they productions units need to be changed and renewed. But the bank conditions are not favourable enough.

- Issue 8: This issue is highlighted by technology acquirers and users. The overvaluation of costs, the non or partial delivery services are items regularly observed from technology makers.

- Issue 9: The channel of shea butter production in Benin lacks a frame of dialogue and consultation including the leaders of the stakeholder groups.

From the table above and the middle of error bars (see the chart below) the rank stability of issues is analysed as followed:

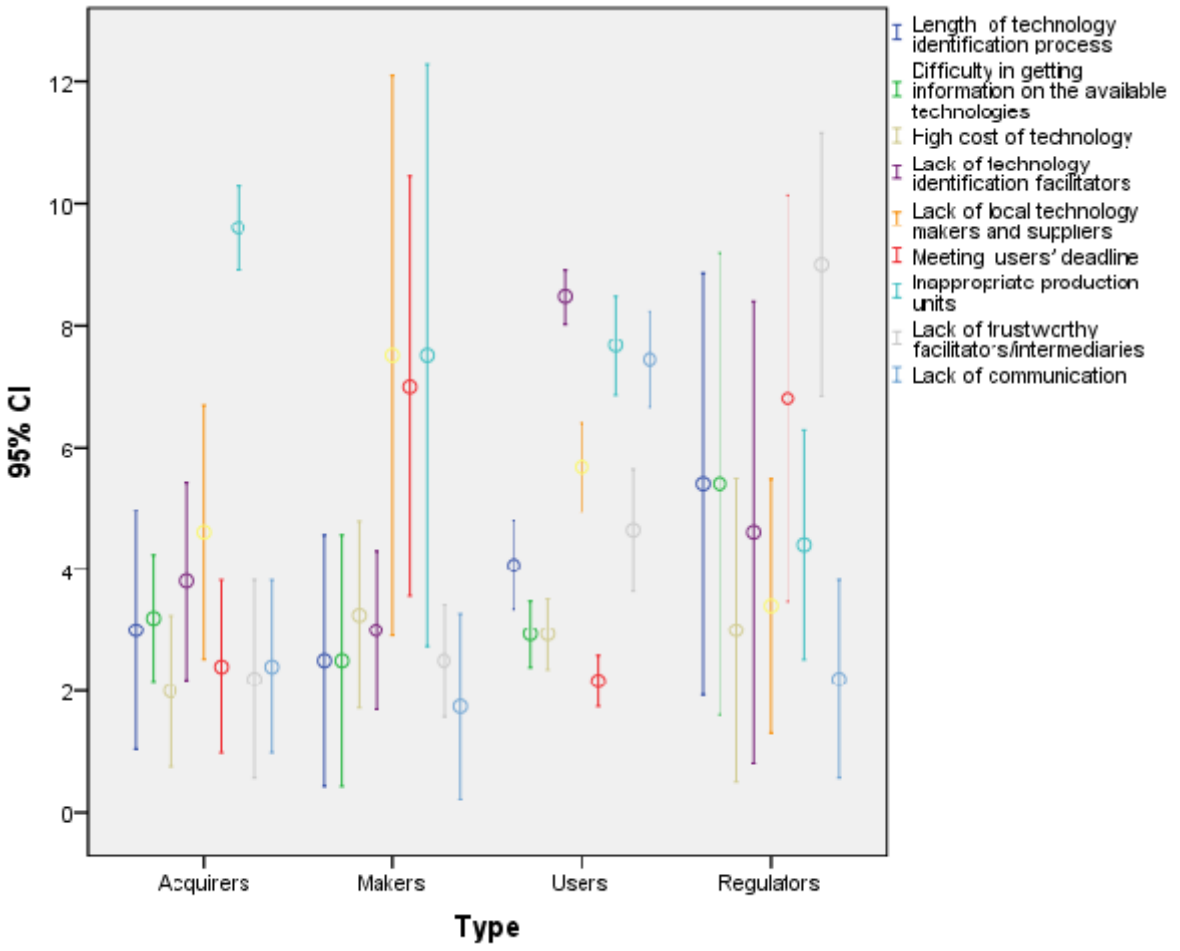
Table 5.1.1.2: Analysis of the stability rank of identification issues

Stakeholder groups	Rank from CV	Rank from CI middle	Observations on the rank stability	Stability Ratio
Acquirers	8-1-3-6-9-5–4-2-7	3-8-6-9-1-2-4-5-7	Only issue 1 has changed significantly.	8/9
Makers	9-1-2-7-5- 6-3-4-8	9-1-2-8-3-4-6-5-7	Issues 7-5 are inverted rank and have changed significantly. Also, issue 8 has changed significantly.	6/9
Users	8-3-6- 2-1-5- 9-7- 4	6-2-3-1-8-5-9-7-4	Only issue 8 has changed significantly.	8/9
Regulators	3-4-9-2-1-5- 6-7-8	9-3-5-7-4-1-2-6-8	Issues 2-4-5-7 have significance changed	6/9

The chart below presents a dispersion of stakeholder groups’ perceptions using confidence interval.

NB: If the error bars do not overlap when comparing say acquirers and regulators then it is said to be a significant difference.

Chart 5.1.1.1: Comparison of dispersion of stakeholder groups' perceptions on issues related to technology identification



- ***Comments***

- Most of the error bars overlap when comparing all groups of stakeholders. However, there are some cases presenting a significant difference. Those are:

- Error bars n°4 and n°9 related to Users which do not overlap with the ones of the rest.

- Error bars n°6 related to Makers and regulators are isolated from the ones of Acquirers and Users

- Error bars n°8 related to Users and Regulators are isolated from the ones of Acquirers and Makers

In short, apart from some cases, all the stakeholder groups agree with most of the highlighted issues.

5.1.2. Issues related to technology evaluation's steps

The responses of interviewees are categorised into two (02) fields. Table 5.2 presents in detail the analysis parameters of each question.

Table 5.1.2.1: Ranking of the issues related to technology evaluation

Indicators per stakeholder group	Technology acquirers					Technology makers					Technology users					Technology regulators				
Issues	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**
1. Evaluation of application capacities and costs (parts, maintenance, training and related cost, availability of technology, warranty, price variation, technology costs)	1,6	0,548	0,245	34,233	**2,00**	1,5	0,577	0,289	38,490	**1,00**	1,9	0,819	0,150	43,891	**2,00**	2,8	0,447	0,200	15,972	**2,00**
2. Difficulty in evaluating social and environmental impacts	2,2	0,837	0,374	38,030	**1,00**	2,5	0,577	0,289	23,094	**2,00**	1,5	0,730	0,133	47,628	**1,00**	2,4	0,548	0,245	22,822	**1,00**

- *Comments*

Issue 1: The evaluation of technologies is not fully mastered by the stakeholders. According to them, it is difficult to get full information on the desired technology.

Issue 2: The same observation is revealed about getting full information notably on consequences on environment aspects. All the aspects of the desired technologies which could be harmful to people and to environment are not revealed by technology providers. For this issue, all the stakeholder groups agree with each other. This is illustrated by chart 5.1.2.1.

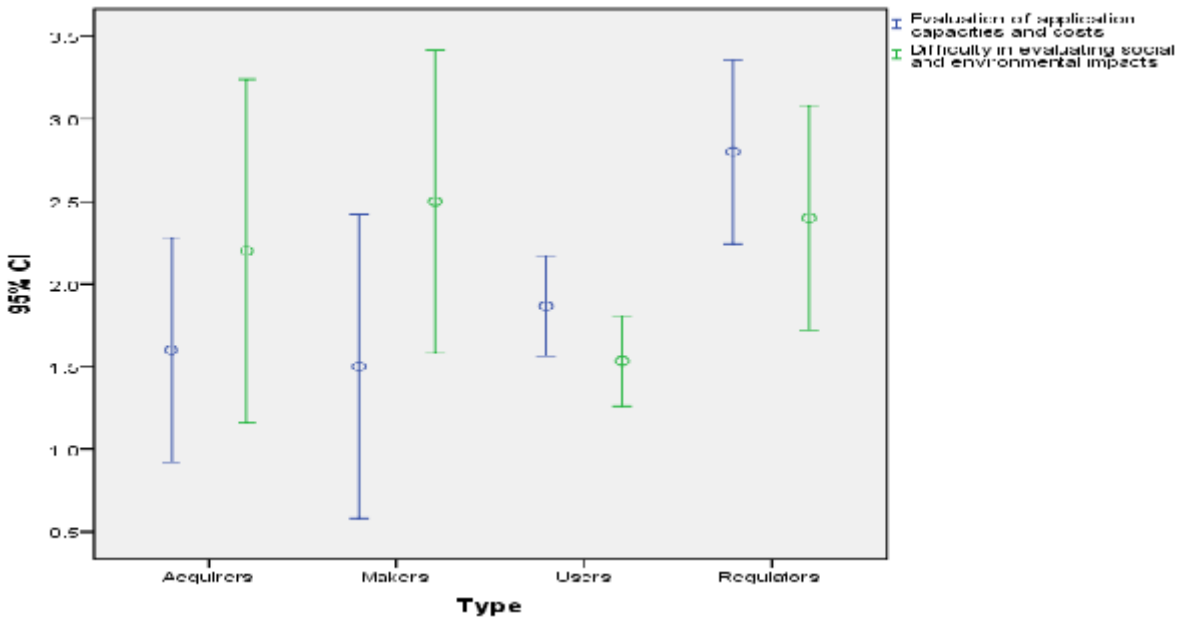
From the table above and the middle of error bars (see the chart below) the rank stability of issues is analysed as followed:

Table 5.1.2.2: Analysis of rank stability of evaluation issues

Stakeholder groups	Rank from CV	Rank from CI middle	Observations on the rank stability	Stability Ratio
Acquirers	2-1	1-2	Issue 1 has been inverted thus slight change	1/2
Makers	1-2	1-2	Stability	2/2
Users	2-1	2-1		
Regulators	2-1	2-1		

Chart 5.1.2.1 illustrates how the stakeholder groups agree with each other on the same question

Chart 5.1.2.1: Comparison of dispersion of stakeholder groups' perceptions on issues related to technology evaluation



- ***Comments***

Apart from the error bar of issue n°1 related to Regulators, which seems to be isolated from the ones of Acquirers, Makers and Users, it appears an overlap with all the rest.

In short, all the stakeholders agree on issues pointed out.

5.1.3. Issues related to technology attraction's step

Eight fields' issues are categorised. Table 5.1.3.1 presents in detail the analysis parameters.

Table 5.1.3.1: Ranking of the issues related to technology attraction

Indicators per stakeholder group	Technology acquirers					Technology makers					Technology users					Technology regulators				
Issues	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**
1. Lack of ministry decision coordination that induces a lack of regulation framework and absence of technology policy negociation	3,8	1,789	0,800	47,075	**5,00**	7	2,828	1,414	40,406	**4,00**	9,0	0,000	0,000	0,000	**5,50**	2	1,000	0,447	50,000	**4,00**
2. Non encouraging banking conditions	3,8	1,483	0,663	39,033	**6,00**	1,75	0,500	0,250	28,571	**5,00**	2,6	0,999	0,182	37,953	**4,00**	5	2,915	1,304	58,310	**1,00**
3. Corruption and ransoms (customs, civil servants, etc.	2	1,000	0,447	50,000	**3,00**	1,75	0,957	0,479	54,710	**3,00**	2,2	1,064	0,194	48,341	**2,00**	6,2	2,775	1,241	44,756	**5,00**
4. Burdensome acquisition negociation (aspects related to business negociation)	3,8	2,168	0,970	57,051	**2,00**	5,5	1,291	0,645	23,473	**7,00**	2,9	1,185	0,216	40,851	**3,00**	5,4	2,702	1,208	50,034	**3,00**
5. Absence of joint venture between local and foreign partners	8,4	1,342	0,600	15,972	**7,00**	4,75	0,957	0,479	20,156	**6,00**	9,0	0,000	0,000	0,000	**5,50**	7,2	2,490	1,114	34,583	**7,00**
6. Lack of control over property right	8,6	0,548	0,245	6,369	**8,00**	3,5	2,517	1,258	71,903	**1,00**	9,0	0,000	0,000	0,000	**5,50**	4	1,225	0,548	30,619	**8,00**
7. Low negotiation skills	2,2	1,095	0,490	49,793	**4,00**	5,5	0,577	0,289	10,497	**8,00**	1,6	0,850	0,155	52,058	**1,00**	3,2	1,304	0,583	40,745	**6,00**
8. Burdensome administrative procedures as far as the application of technology transfer decisions and production certification is concerned	4,2	2,950	1,319	70,228	**1,00**	4,25	2,500	1,250	58,824	**2,00**	9,0	0,000	0,000	0,000	**5,50**	4,6	2,510	1,122	54,565	**2,00**

- *Comments*

*Issue 1: There are lots of public organisations dealing with shea almond processing in Benin. According to stakeholders, the activities of those organisations lack synergy. There is a l*ack of regulation framework and absence of technology policy negotiation.

Issue 2: According to stakeholders, most of the conditions to get funds from banks and Micro finance institutions located in Benin are not favourable to promoters. However, the latter solicit them as there do not have another alternative which leads to enhance promoters' capitals. Hence, promoters pass the charge of interest rate on the price of made technology.

Issue 3: Technology acquirers and makers are often victims of corruption and ransoms notably by customs and civil servants when entering technology from other countries.

Issues 4, 7 and 8: The negotiation related to technology attraction notably from other countries with business and public administrators and civil servants is too long and full of pitfalls. Most of the pitfalls are due to the low negotiation skills.

Issue 5: The channel of shea almond processing in Benin lacks joint venture between local and foreign partners both in technology fabrication and in shea almond processing. Thus, the improvement of technologies in the channel and the increase of shea butter production do not rise up.

Issue 6: The control over property right is not effective according to technology makers. That does not encourage technology makers to innovate more.

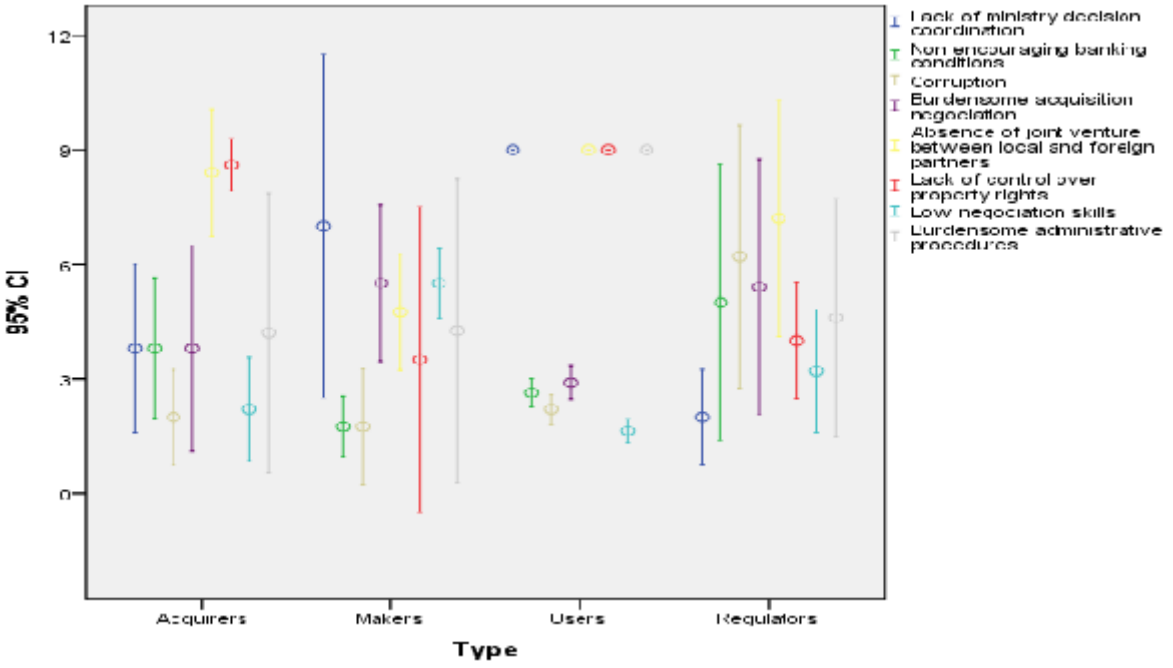
From the table above and the middle of error bars (see the chart below) the rank stability of issues is analysed as followed:

Table 5.1.3.2: Analysis of rank stability of attraction issues

Stakeholder groups	Rank from CV	Rank from CI middle	Observations on the rank stability	Stability Ratio
Acquirers	8-4-3-7-1-2-5-6	3-7-1-2-4-8-5-6	Issue 4-8 has changed significantly.	6/8
Makers	6-8-3-1-2-5-4-7	2-3-6-8-5-4-7-1	Issues 1-2 have changed significantly.	6/8
Users	7-3-4-2-1-5-6-8	7-3-2-4-1-5-6-8	Slight change	7/8
Regulators	2-8-4-1-3-7-5-6	1-7-6-8-2-4-3-5	Issues 1- 2- 4-7 have significantly changed	4/8

Only the ranks related to regulators have significantly changed.

Chart 5.1.3.1: Comparison of dispersion of stakeholder groups' perceptions on issues related to technology attraction



- *Comments*

Most of the error bars overlap when comparing the four groups of stakeholders. However, there are some isolated cases showing a significant difference.

Those are error bars n°3 related to Regulators, n°7 related to Makers and n°8 related to Users. When comparing Users to Regulators, there is a significant difference on issues n°1, n°3, n°6 and n°8. Those could be explained by the field of interest of stakeholder groups.

5.1.4. Issues related to technology absorption's steps

Seven fields of issues are listed by the interviewees. Table 5.1.4.1 presents in detail the statistical items.

Table 5.1.4.1: Ranking of the issues related to technology absorption

Indicators per stakeholder group	Technology acquirers					Technology makers					Technology users					Technology regulators				
Issues	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**
1. Non understanding by women of how to use the acquired technologies (manual, machinery, etc.)	1,8	0,837	0,374	46,481	**1,00**	2	0,816	0,408	40,825	**2,50**	1,5	0,681	0,124	44,442	**2,00**	4,4	2,302	1,030	52,322	**3,00**
2. Low level of education, advanced age, illiteracy and incomes of women involved in the process	1,4	0,548	0,245	39,123	**2,50**	2	0,816	0,408	40,825	**2,50**	1,3	0,479	0,088	35,960	**3,00**	3	1,581	0,707	52,705	**2,00**
3. Lack of entrepreneurial mind	3	0,707	0,316	23,570	**7,00**	3	0,816	0,408	27,217	**5,00**	5,7	2,016	0,368	35,163	**4,00**	3,8	2,588	1,158	68,117	**1,00**
4. Lack of appropriate training (technical, management of human resources, production strategy, etc.)	5	1,225	0,548	24,495	**6,00**	5	1,414	0,707	28,284	**4,00**	3,3	0,959	0,175	28,768	**5,00**	5,6	1,517	0,678	27,082	**6,00**
5. Lack of local technology transferors that induces a high cost of paying the few available transferors	5,2	1,304	0,583	25,074	**5,00**	7,75	0,500	0,250	6,452	**7,00**	2,3	1,048	0,191	46,247	**1,00**	5,2	1,789	0,800	34,401	**5,00**
6. Withholding of information by technology transferors	4,2	1,643	0,735	39,123	**2,50**	5,25	2,986	1,493	56,878	**1,00**	5,3	0,596	0,109	11,245	**6,50**	4	1,871	0,837	46,771	**4,00**
7. Lack of concentration of women during training due to their daily concerns to ensure the vital' needs of family	6,6	2,191	0,980	33,195	**4,00**	7,25	0,957	0,479	13,206	**6,00**	6,3	0,596	0,109	9,460	**6,50**	8	0,000	0,000	0,000	**7,00**

- *Comments*

Issues 1, 3, 6 and 7 are mostly the consequences of issue 2 below described.

Issue 2 : The low levels of education and incomes, advanced age, illiteracy of women involved in the process have been highlighted by stakeholders. Those factors affects technology absorption as users mostly cannot read or write directives given by the technology transferors. The technology transferors cannot also explain all the characteristics of the given technology in their languages. That induces the withholding of information by technology transferors.

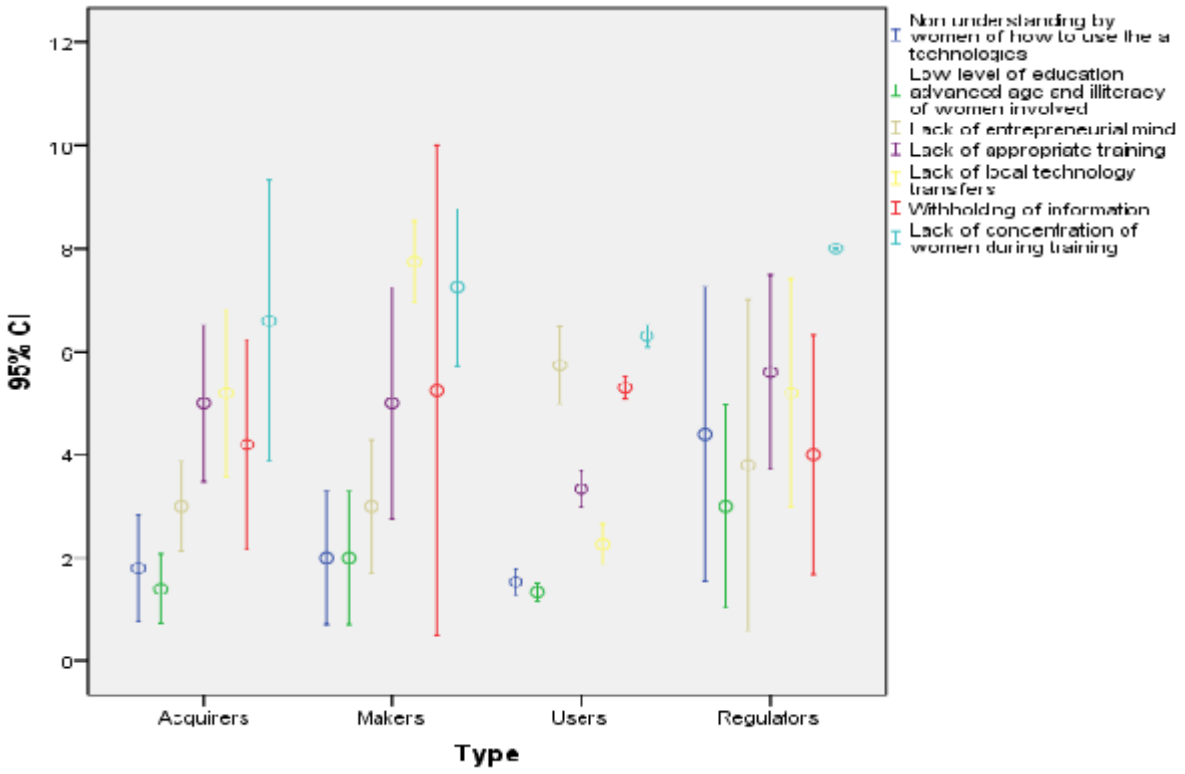
From the table above and the middle of error bars (see the chart below) the rank stability of issues is analysed as followed:

Table 5.1.4.2: Analysis of rank stability of absorption issues

Stakeholder groups	Rank from CV	Rank from CI middle	Observations on the rank stability	Stability Ratio
Acquirers	1-2-6-7-5-4-3	2-1-3-6-4-5-7	Issue 3-7 have significantly changed.	5/7
Makers	6-1-2-4-3-7-5	2-1-3-4-6-7-5	Issues 6-2 have significantly changed.	5/7
Users	5-1-2-3-4-6-7	2-1-5-4-6-3-7	Slight change	6/7
Regulators	3-2-1-6-5-4-7	2-3-1-6-5-4-7		6/7

Chart 5.1.4.1. Illustrates how the stakeholder groups agree with each other on the same question.

Chart 5.1.4.1: Comparison of dispersion of stakeholder groups' perceptions on issues related to technology absorption



- *Comments*

Apart from error bars n°3 related to Users and n°5 related to both Makers and Users, most of the error bars overlap when comparing the four groups of stakeholders. It can be concluded that stakeholders concur on issues pointed out even if there are relative importance.

5.1.5. Issues related to technology application's step

Five fields of issues are listed by the interviewees. The analysis of data leads to table 5.1.5.1 which is presented below.

Table 5.1.5.1: Ranking of the issues related to technology application.

Indicators per stakeholder group	Technology acquirers					Technology makers					Technology users					Technology regulators				
Issues	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**
1. Non optimum use of acquired technology due to low level of technology absorptive, and unableness to follow usage instruction	2,2	0,837	0,374	38,030	**2,00**	3,75	0,957	0,479	25,531	**3,00**	4,9	1,383	0,252	28,417	**4,00**	2,4	1,342	0,600	55,902	**1,00**
2. Cultural attitudes towards technology (fear and shame of being injured)	1,6	0,548	0,245	34,233	**3,00**	2,75	1,708	0,854	62,103	**1,00**	1,9	0,923	0,168	48,573	**2,00**	2	0,707	0,316	35,355	**4,00**
3. Complexity of some technologies	4,6	1,342	0,600	29,166	**4,00**	5,75	0,500	0,250	8,696	**5,00**	2,5	1,332	0,243	52,586	**1,00**	5,4	1,342	0,600	24,845	**5,00**
4. Problems in technology introduction strategy	2,4	1,342	0,600	55,902	**1,00**	2,5	1,291	0,645	51,640	**2,00**	2,6	1,189	0,217	45,135	**3,00**	2,4	1,140	0,510	47,507	**3,00**
5. Inexistence of communication among stakeholders	4,8	0,837	0,374	17,430	**5,00**	4	0,816	0,408	20,412	**4,00**	3,2	0,791	0,145	24,994	**5,00**	4,6	2,191	0,980	47,628	**2,00**

- *Comments*

Issue 1: Women cannot successful absorb provided technology that could explain the non optimal use of technology. Women revealed that as do not take note of training thus, they do not get possibility to review training contents when for instance hard technology stops working.

Issue 4: Related to the strategy of technology introduction is dealt yet in chapter 3.

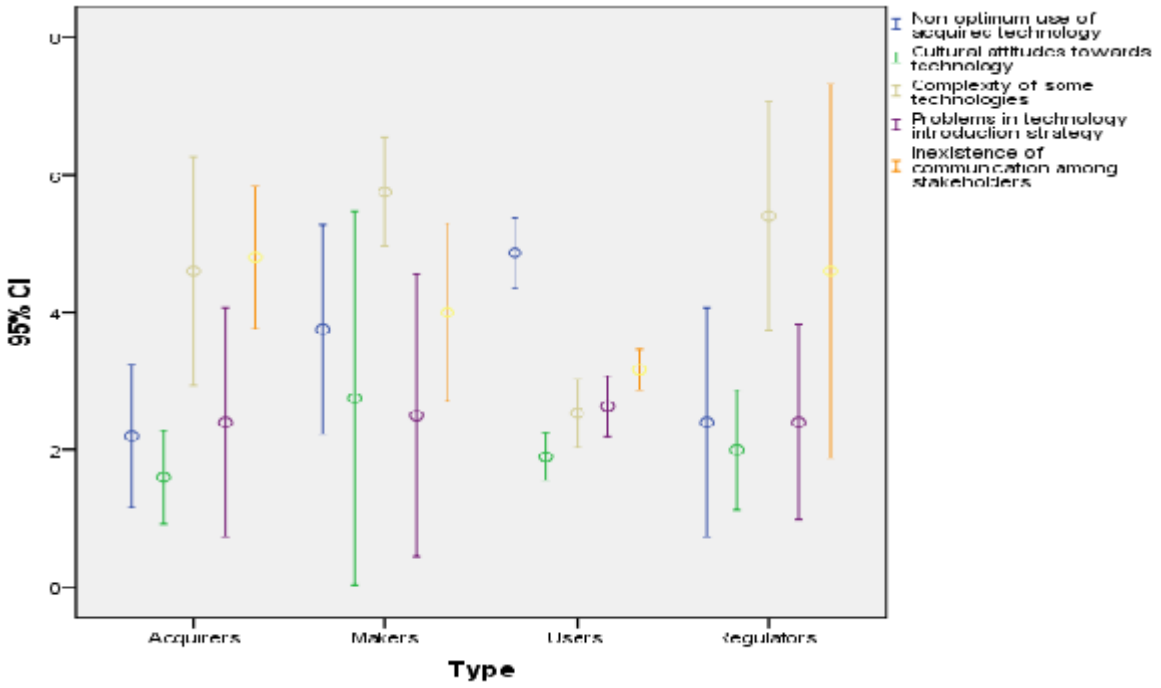
From the table above and the middle of error bars (see the chart below) the rank stability of issues is analysed as followed:

Table 5.1.4.2: Analysis of the stability rank of application issues

Stakeholder groups	Rank from CV	Rank from CI middle	Observations on the rank stability	Stability Ratio
Acquirers	4-1-2-3-5	2-1-4-3-5	Slight change	4/5
Makers	2-4-1-5-3	4-2-1-5-3		4/5
Users	3-2-4-1-5	2-3-4-5-1		4/5
Regulators	1-5-4-2-3	2-1-4-5-3	Issue 2and 5 have significantly change	3/5

Chart 5.1.5.1 presents how the stakeholder groups concur with each other on the same question.

Chart 5.1.5.1: Comparison of dispersion of stakeholder groups' perceptions on issues related to technology application



- *Comments*

- Error bar n°1 related to Users shows a significant difference when comparing with the ones of Acquirers and Regulators.
- There is a significant difference when comparing error bars n°3 related to Users to the ones of Acquirers, Makers and Regulators.

Those would mean that the concerning stakeholders do not concur with the related issues. As for the rest, the error bars overlap in one way or another.

5.1.6. Issues related to technology monitoring step

Two (02) fields of issues are listed by the interviewees. See below in table 5.1.6.1 the statistical data.

Table 5.1.6.1: Ranking of the issues related to technology monitoring

Indicators per stakeholder group	Technology acquirers					Technology makers					Technology users					Technology regulators				
Issues	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**	**M**	**SD**	**SE**	**CV**	**R**
1. Difficulty in evaluating the effectiveness of usage	2,2	0,447	0,200	20,328	**2,00**	2	0,000	0,000	0,000	**2,00**	1,6	0,724	0,132	45,248	**2,00**	2	0,707	0,316	35,355	**1,00**
2. Absence of monitoring process	1,2	0,447	0,200	37,268	**1,00**	1,25	0,500	0,250	40,000	**1,00**	1,8	0,817	0,149	46,257	**1,00**	1,6	0,548	0,245	34,233	**2,00**

From the table above and the middle of error bars (see the chart below) the rank stability of issues is analysed as followed:

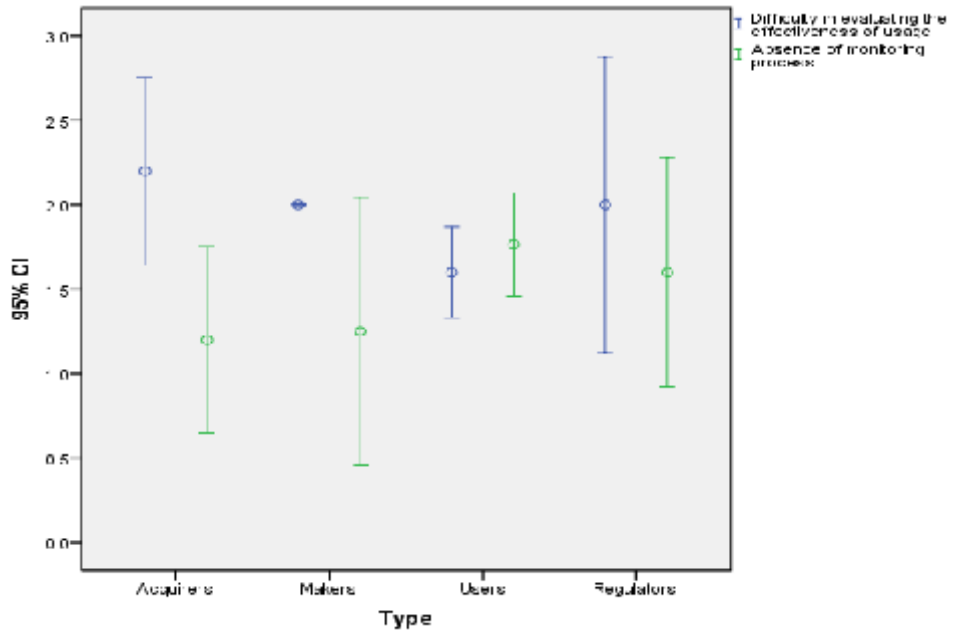
Table 5.1.6.2: Analysis of the stability rank of application issues

Stakeholder groups	Rank from CV	Rank from CI middle	Observations on the rank stability	Stability Ratio
Acquirers	2-1	2-1	Stability	2/2
Makers	2-1	2-1		2/2
Users	2-1	1-2	Slight change	1/2
Regulators	1-2	2-1	Slight change	1/2

- *Comments*

Both issues are relevant to stakeholder groups. However issue n°2 is ranked first by most of the stakeholders. This is confirmed by the chart below. *In short, from the chart, all the stakeholders concur with issues pointed out.*

Chart 5.1.6.1: Comparison of dispersion of stakeholder groups' perceptions on issues related to technology monitoring



- **Summary**

The two approaches used to analyse the study findings notably the ones of coefficient of variation and confidence interval lead mostly to the same results.

In short, apart from some cases, most of the stakeholder groups concur with issues highlighted. In fact, each stakeholder group grants a specific importance to each question related to the field of interest. This could explain the overlapping of error bars of the dispersion of the latter. But, there are some cases with significance difference which needs to be deeply investigated on other research occasions.

5.2. Issues affecting the success of technology transfer in the commercialisation of shea butter in Benin

The commercialisation of shea butter is mainly dominated by local sales with local ways. There are some tentative suggestions to improve the sales with the improved technologies like packaging shea butter instead of selling it open. In the eyes of the backward technology that knows the shea butter trading, the study is focused on issues affecting the shea butter trading as new technology is scarcely used to sell it.

The issues faced by this channel are listed without ranking as presented in table 5.8 below.

Table 5.2.1: Issues related to shea butter trading listed by stakeholders

Issues	TA	TM	TU	TR
1- Absence of training on marketing strategies			X	
2- Insufficient of shea butter promotion occasions			X	
3- Lack of information (about national as well as international outlets, intermediary services, etc.)	X	X	X	
4- Packing and packaging problems	X	X		
5- Dominance of traditional trade				X
6- Non usage of Information and communication technology				X
7- Isolation of women producers of shea butter				X
8- Illiteracy of the owners of the channel notably women				X

Chapter 6: Conclusions and Implications

6.1. Conclusions

The backwardness of shea almond processing in Benin compared to its neighbouring countries requires that one think to improve the performance of the processing. That justifies the choice of shea almond as object of the present study. The objective of this study was to identify and analyse the main issues for successful technology transfer in shea almond processing and shea butter trading in Benin.

A literature review is conducted and has helped to comprehend the topic items. It has also helped to write chapters 2 and 3 of the present report.

The Delphi Method has been used to investigate the question. The literature review has helped to comprehend the Delphi approach. Due to the short time, two rounds of Delphi are realised with a sample size of 45 persons. Four groups of stakeholders are identified and interviewed. Those concern the technology acquirers (06 persons), the technology makers (04 persons), the technology users (30 persons) and the technology regulators (05 persons). Some of the criticisms made about this approach have been taken into consideration notably by doing face-to-face interviews in order to get more information from interviewees and discuss more the subject.

As for study findings, issues are identified and coded. Quantitative analysis is used to illustrate the dispersion of responses for each issue. Qualitative analysis is also used to explain issues identified and to comment quantitative data. The coefficients of variation are calculated and have helped to rank issues inside each group of stakeholders. The confidence intervals are also calculated and have led to get charts illustrating the dispersion degree of responses both inside a stakeholder group and among stakeholder groups.

As for issues, nine (09) issues are identified related to technology identification, two (02) for technology evaluation, height (08) for technology attraction, seven (07) for technology absorption, five (05) for technology application and two (02) for technology monitoring. It is pointed out that the four groups of stakeholders concur with most of the issues apart from isolated cases (see Chapter5). As far as commercialisation is concerned, eight issues are identified but not ranked.

In short, the study reveals a low level of technology use in the sector both for shea processing and trading, absence of policy and strategy to design technologies. Besides, it is revealed an absence of policy and strategy of technology transfer in the sector.

This study provides useful insights to the field of technology transfer in shea almond processing. The identification of issues according to the steps of technology transfer provides new insights in technology transfer analysis. The report is a contribution to literature review. The list of key issues identified by stakeholder groups can help government, development partners, technology acquirers, makers, users and regulators who seek to better understand the main issues surrounding technology transfer in shea almond processing.

6.2. Implications and Recommendations

Issues dealing with same concerns are grouped and recommendations or policy considerations are formulated as presented in the table below.

Table 6.2.1: Implications and recommendations

N°	Group of issues	Implications	Recommendation/ Policy consideration
1	Lack of policy coordination that induces a lack of regulation framework and absence of technology transfer policy	Necessity to set up the coordination and exchange frameworks within public organisation and also with stakeholders	Government should : - set up a coordination framework in order to conduct synergy actions - define together with stakeholders a policy and strategy on technology transfer in shea almond sector - effectively implement defined policies and strategies with the involvement of stakeholders
2	Burdensome administrative procedures as far as the application of technology transfer decisions and production certification is concerned	Reduce the number of procedures and bring organisations in charge of procedures closer to stakeholders	Government should: - facilitate the procedures to promoters - clearly show to stakeholders public organisation in charge of technology transfer - train the management and co-workers of those organisations and provide them with the skills to assist stakeholders
3	Corruption and ransoms (customs, traders, &c)	Necessity to ensure better work conditions to reduce ransoms	Government jointly with Acquirers, Users and Makers should: - clearly define procedures and effectively implement them - invite all stakeholders to respect procedures
4	Absence of joint venture between local and foreign partners	Facilitate the establishment of joint venture between foreign investors and local promoters, to boost technology transfer as women are not able to consume technology an optimal way	Government should: - attract joint ventures - create favourable climate to establish and exert - arouse local promoters to deal with foreign investors
5	Lack of communication among private stakeholders (Users, Makers, acquires and other)	Creation of exchange framework by involved private stakeholders	Private promoters jointly with foreign investors should : - create a framework of exchange to discuss the problems and possible resolutions - define regular meeting agenda with public authorities to exchange on directives and needs
6	Lack of technology	Arouse the establishment of facilitators	Government should inform possible promoters to create units

N°	Group of issues	Implications	Recommendation/ Policy consideration
	Identification facilitators and local technology makers		specialised in identification technology anywhere
7	Inappropriate production units	Support the existent makers and also arouse the establishment of other centres of technology production	Government should: - encourage technical schools and craftsmen to design appropriate technologies for acquirers and users - encourage research centres to increase research to get appropriate technology easily usable by women
8	Insufficient capacities to conduct technology transfer process	Overall necessity to acquaint with the process of technology transfer to stakeholders and provide with them appropriate training to conduct the process and get skills on it	- All stakeholders should take actively part in the process to succeed in it. - Government can finance to inform and train stakeholders with the contribution of beneficiaries. - Training will essentially tackle the steps of technology transfer.
9	Problems in technology introduction strategy	Necessity to improve the approach	Government should : - adopt a bottom-up approach namely from women real needs instead of a top-down approach in case of women should keep their present position in the sector - review in overall the strategy to introduce the technology
10	Low level of education, illiteracy and advanced age of women, owners of the sector	The question is whether the sector will be owned by women or prioritised private and foreign investors?	Government should : - facilitate foreign investment through joint-venture mainly for international market of shea butter and simultaneously - ensure women national market to sell their productions to get incomes to satisfy their family needs
11	Absence of monitoring process	Take into consideration the monitoring of technology transfer when implementing technology strategy. This implies the involvement of stakeholders	Inform and train technology users on the monitoring of introduced technology. Government can finance to inform and train with the contribution of beneficiary

6.3. Reliability and validity considerations

A detailed questionnaire including precise questions and guideline has helped to get information. The round-two has contributed to improve the reliability.

As for validity, the choice of stakeholders has been rigorous. Moreover, a face-to-face interview is realised for both round one and round two instead of a questionnaire-sending. Besides, three protocols for triangulations are considered.

First, it is a ‘‘data source triangulation’’: in fact, some of the issues listed by interviewees seem slightly converge by past studies. Some of those are:

- High cost of technology:
- ‘‘Withholding of information by technology transferor’’ which makes technology transferors depending to technology acquirers.
- ‘‘Low level of education, advanced age and illiteracy of women involved in the process’’.

Second, ‘‘Member triangulation’’, the second round of Delphi method would correspond to member triangulation as interviewees are asked to review their responses before ranking.

Third, it is used methodological triangulation through the use of confidence interval to confirm or infirm the values of coefficient of variation.

6.4. Comment on reliability, validity and generalisability

The findings of the study are presented according to the steps of technology transfer process. At the national level, the findings of this study could be generalisable. But at the international level, the findings could slightly change. However, the present study could be useful for government authorities, and operational actors. The findings could serve other processing sectors of developing countries.

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Appendices

Appendix I : Confidentiality

Confidentiality
in
Use of Data
Provided by Third Parties

The data received from the organisations listed below have been used solely in the pursuit of the academic objectives of the work contained in this Dissertation and has not and will not be used for any other purpose outwith that agreed to by the provider of the data.

Name (Print): BABA IBRAHIM Amina

Signature: 

Date: 10 October 2010

List of Data Providers:

- Edinburgh Napier University : Professor Robert Raeside
- Bureau d'appui aux artisans: Mr Cyr DAVODOUN
- Laboratoire d'analyse régionale et d'expertise sociale : Dr Bio Goura Soulé

Appendix II: Declaration

I declare that the work undertaken for this MSc Dissertation has been undertaken by myself and the final Dissertation produced by me. The work has not been submitted in part or in whole in regard to any other academic qualification.

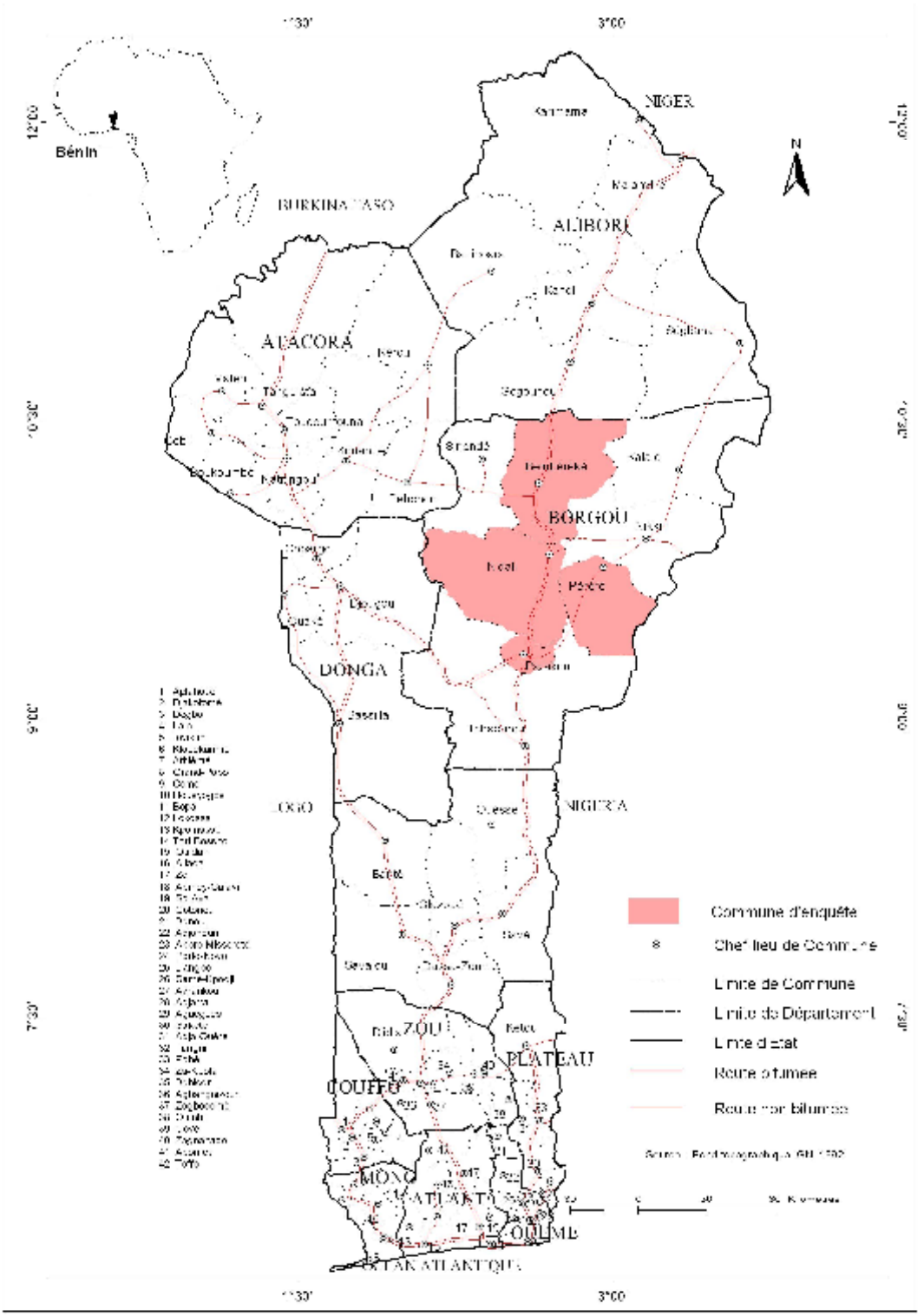
Title of Dissertation: AN ANALYSIS OF THE MAIN ISSUES FOR SUCCESSFUL TECHNOLOGY TRANSFER IN SHEA ALMOND PROCESSING AND TRADING IN BENIN

Name (Print): BABA IBRAHIM Amina

Signature: 

Date: 10 October 2010

Appendix III: Benin' s map and Survey's area



Appendix IV: Questionnaire

I- Identification

Name:……
First name:……
City:……
District:……..
Sex: ……

II- Type of stakeholders
Complete the concerned type

Technology user
Name of group……
Responsibility in the group……

Technology acquirer

Government organisation
Name of the organization……
Type of technology acquired……..

Technical and financial partners
Name of the organization…….
Type of technology acquired……

Study office
Name of the organization……..
Type of technology acquired…….

Technology designer
Name of the organization……
Type of technology designed……..

Technology transfer regulator
Name of the organization…….
Type of technology transfer regulation ……..

Other
Name of the organization…….

III- ISSUES FOR TECHNOLOGY TRANSFER

- What are issues affecting the success of technology transfer according to you?
    - Shea almond processing

Steps of Technology Transfer	**Issues**	**What is the relative importance of these issues according to steps?**
Technology identification		
Technology evaluation		
Technology attraction		
Technology absorption		
Technology application		
Technology monitoring		

- Shea butter trading

Technology Transfer	**What are issues affecting the success of technology transfer faced by you?**	**What is the relative importance of these issues according to steps?**
Technology identification		
Technology evaluation		
Technology attraction		
Technology absorption		
Technology application		
Technology evaluation		

- Shea almond channel organisation

What are issues affecting the channel in general

Appendix V: List of respondents

N°	Name	Locality	Organisation
1	ABOULAYE Mamoudou	Parakou	APIDeV
2	ALI KPELE Abibata	Bembèrèkè	Su kian na
3	BABIO CHRYSOSTOME Zénabou	Parakou	FNPEJ
4	BIO N'GOYI Gbénigui	N'dali	Ando Agan goua
5	BIOKPE Awaou	N'dali	Antii Sua
6	BLAISE Abadji	Parakou	DDIC
7	BONI Adama	Pèrèrè	Antii Sowa
8	BOUKE Séko Zaria	Parakou	CAMFP
9	CHABI GONI Mordoumon	Parakou	Bouinyimbou
10	ESSOU Jacques	Parakou	BAA
11	FRACOIS Sébouragui	Parakou	Su Dom Sé
12	GADOURA Dado	Pèrèrè	An Koua N'mon
13	GAROUBA Ali C. Bio Gando	Bèmbèrèkè - Gando	Complexe ALAFIA
14	GAROUBA Alimatou Baké	Bembèrèkè	Su kian na
15	GOBI OROU Fanna	Parakou	Su Dom Sé
16	GOUNOU Baké	Parakou	Antii Sowa
17	GOUNOU Baké	Parakou	Antii Sowa
18	GOUNOU GNIRE	Parakou	Antii Sowa
19	GOUNOU Maguérite	Pèrèrè	Antii Kpana A Tonu Goruwa
20	GUEO Baké	Parakou	Antii Sowa
21	HOUNNOU Augustin	Parakou	COBEMAG
22	HOUNNOUKON Pascal	Bèmbèrèkè	Complexe ALAFIA
23	IBROUHIMA Adama	Pèrèrè	ANTII Sowa
24	IDRISSOU Maimouna	N'dali	Antii Sua
25	IMOROU Adam	N'dali	An tin mana
26	JULIEN Elisabeth	Pèrèrè	An Koua N'mon
27	KORA Dassi	N'dali	Antii Sua
28	KORA SERO Aboubacar	Parakou	MPME
29	KOTO Gniré	Parakou	Su Dom Sé
30	KPASSO Goura	Parakou	Su Dom Sé
31	LAFIA Kpaéro	N'dali	Ando Agan goua
32	LAHOUIN B. Anne	Parakou	UGKAP

33	MAMA Adamou	Parakou	Su Dom Sé
34	MAMA Issifa	N'dali	An tin mana
35	MAMA Ouroubé	Parakou	Antii Sowa
36	MAMA Zoubéra	Parakou	Bakpè Maka
37	MANGA Salamatou	Bembèrèkè	Su kian na
38	Mme LOKOSSOU	Cotonou	DPQC
39	MONRA GOYI Bérou	Parakou	Antii Sowa
40	MOUCHAMOU Elène	Bembèrèkè	Su kian na
41	ODJOUORIBY Toussaint	Parakou	COBEMAG
42	SABI GADO Maïmounatou	Parakou	Sutii Dera
43	SARE Séni	N'dali	Antii Sua
44	SINA Latifath	Parakou	CAMFP
45	SOULE Adama	Parakou	Su Dom Sé
46	TAMBA Yanki	Pèrèrè	Antii Sowa
47	TAMOU Maré	Pèrèrè	An Koua N'mon
48	YACOUBOU Safia	N'dali	An tin mana
49	YAROU Mamatou	Pèrèrè	An Koua N'mon
50	YAROU MANGA Baké	N'dali	Ando Agan goua
51	YERIMA N'GOBI Orou Gani	Parakou	Su Dom Sé
52	YERIMA N'GOBI Yarou	Parakou	Su Dom Sé
53	YOROU Boro	Parakou	Antii Sowa
54	ZACHARI Satou	Pèrèrè	An Koua N'mon
55	ZIME Bègegui	Parakou	Antii Sowa
56	ZIME Yanki	Parakou	Antii Sowa