INNOVATIVE METHODS FOR IDENTIFYING THE TRAINING NEEDS OF SHEA BUTTER PROCESSORS IN THE NORTH-CENTRAL AGRO-ECOLOGICAL ZONE OF NIGERIA

By

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DECLARATION OF INDEPENDENT WORK

I, **LUCKY IGENE,** hereby declare that this research work submitted to the Central University of Technology, Free State, Bloemfontein, South Africa, for the degree **DOCTOR TECHNOLOGIAE: AGRICULTURE**, is my own original and independent work, and not been submitted to any institution, by myself or any other person, in fulfilment of the requirement for the attainment of any qualification.

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Signature **Date**

ABSTRACT

The acquisition, through regular training, of skills and knowledge on modern shea butter processing technologies by shea butter processors enhances their productivity, provides rural employment, ensures increased income, reduces rural poverty and reduces rural-urban migration. However, the level of shea butter production in the study area has drastically decreased resulting from deficiencies in processors' performance in the extraction of shea butter by means of the available modern shea butter processing technologies. In view of this, a questionnaire, interview guide, focus group discussion and task, and skill-gap analysis were used in this study as innovative methods to identify the training needs of shea butter processors in the North-Central Agro-ecological Zone of Nigeria. The population for the study comprised of all shea butter processors in the study area. Primary data were collected from a total of 216 processors using a multistage sampling procedure, and purposive and a simple random sampling techniques. Well-structured questionnaire and interview guides were used to elicit information from processors during the focus group discussion. Data were analysed using descriptive statistics, inferential statistics and a training need analysis. The results revealed that the shea butter processors in the study area were mostly young married females with little or no formal education. They were Muslim, with large household sizes, and had approximately 15 years' processing experience. Furthermore, they were members of co-operative societies that are capable of generating approximately ₦15,000 per month from shea butter processing activities. Common modern shea butter processing technologies available to processors for shea butter extraction include the following: shea kernel dryer, shea nutcracker and separator, shea kernel roaster, hammer mill crusher, disc mill, kneader, manual screw press, clarifier, and storage tanks. All the processors were aware of, and had access to, the available modern processing technologies. However, their adoption of these processing technologies was low. Nevertheless, in the study area, the use of modern technologies resulted in a higher shea butter production than the use of indigenous processing techniques. More than half of the processors derived benefits from the use of modern shea butter processing technologies. None of the processors attended training in modern shea butter processing technologies from 2010 to 2015. However, some of them were knowledgeable on the use of modern shea butter processing technologies. Most of the processors were not competent in kneading, milling, crushing and roasting tasks; hence their perception that a high level of training in these areas of tasks in modern shea butter processing technologies is required. Processors identified a processors' workshop; field or factory training; and a proficiency course as the most preferred training

methods. Processors preferred early morning training from Mondays to Wednesdays, in March and April. Most preferred institutions to conduct the training in modern shea butter processing technologies are Raw Materials Research and Development Council (RMRDC), Nigerian Institute for Oil Palm Research (NIFOR) and Agricultural Development Programmes (ADPs). Water scarcity ($\overline{x}$ = 2.95), a lack of extension training ($\overline{x}$ = 2.90), inadequate funds ($\overline{x}$ = 2.87), and the epileptic power supply ($\overline{x}$ = 2.36), were the severe constraints hindering the effective performance of processors in the use of modern shea butter processing technologies for shea butter extraction activities. As mentioned earlier, kneading, milling, crushing and roasting were all tasks in which respondents require extensive training.

Significantly strong relationship exist between the processors age (r = 38.865, p < 0.00), gender (χ^2 = 22.076, p < 0.00), marital status (χ^2 = 22.076, p < 0.00), religion (χ^2 = 14.196, p < 0.00), level of education (χ^2 = 69.018, p < 0.00), household size (χ^2 = 51.048, p < 0.00), years' of processing experience (χ^2 = 40.118, p < .00),membership to co-operatives (χ^2 = 38.865, p =0.000) and monthly income (χ^2 = 85.983, p =0.00) and training need. Significant relationships also existed between processors' training needs and previously attended aspects of training (r = -0.159, p = 0.019), the time of training preferred (r = 0.240, p = 0.000), their knowledge (r = 0.412, p = 0.000), and their competence (r = -0.598, p = 0.000), in the use of modern shea butter processing technologies. However, the analysis of a t-test (t=0.636, $p \leq 0.05$) of the training needs of processors' from the Niger State and processors' from the Kwara State indicated that no significant difference existed between the training needs of processors' from the two States. Subsequently, it is recommended that extension service providers in Nigeria, should give urgent attention to the identified training needs (Raw Materials Research and Development Council, the Nigerian Institute for Oil Palm Research (NIFOR) and Agricultural Development Projects (ADPs). Thereby addressing the lack of training and improving shea butter processors' skills and knowledge, in order to increase their productivity, so that they can meet the demands for domestic consumption, export and increase household income. Further recommendation was that borehole water be availed to shea butter extraction sites, and that the government, via the co-operatives, should offer loans to processors.

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DEDICATION

This project is dedicated to the King of Kings, Lord of Lords and the only true and Almighty God. The source of my joy, the one that gives meaning and colour to my life, may your name be glorified forever and ever. Amen.

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INTRODUCTION

1.1 Background to the study

The shea tree (*Vitellaria paradoxa),* known under its synonym *Butryospermum paradoxum*, is a member of the family *Sapotaceae* (Ojo and Adebayo, 2013). Africa is the centre origin of this genus, and there are two species of *Sapotaceae*: *paradoxa* and *nilotica*. Although these species in the wild are found within a distance of 175m of one another, the differences between them are mutually exclusive (Hall, Aebischer, Tomlinson, Osei-Amaning and Hindle, 1996). *Vitellaria paradoxa* is found mainly in the West African sub-region whilst *Vitellaria nilotica* grows mainly in northern Uganda, southern Sudan, Ethiopia and the north-east of the Democratic Republic of the Congo (DRC) (Boffa, 1999). The primary difference between the two species occurs is in the consistency of the nut fat content (Boffa, 1999). The bark of the stem is deeply fissured, thick, waxy, corky and fire resistant. The tree flowers between Decembers and March, whilst the fruits are harvesting starts in May until September (Nigerian Institute for Oil Palm Research (NIFOR), 2008).

The shea tree occurs in 19 countries across the African continent, namely Benin, Ghana, Chad, Burkina Faso, Cameroon, Central African Republic, Ethiopia, Guinea Bissau, Cote D'Ivoire, Mali, Niger, Nigeria, Senegal, Sierra Leone, Sudan, Togo, Uganda, DRC and Guinea (Food and Agriculture Organization of the United Nations (FAO), 2014). Shea butter is a derivative of shea nuts/kernels, which constitute an important source of affordable cooking fat that is widely utilized for domestic purposes such as cooking and skin moisturizer. Commercially, is an ingredient in cosmetic, pharmaceutical and edible products respectively (Abbiw, 1990; Alander, 2004). As for a cosmetic, is used hair dressing a moisturizer (Ezema and Ogujiofor, 1992) and for protection against UV light of the sun (Bonkoungou, 2005). It is often used as a substitute for cocoa butter in the chocolate and confectionary industries, as it is sweet and oily (FAO, 1991).

In Europe and Japan, shea butter is valued for its superb healing and moisturizing properties. It is a high–value export product to Europe and the United States, where it is a luxury (Lovett,

2004). The price for a ton of shea butter (international market) packed in 20 pound (9.1 kg), ranges from 1,800 to 2,800 US$ per metric ton (MT) depending on the quality thereof, whilst the local market price ranges from NGN180, 000.00 to NGN250, 000.00 (i.e $1,125 to $1,562 per ton) (Ololade and Ibrahim, 2014).

In Nigeria, approximately 45% of the land provides a suitable environment for the growth of shea trees (Ololade and Ibraham, 2014). It currently grows in the wild in many states, including Niger, Nasarawa, Kebbi, Kwara, Kogi, Adamawa, Benue, Edo, Katsina, Plateau, Sokoto, Zamfara, Taraba, Borno and Oyo (NIFOR, 2013). It is widely known, valued and exploited by the natives in all the areas in which it grows, although, it appears to be rather obscure, wild species that grow side by side with arable crops (Daniel, Olafimihan, Kwaya and Odejide, 2005).

Shea butter processing is a way of life for many women in the North-Central Agro-ecological Zone of Nigeria. Either, indigenous processing or modern processing technologies are used to process fruits into butter. The indigenous processing of shea butter is mainly a female activity. The transformation of shea nuts into butter is not only an arduous-, labour-intensive and time consuming task, but also requires large amounts of water and firewood (Ademola, Oyesola and Osewa, 2012). The preparation process takes several days to complete, and involves many stages. There are 14 steps in traditional Nigerian shea butter processing (Daniel *et al.*, 2005), namely:

1. Gathering of shea fruits from the wild by women and children;
2. De-pulping involving the removal of the fleshy pericarp;
3. Boiling the fruits for four hours in cast aluminium or clay pots to terminate the germination process;
4. Sun-drying of nuts for five to ten days, in order to reduce the moisture content and allowing for easy shelling;
5. De-husking and winnowing (i.e. removal of husk from the nuts and separation of healthy nuts from the unhealthy nuts);
6. Sun drying the nuts to reduce moisture;
7. Roasting the nuts to dehydrate them, for the release of butter;
8. Crushing the roasted nuts with a mortar and pestle or a grinding stone;
9. Milling the nuts into a fine paste;

10. Kneading the nuts to break up oil cells for easy butter extraction;
11. Mixing and churning with cold water to obtain a floating grey mass;
12. Boiling the grey mass to separate the oil from other impurities in the scooped floating grey mass;
13. Decanting, which entails leaving the oil overnight to settle, so as to ensure the proper separation of the oil from the residue; and
14. Settling and packing: stirred decanted oil facilitate solidification and cooling process. The fat obtained, is stored into a basin, where it solidify to shea butter.

The shea butter that is produced using this method is usually of low quality, due to the high level of contamination from foreign materials, fungal and high free fatty acid content (Nigerian Export Promotion Council (NEPC), 2012). Bonkoungou (2005) estimated that processing of a kilogram of shea butter in the traditional manner takes twenty to thirty hours for one person from the time the shea fruits are collection to the final product.

However, modern processing technologies such as the shea fruit digester, hammer mill crusher, disc mill, roaster, kneader, screw press, etc. that save time, reduce drudgery and increase yield, had been developed in Europe, Asia, North America and Nigeria (Chalfin, 2004; Daniel *et al.*, 2005). The development and use of these technologies resulted in the production of high quality shea butter that reaches high prices, both in the local and international markets, thus ensuring a high income for the processors thereof. Comparatively, the extraction rate of shea butter by using indigenous processing methods is approximately 20% to 40%, compared to 42% to 80% when modern processing technologies are used (Addaquay, 2004). Therefore, the use of modern shea butter processing technologies in Nigeria will significantly increase processors' income, and will provide employment opportunities to millions of unemployed youths. This will also contribute significantly to freeing shea butter processors from the tyranny of poverty and hunger, ensure food security, improve nutrition and promote the sustainability of shea butter production.

The Federal Government of Nigeria realized the importance of shea butter, and its potential for creating employment, foreign exchange earnings and income. It has potential for poverty alleviation amongst women, who, incidentally, are the major role players in the value chain. Co-operation with non-governmental organisations (NGOs), such as the German Technical Co-operation (GTZ) and the World Trade Organisation (WTO), embark on attracting publicity

(mass- and social media), and creating awareness of, the need for processors to use modern processing technologies, in order to produce high-quality shea butter that will meet international standards (NEPC, 2012). Consequently, modern shea butter processing technologies are provided, across the shea butter-producing states, for easy access and utilisation by processors (Peter, 2004; Daniel *et al*, 2005; Matanmi, Adesiji, Olasheinde and Oladipo, 2011; NEPC, 2012)

This intervention by the Federal Government and NGOs, coupled with the active role of women in the production activities, resulted in a significant increase in the production of high-quality shea butter with a free fatty acid content of less than a percent, and a dirt content of less than 0.1% (NIFOR, 2013). However, the increase should be sustained in order to meet Nigeria's, the European Union (EU)'s and the US' demand for the butter as a food, and as a requirement for industries and the export market.

Therefore, in order to sustain this high level of shea butter production in Nigeria, old and new processors require periodic updating and upgrading of their technical knowledge and skills. However, studies conducted by Akinsokeji, (2012) and NIFOR, (2013) revealed that, across the shea butter-producing states, shea butter processors' performance in the extraction of shea butter has drastically reduced using the available modern processing technologies. According to both authors, this resulted in a total decrease in the output of shea butter production in Nigeria. The decrease in shea butter production has brought about a decrease in processors' income, hence resulted in a lower standard of living. The cause of these performance deficiencies in processors' performance in the extraction of shea butter is unknown. However, from their finding it is clear that problems in the extraction of shea butter do exist amongst the processors, and need attention first to increase the production of shea butter in Nigeria.

According to Rouda and Kusy (1995), performance deficiencies are problems associated with knowledge, skills and attitudes. Rouda and Kusy (1995) also state that training is required to address this problem. Training constitutes teaching and practice given to a person or a group of persons on a subject matter in order to bring them to a desired standard of behaviour, efficiency or physical condition (Okanlawon, 2014). Therefore, to enhance processors' adoption of modern shea butter processing technologies, which will have a positive impact on their well-being, training is required. Training will remove barriers and improve processors' technical competency and efficiency, resource utilisation, and increasing productivity and their

performance. However, before training, a need assessment is required to establish the areas of training needs.

According to Gerster-Bentaya and Hoffmann (2011), a training need is a gap between the present and the desired future level of knowledge. In agreement, Proctor and Thornton (1961) define training needs as the skills, knowledge and attitude an individual requires in order to overcome problems, as well as to avoid creating a problem situation. From the definitions above, it is clear that training is an essential resource that will contribute knowledge and skills towards production (Adesoji, Farinde and Ajayi, 2006). The benefits of a training needs assessment include the identification of a perceived need; categorisation of trainees; identification of an adequate training methodology; and knowledge of the appropriate time to deliver (Ifejika, Uzokwe and Oladosu, 2013).

Various analytical procedures used to identify a need are being used (Rouda and Kusy, 1995). Possible methods or techniques for individual analysis include performance appraisal, interviews, questionnaires, tests, behavioural analysis, informal talks, checklists, counselling, critical incidents, recordings, surveys and observations. Other methods include focus group discussion (FGDs), job analyses, task analyses, and knowledge and skill-gap analyses (Abdul and Mozahar, 1998).

Innovation can be defined as “a new idea or device” (Merriam-Webster dictionary), or “an application of better solutions that meet new requirements, unarticulated needs, or existing market needs” (Maryville, 1992). Therefore, from these methods identified, the researcher considered the following as innovative methods; questionnaires, interview guides, FDGs, and the assessment of processors’ training needs by means of a task and skill-gap analysis, (Abdul and Mozahar, 1998). Questionnaire and interview guide during the FGD were never used simultaneously on shea butter research in Nigeria (Odebiyi, Bada, Awodoyi, Oni and Omoloye, 2000; Popoola and Tee, 2001; Peter, 2004; Enaberue, Okolo and Yusuf, 2011; Matanmi *et al.*, 2011; Ademola *et al.*, 2012). Thus, in this study it will be for the first time, where this method is used to interview shea butter processors. It might ensure reliability of data collected and it will save the research group time and resources.

1.2 Problem statement

Prior to the Federal Government of Nigeria and NGOs' intervention in the shea industry, shea butter was produced mostly in the country using indigenous processing techniques. These techniques often resulted in the production of shea butter that could not be exported, due to the low quality thereof as a result of a high level of contamination from foreign materials and fungi, as well as high free fatty acid content (NEPC, 2012). However, over the last few years, as a result of the aforementioned intervention and the provision of modern shea butter processing technologies, there has been an increase in the production of high-quality shea butter that meets international standards, is exportable, and reaches high market prices. Unfortunately, recent studies conducted by Akinsokeji (2012) and NIFOR (2013) revealed that, across the shea butter-producing states, shea butter processors' performance in the extraction of shea butter has drastically reduced using the available modern processing technologies. According to both authors, this resulted in a total decrease in the output of shea butter production in Nigeria.

The cause of these performance deficiencies in processors' performance in the extraction of shea butter is unknown, but it is clear from their finding that a problem or problems in the extraction of shea butter do exist amongst the shea butter processors, which should be solved in order to ensure an increase in the production of shea butter in Nigeria. Rouda and Kusy (1995) define performance deficiencies as problems associated with knowledge, skills and attitudes, and the author is of the opinion that training is required to address these problems. Therefore, this study will seek to provide answers to the above-mentioned problems, and to ascertain factors that hindered the effective performance of processors in the use of modern shea butter processing technologies in the study area.

A sizable body of literature is available on shea nut collection, processing, storage and marketing, and the overall value chain of shea nuts (Boffa, Yameogo, Nikiema and Knudson, 1996; Aboyella, 2002; Addaquay, 2004; Lovett, 2004; Schreckenberg, 2004; Bonkoungou, 2005; Daniel *et al*., 2005; Adgidzi, 2008; Yezouma, Stephane and Nathalie, 2009; Ademola *et al*., 2012; Mohammed, Boatang and Alhassan, 2013; Godfred, Osamu and Kazuhiko, 2015; Phillip, Moses and Konlan, 2014; Abedin, Abubakar, Quainoo, Chimsah, Abagole and Addai, 2015). However, this study differs from the aforementioned studies in that innovative methods

for identifying the training needs of shea butter processors are considered. This aspect of the study is important, as the research findings will be added to the literature, and will provide policy paradigms towards fulfilling the Nigerian Government's Sustainable Development Goal (SDG) of poverty eradication.

In this study, answers to the following research questions will be provided:

1. What are the selected socio-economic characteristics of the respondents?
2. Which indigenous processing techniques and modern processing technologies are available to respondents?
3. What is the quantity of shea butter produced per month using modern shea butter processing technologies versus using indigenous processing techniques?
4. What do respondents perceive to be the benefits of modern shea butter processing technologies?
5. Are the respondents aware of, and access and adopt modern shea butter processing technologies?
6. Are the respondents knowledgeable about modern shea butter processing technologies?
7. What is the respondents' training situations in terms of training previously attended, number of trainings attended from 2010 to 2015; preferred training methods; preferred time of training and preferred institutions to conduct training in modern shea butter processing technologies?
8. What are the respondents' levels of competence or ability in a range of shea butter processing tasks?
9. What do respondents perceive to be the required level of training in the available modern shea butter processing technologies?
10. What are the perceived constraints hindering the effective performance of respondents in the use of modern shea butter processing technologies for shea butter extraction activities?

1.3 Objectives of the study

The major objective of this study was to identify training needs of shea butter processors in the North Central Agro-ecological zone of Nigeria using innovative methods where both the questionnaire and the interview guide were used during the focus group discussions. Furthermore, to develop a training framework/model that will assist government and private trainers in the mentoring and assistance of shea butter processors.

The specific objectives are to;

1. examine the selected socio-economic characteristic of respondents in the study areas;
2. identify the indigenous processing techniques and modern processing technologies available to respondents;
3. determine the respondents' quantity of shea butter produced per month using modern processing technologies versus indigenous processing techniques;
4. determine what respondents perceive to be the benefits of modern shea butter processing technologies;
5. determine the respondents' awareness of, access to and adoption of modern shea butter processing technologies;
6. determine respondents' level of knowledge of available modern shea butter processing technologies;
7. investigate respondents' training situations in terms of areas of training previously attended, number of trainings attended from 2010 to 2015, preferred training methods, preferred time of training and preferred institutions to conduct training) in modern shea butter processing technologies;
8. identify respondents' level of competence or ability possessed by shea butter processors in a range of processing tasks;
9. determine respondents' perception of the required level of training in available modern shea butter processing technologies;
10. identify respondent's perception of the constraints that hinder effective performance in the use of modern shea butter processing technologies for shea butter extraction activities; and
11. develop a training framework/model that will assist government and private trainers in the mentoring and assistance of these shea butter processors.

1.4 Hypotheses of the study

The following hypotheses stated in the null form, would be tested in the study:

1. There is no significant relationship between the selected socio-economic characteristics of respondents and their training needs in modern shea butter processing technologies.
2. There is no significant relationship between respondents' training situations (areas of training previously attended and preferred time for training in modern processing technologies) and their training needs in modern shea butter processing technologies.
3. There is no significant relationship between respondents' knowledge of modern shea butter processing technologies and their training needs in modern shea butter processing technologies.
4. There is no significant relationship between respondents' level of competence and their training needs in modern shea butter processing technologies.
5. There is no significant difference between training needs of shea butter processors from the Niger State and processors from the Kwara State.

1.5 Significance of the study

The identification, through innovative methods, of the training needs of shea butter processors could fulfil a role in the overall increase of processors' knowledge in the different areas of modern shea butter processing technologies, such as drying, roasting, crushing, milling, kneading, extraction, clarification, etc. In addition, meeting the identified training needs, through appropriate training, could lead to capacity building on modern shea butter processing technologies amongst small-scale processors.

Furthermore, identifying the training needs of processors could stimulate research activities, aimed at solving processors' problems, by various research institutions. The identification of the training needs of shea butter processors could also assist agencies in Nigeria that are involved in extension to disseminate and design an appropriate training programme for their target processors. Furthermore, the findings of this study could provide baseline information on needs identification/assessment, for future studies on oil-bearing crops, both in Nigeria and South Africa. Finally, this study could assist policy makers to formulate policies to encourage

the Nigerian and South African governments to fund training programmes on modern processing technologies for processors.

1.6 Definition of terms

Training: The teaching and learning activities carried out for the primary purpose of helping members of an organisation to acquire and apply the knowledge, skills, abilities, and attitudes needed by a particular job and organisation (Okanlawon, 2014).

Need: A state of incompleteness, which suggests the existence of a gap between “what is” and “what ought to be” (Olajide, 2009).

Innovation: The introduction of new things, ideas or ways of doing something, or an application of better solutions that meet new requirements, unarticulated needs, or existing market needs"(Maryville, 1992).

Processors: Basically, processors, in the context of this study, are the people involved in the processing of shea butter (Igene, 2012).

Processing: A method of doing or making something, especially one that is used in industry: manufacturing processes (Igene, 2012).

Indigenous processing techniques: The use of available local tools or materials in the processing of agricultural products. It is characterised by drudgery, time wasting, intensive labour, and low output (Igene, 2012).

Modern processing/extraction technologies: The use of sophisticated and automated machines or equipment in the processing or extraction of agricultural products. It is characterised by less strenuous activities, less time, less intensive labour/less man-days, higher output, understandable techniques, and serviceable and repairable tools (Igene, 2012).

Extraction: The act or process of removing or obtaining something from something else (Igene, 2012).

NB: In this study, the terms “processing” and “extraction” have the same meaning, and will be used interchangeably by the author.

CHAPTER 2

LITERATURE REVIEW

2.1 Concept of needs

The concept of needs has a variety of definitions and dimensions. One of the simplest explanations is that need is the difference between what is, and what should be (Olajide, 2009).

WHAT IS ---------- (GAP) ---------- WHAT SHOULD BE

(---------- NEED ----------)

"Need" as a noun refers to the discrepancy or gap between a present state (i.e. “what is”) and a desired end state (i.e. “what should be”), or between the actual and the ideal (Olajide, 2009). "Need" as a verb points to what is required to fill the discrepancy that is solutions; a means to an end.

A need is a subjective experience, which occurs only in the mind of the person in need, and, consequently, is not directly accessible to an observer (Wilson, 1981). The experience of need can only be discovered by deduction from behaviour, or through the reports of the person in need.

According to Morgan and King (1971), as cited by Olajide (2009), needs emerge from three different kinds of motives, which are physiological (e.g. hunger and thirst), unlearned (e.g. curiosity and sensory stimulation), and social (the desire for affiliation, approval or aggression).

2.1.1 Needs assessment

A needs assessment is a systematic exploration of the way things are, and the way they should be (Rouda and Kusy, 1995). These “things” are usually associated with organisational and/or individual performance.

A needs assessment is used to identify gaps, and to provide information for a decision on whether the gaps could be addressed through training. The assessment is part of a planning process that focuses on identifying and solving performance problems.

These performance problems may be related to knowledge, skills and attitudes. Rouda and Kusy (1995) identified four steps used to conduct need assessment:

Step 1: Perform a "gap" analysis

The first step is to check the actual performance of our organizations and our people against existing standards, or to set new standards. There are two parts to this:

- *Current situation***:** The current state of skills, knowledge, and abilities of current and future employees must be determined. This analysis also should examine the organizational goals, climate and internal and external constraints.

- *Desired situation***:** The desired conditions for organization and personal success must be identified. This analysis focuses on the necessary job tasks or standards as well as the skills, knowledge, and abilities needed to accomplish these successfully. The importance critical tasks must be identified and not just observe the current practices. Also, the actual needs must be distinguished here from perceived needs and wants.

The difference in the "gap" between the current and the desire will identify the needs, purpose and objectives. Here are some questions to ask, to determine where need assessment may be useful in providing solutions.

- *Problems or deficits*: Are there problems in the organization, which might be solved by training?

- *Impending change*: Are there problems, which do not currently exist but are foreseen due to changes, such as new processes and equipment or outside competition?

- *Opportunities:* Could we gain a competitive edge by taking advantage of new technologies, training programmes, consultants or suppliers?

- *Strengths*: How can we take advantage of their organizational strength as opposed to reacting to their weaknesses?

- *New direction***:** Could we take a proactive approach, apply need assessment to move their organizations to new levels of performance? For example, could extension agents and related bodies activities help farmers improve their productivity?

- *Mandated training***:** Are there internal or external forces dictating that training will take place? Are their policies or management that training will take place?

Are there policies or management decisions, which might dictate the implementation of some program? Are there governmental mandates to which we must comply?

Step 2: Identify priorities and importance

The first step should have produced a large list of needs for training and other interventions. This list of needs must be examined, and the needs must be viewed in order of importance to the farmers' goals, realities and constraints. One must determine if the identified needs are real, and if they are worth addressing, and must specify the importance and urgency thereof in view of the farmers' or one's needs and requirements.

Step 3: Identify causes of performance problems

Once the need have been prioritised, the specific problem areas must be identified. If appropriate solutions are applied, one must know what people's performance requirements are. The following questions are be asked for every identified need:

- Are the people doing their jobs effectively?

- Do they know how to do their jobs?

This will require a detailed investigation and analysis of people, their jobs, and their organisations, both in terms of the current situation, and in preparation for the future.

Step 4: Identify possible solutions and growth opportunities

If people are doing their jobs effectively, perhaps one should leave well enough alone. However, some training and/or other interventions might be called for if has sufficient importance attached in moving people and their performance into a new direction. However, if people are not doing their jobs effectively:

- training may be the solution, if there is a knowledge problem; or

- if the problem is not based on a lack of knowledge, and is primarily associated with systematic change, organisational development activities may provide solutions.

These interventions might include strategic planning, organisational restructuring, performance management, and/or effective team building.

2.1.2 Overcoming problems and barriers when conducting a needs assessment

Fulgham and Shaughnessy (2008) described five types of problems or barriers that can arise when conducting an assessment, namely:

- *Unwilling employees or participants***:** Employees may not be willing to spend a lot of time completing a survey or attending an interview. To increase participation in information gathering, have a top executive send a cover letter with the survey or, prior to an interview, ask for the employees' co-operation in completing the survey or granting an interview. If a collecting bargaining unit is involved, include their support in a consigned cover letter to management. Get key employees to serve as goodwill ambassadors for the process. State the purpose of the data collection, and indicate what will be done as a result. Sending a survey or conducting interviews sets the expectation that something will be done with the information. Make the distribution, completion and return of the survey, or the conducting of an interview, as convenient as possible.

One can perhaps place an article in the organisation's newsletter, stating the purpose of the survey or interview, and date it will be conducted.

- *Interruption of work:* Time is money. Taking employees away from productive work to complete a survey or undergo an interview may detract from job results. When distributing a survey, keep the survey brief, streamlined, and attractive. Insert the survey into the employee's pay cheque, or have the completion thereof coincide with the first day of another event. When conducting interviews, write out key questions prior to the interview. Make specific appointments, with a start and end time. Depending on the complexity of the performance issues discussed, in most one-on-one interviews that last longer than 30 to 60 minutes, researchers usually fail to gather significant information.

- *Confidential information:* Ask those who offer information during the assessment whether the information they offer is confidential (i.e. what they say should not be told to others) or anonymous (i.e. the information is shared with others, but not who said it). Either do not ask for the name of the person completing a survey, or make the provision of a name optional. Generally, respondents are more forthcoming if they may remain anonymous. Provide an anonymous means to return the survey, such as in a sealed envelope, or use an electronic survey completed in a secure website. Consider having the results tabulated by someone outside the organisation. Be sure to clarify any concerns and purpose of the interview results.

- *Management buy-in:* Management, as the client, should be involved in all three phases of a needs assessment (i.e. gathering information, analysing information and creating a training plan). Convince all the clients/managers who are involved with the deficiency of the purpose and benefits of the survey or interview prior to collecting information. Tie the survey data to the strategic plan and/or performance review processes. Demonstrate the cost-effectiveness of gathering survey information. Anticipate management has needs, and focus the survey on key work processes. Promote the purpose and benefits of the survey to supervisors and managers.

- *Cost:* During a needs assessment process, the performance deficiency usually continues. Promote the gathering of information as an investment in the progress of the

organisation. Do a feasibility analysis on the savings that would result from conducting a survey or interviews versus not doing anything at all. Often commonly held assumptions can be validated or changed when hard data is gathered. Use existing data on the deficiency to avoid the costs involved in obtaining information that is already available.

2.1.3 Types of needs analyses

Many needs assessments are available for use in different employment contexts. Sources according to Olajide (2009), the following sources that can help the researcher to identify the most appropriate needs analysis for a particular situation:

- *Organisational analysis*. An analysis of the business' needs or other reasons the training is desired. This entails an analysis of the organisation's strategies, goals and objectives – what the organisation is trying to accomplish overall. The most important questions being answered by this analysis are: who decided that training should be conducted; why a training programme is recommended as a solution to a business problem; and what is the history of the organisation in terms of employee training and other management interventions?

- *Person analysis.* This entails an analysis of the potential participants and instructors who are involved in the process. The most important questions being answered by this analysis are: who will receive the training; what is the level of their existing knowledge on the subject; what is their learning style; who will conduct the training; do the employees have the required skills; and are there changes to policies, procedures, software, or equipment that require or necessitate training?

- *Work/ task analysis.* This is an analysis of the job, and the requirements for performing the work. It seeks to specify the main duties and level of skill required of employees. It helps to ensure that the training that is being developed will include relevant links to the content of the job.

- *Performance analysis.* A performance analysis seeks to answer the following questions: Are the employees performing up to the established standard? If performance is below expectation, can training help to improve this performance? Is there a performance gap?

- *Content analysis*. This involves an analysis of documents, legislation and procedures used on the job. This analysis answers questions about the knowledge or information that is used on the job, which information is obtained from manuals, documents or regulations. It is important to ensure that the content of the training does not conflict or contradict the job requirements. An experienced worker, as a subject matter expert, may assist in determining the appropriate content of the job.

- *Training suitability analysis*. This is an analysis of whether training is the desired solution. Training is one of several solutions to employment problems. However, it may not always be the best solution. It is important to determine if training will be effective in the particular situation.

- *Cost-benefit analysis*. This involves an analysis of the return on investment (ROI) of the training. Effective training results in a return of a greater value to the organization than the initial investment to produce or administer the training.

2.2 Concept of training

There is no one definition of training. The simplest definition of training in the traditional training theory is “the acquisition of knowledge and skills for presently know tasks” (Crutchfield, 2000). Deutsch (1979), also, define training as follow: “Training serves to help increase upward mobility within the organization, to adjust workers to the technological changes affecting the workplace, and often simply to introduce people to the world of work at the entry level”. Okanlawon, (2014) define it as the teaching and learning activities carried out for the primary purpose of helping members of an organisation to acquire and apply the knowledge, skills, abilities, and attitudes needed by a particular job and organisation Moreover, Nadler and Wiggs (1986) provided the most commonly used definition of training: “Training activities focus on learning the skills, knowledge, and attitudes required to initially perform a job or task or improve upon the performance of current job or task”. From these definitions, it

can be deduced that training is an important activity within an organisation, which improves employees' performance and provides them the skills and knowledge required to do the job in a professional manner.

It is well acknowledged that one of the most important steps in training development is conducting a training needs analysis. This first step in training process focuses on the process of deciding who and what should be trained. A training needs analysis is primarily conducted to determine where training is needed, what should be taught, and who should be trained (Goldstein, 1993).

2.2.1 Training needs analysis

There are many definitions of a training needs analysis (TNA). Boydell (1976) defined a training need as "an existence of a particular weakness whereby the application of systematic training will serve to overcome that particular weakness". In addition, one of the clearest explanations of a needs assessment is provided by Anderson (2000), who states that the needs assessment is the starting point in the training process. It is the phase in which an organisation's needs are identified, forming the foundation of an effective training effort. The needs assessment identifies where and what kind of training programmes are required; who needs to be included; the conditions under which training will occur; and the criteria that should guide programme evaluation. A few terms can be used to refer to the process of identifying training needs, the most common of which are "training needs analysis (TNA)" or "training needs assessment". Although both terms are often used interchangeably, and many writers regard them as similar, Kaufman, Alicia and Hannah (1992) considered them as different.

According to Kaufman (1992), the purposes of a needs assessment are threefold, namely (i) to identify performance gaps; (ii) to prioritise these performance gaps; and (iii) to address the most important performance gaps. A needs analysis, on the other hand, is a process that is adopted to investigate the reasons for performance gaps (Holton, Bates and Naquin, 2000). However, the researcher believes that both of these terms are closely related, and are designed to identify the training needs of shea butter processors. Hence, he is of the opinion that the two terms may be used interchangeably in this study.

2.2.2 Training needs analysis models

Over the past three decades, dozens of needs assessment models have been developed, each differing in terms of the level of concentration thereof (Leigh, Watkins, Platt and Kaufman, 2000). McGehee and Thayer's three-level (Organisation-Task-Person) conception of a needs assessment is considered to be the core framework for a needs assessment, upon which most of the models that have since been developed had been based (Holton *et al*., 2000). The three levels of the frameworks are the following:

- *Organisational analysis:* The original purpose of an organisational analysis, as described by McGehee and Thayer (1961), is to provide information about where and when training in an organisation is required.

- *Task analysis:* A task analysis identifies the nature of the tasks to be performed on the job, and the knowledge, skills and abilities (KSAs) required performing these tasks.

- *Person analysis*: A person analysis focuses on identifying who should be trained, and which training is required by an individual.

2.2.3 Conducting a training needs analysis

A needs analysis is usually conducted to determine the training required by new employees, or to identify and find solutions to:

- problems with performance; and

- a new system, task or technology.

There are many tools to gather information about employee performance, each of which works best in different circumstances. These tools include the following:

- *Observation*: First-hand observation and analysis in a setting in which the observer does not interfere with normal productivity. Observation is used to gather first-hand information about an employee's strengths and weaknesses.

- *Interviews*: Using a series of predetermined questions to obtain opinions and perceptions. This tool allows employees to comment on their performance, whilst it allows the interviewer to ask in-depth questions about employees' performance.

- *Questionnaires*: Questionnaires enable the researcher to obtain a "big picture" of the environment by asking respondents identical questions. Questionnaires allow data collection from more respondents than individual interviews, and are less time-consuming. The data collected by means of questionnaires can be analysed in a more quantitative manner than the data collected by means of interviews.

- *Job descriptions*: A study of all the responsibilities involved in a certain job, in order to define an employee's expectation and responsibilities, thus allowing for more thorough training and supervision.

- *The difficulty analysis*: The identification of the duties of an employee that cause him/her the most difficulty, thus allowing for more training in those areas.

- *Problem-solving conference*: A conference setting that allows employees and other staff to identify a plan for a new task or technology, and to mould the training according to it.

- *Appraisal reviews*: Questioning employees, within a performance review, about their duties and training. This allows supervisors to uncover reasons for poor performance.

- *Analysis of organisational policy*: Reviewing the organisation's policy on training, and the amount and types of training that is offered to employees.

The following three concepts should be kept in mind when applying any of the above-mentioned methods:

- The tools should be used in combination; one should never rely on just one of them.

- They may be used to identify the training needs of different groups or types of employees.

- They should be adapted to individual employees, due to the variation of training amongst employees.

2.2.4 Training needs assessments

A training needs assessment is a systematic inquiry of training needs within an organisation, for purposes of identifying priorities and making decisions, and allocating finite resources in a manner consistent with identified programme goals and objectives. Kogan (1993) defined a training need as a condition in which there is a difference between a job done according to the current ability of the job holder, and a job done excellently. The difference can be related the knowledge, attitude or skills that trainees require to perform their jobs effectively. Stanley (1990) developed a training needs assessment model to assess training needs on an individual level – to assess what a particular trainee needs to ensure the meeting of set objectives. The first phase in this model entails the identification of training needs, in order to be sure of the existence of a training need before such a need is assessed.

During the identification phase, the activity in which a trainee is currently involved (Figure 2.1), as well as the existence of a need that can be resolved through training, is determined. The methods and principles used to conduct a training need assessment include job and task analyses. The advantage of this model is the inclusion of a training needs identification phase.

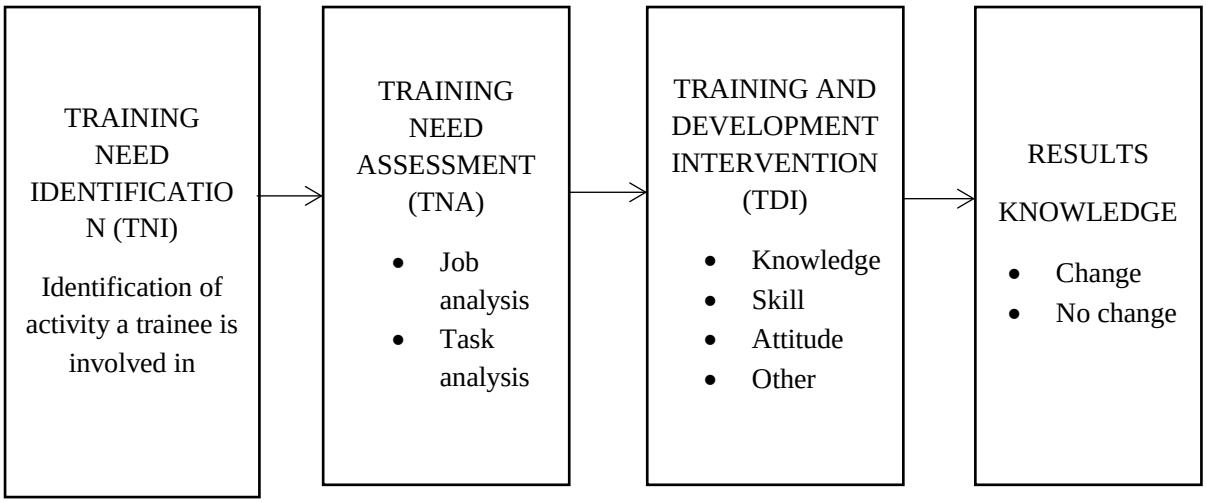

Figure 2.1: Model of training needs assessment (Stanley, 1990).

2.2.5 The importance of conducting training needs assessment

The primary purpose of a training needs assessment is to ensure that there is a need for training, and to identify the nature of what a training programme should contain. A training needs assessment provides the information required to develop a training plan that is based on the learning needs of the participants. It increases the relevance of the training and the commitment of the learners, as they are involved in the preparation of the training design, which reflects their expressed needs. Thus, it helps to foster a rapport between the facilitators and the participants. The facilitators can acquire basic knowledge of the strengths and limitations of the participants, whilst the learners can become partners in analysing their own learning needs (Olajide, 2009).

2.2.6 Levels of a training needs assessment

A training needs assessment comprises three levels, namely:

- *Organisational assessment:* An evaluation of the level of organisational performance. The skills, knowledge and ability needs of an agency are determined through an organisational assessment. It allows for the identification of what is required to alleviate the problems and weaknesses of the agency, and to enhance its strengths and

competencies. Factors such as changing demographics, political trends, technology and the economy are taken into consideration during an organisational assessment.

- *Occupational assessment***:** An examination of the skills, knowledge and abilities required of affected occupational groups. An occupational assessment identifies how and which occupational discrepancies or gaps exist. New ways to do work, which could rectify those discrepancies or gaps, are also examined.

- *Individual assessment***:** An analysis of how well an individual employee does his/her job, and serves as a means to determine the individual's capacity to do new or different work. An individual assessment provides information on which employees require training, and which kind of training is required.

2.2.7 Benefits of training needs assessment

The benefits of training needs assessment according to Ifejika, Uzokwe and Oladosu (2013) include:

- determining felt need,
- categorization of trainees,
- identification of adequate training methodology,
- knowing the appropriate time to deliver training,
- identifies non-training issues influencing performance,
- ensures survival of training function and
- establishes foundation for post-training evaluation

2.2.8 Training approach

According to Rama, Etling and Bowen (1993), there are three approaches to training, namely:

- *Traditional approach*: In the traditional approach, the training staffs designs the objectives, contents, teaching techniques, assignments, lesson plans, motivation, tests and evaluation of the training. The focus in this model is on intervention by the training staff.

- *Experiential approach***:** In the experiential approach, the trainer incorporates experiences in which the learner becomes active and influences the training process. Unlike the academic approach inherent in the traditional model, experiential training emphasises real or simulated situations in which the trainees will eventually operate. In this model, the objectives and other elements of training are jointly determined by the trainers and trainees. Trainers primarily serve as facilitators, catalysts or resource persons. In the performance-based approach to training, goals are measured through the attainment of a given level of proficiency, instead of the passing grades of the trainees. Emphasis is placed on the acquisition of specific, observable skills for a task.

- *Performance-based approach***:** The performance-based teacher education (PBTE) model, developed by Elam (1971), is mostly task or skill centred, and is also applicable to non-formal educational organisations, such as extensions.

2.2.9 Phases of training

Training is a circular process that begins with needs identification and, after a number of steps, ends with an evaluation of the training activity. A change or deficiency in any step of the training process affects the entire system, and therefore it is important for a trainer to have a clear understanding of all the phases of, and steps in, the training process. In the broadest view, there are three phases of a training process: planning, implementation, and evaluation (Abdul and Mozahar, 1998).

a) Planning phase

The planning phase encompasses several activities, two of which, namely (i) training needs identification and (ii) curriculum development, are very important.

(i) Training needs identification

A training need is a condition where there is a gap between "what is" and "what should be" in terms of incumbents' knowledge, skills, attitudes and behaviour for a particular situation at one point in time. This gap is called a "problem", which usually occurs when a difference exists between "desired performance" and "actual performance". The needs identification process assists trainers to ensure that they have matched a training programme to a training problem (Abdul and Mozahar, 1998).

Training needs identification is possible through different analytical procedures. The major procedures used in determining training needs are the following:

*Organisational analysis***:** It determines where the emphasis of the training should be placed within the organisation, and is based on the objectives of an organisation. Concerning what should be done when analysing an organisation, McGhee and Thayer (1961) suggest the following four steps:

- Stating the goals and objectives of an organisation.
- Analysing the human resources.
- Analysing efficiency indices.
- Analysing the organisational climate.

The results of these analyses are then compared with the objectives of the organisation, which comparisons will point to specific areas in which training is required.

*Individual analysis***:** Individual analysis is aimed at identifying the specific training needs of an individual or group of employees, so that training can be tailored to their needs. This analysis centres on individuals and their specific needs in relation to the skills, knowledge or attitudes they must develop to perform their assigned tasks. The possible methods or techniques for individual analysis include performance appraisal, interviews, questionnaires, tests, analysis of behaviour, informal talks, checklists, counselling, critical incidents, recordings, surveys, and observations.

Group analysis: It includes a number of techniques in which a group of well-informed employees discuss different aspects of the organisation, its employees, and their tasks, in order to identify the major discrepancies in achieving each of their predetermined targets, for purposes of assessing training needs, as distinguished from other necessary changes for removing these discrepancies.

The major techniques that are used in this approach are brainstorming, buzzing, card-sorts, an advisory committee, conferences, a problem clinic, role playing, simulation, task forces, workshops, etc.

(ii) *Curriculum development*

This is the most important part of a training programme after the identification of a need for training. The curriculum specifies what will be taught, and how it will be taught. It provides the framework and foundation of training. The first phase of curriculum development determines what will be taught; that is, the training content.

Once training needs have been identified, and training activities have been decided upon as part of the solution, needs analysis should be conducted to determine the knowledge, skills and attitude required, and the performance deficiencies. The needs analysis procedure involves breaking down the "training problem" into its basic parts in different successive phases, in order to identify and understand the important components of each phase. This ultimately leads to identification and understanding of the training content.

b) Implementation phase

Once the planning phase of a training programme has been completed, it is time to implement the course. Implementation is the point at which a trainer activates the training plan, or the process of putting a training programme into operation.

The first step towards implementing a training programme is publicity. Most well-established training centres develop training brochures that contain course descriptions; prepare an annual calendar of training opportunities; and inform concerned organisations, agencies or departments of their training plans well in advance. Once the training centre and concerned organisations agree to the implementation of training, the next step is to arrange available resources, such as sufficient funds for the course and facilities for food, lodging, transportation and recreation. All these resources should be well managed and co-ordinated to ensure the smooth running of the programme.

c) Evaluation phase

Evaluation is a process to determine the relevance, effectiveness and impact of activities in light of their objectives. In evaluating an extension training programme, one needs to consider that most training activities exist in a larger context of projects, programmes and plans. Thus, Raab, Swanson, Wentling and Dark (1987) define a training evaluation as "a systematic process of collecting information for and about a training activity, which can then be used for guiding decision making, and for assessing the relevance and effectiveness of various training components".

Kirkpatrick (1976) suggested four criteria to evaluate training programmes, namely: (i) reaction, (ii) learning, (iii) behaviour, and (iv) results. Each criterion is used to measure the different aspects of a training programme. Reaction measures how the trainees liked the programme in terms of the content, methods, duration, trainers, facilities and management thereof. Learning measures the skills and knowledge learners were able to acquire at the time of training. Behaviour is concerned with the extent to which the trainees were able to apply their knowledge to real field situations. Results are concerned with the tangible impact of the training programme on individuals, their job environment, or the organisation as a whole.

2.2.10 Processes of a training needs analysis

The training needs analysis process can be divided into three distinct analytical phases: (i) job analysis, (ii) task analysis, and (iii) knowledge and skill-gap analysis (Abdul and Mozahar, 1998).

a) Job analysis

Job analysis is a method of determining major areas of tasks in which training may be required. It involves the dissecting of a job into its component events or parts. This analysis allows a trainer to better understand what an employee does in an organisation. Job analysis involves the "task identification" of a particular job (Wentling, 1992). The techniques used in task identification include a job questionnaire, interview, participant observation, work sampling, job audit, and small-group discussion. The following steps may provide a guide for the completion of a job analysis (Abdul and Mozahar, 1998):

*Identify the job that is to be the subject of the analysis***:** This involves defining the focal point for the job analysis. It may include the entire job of a group of employees, or only a specific segment of their job.

Prepare a list of tasks that can be executed by following different approaches and methods: Four approaches can be used to identify job tasks: (i) experts identify and list critical tasks; (ii) observations and interviews are conducted with employees; (iii) meetings are held with group representatives; and (iv) a tentative list of tasks is reviewed by employees and their supervisors.

Verify the tasks: The draft list of tasks should be verified by experts, workers and supervisors during the analysis process. This can be done through expert reviews, small-group discussions, and interviews. When the tasks are verified, a final list of job tasks is prepared.

*Determine the frequency***:** Workers and supervisors can complete a form, indicating how frequently each task in a job is performed. Different scales, such as "seldom", "occasionally", "weekly to monthly", "daily to weekly", and "daily" can be used to quantify the intensity of an accomplished task.

Determine the importance: Not all tasks are equally important in a job. An occasionally performed task may be very important. Therefore, a relative importance rating, along with a frequency rating, is useful. A scale, such as "marginally important", "moderately important", and "extremely important" may be used to determine the relative importance of the job tasks.

*Estimate the learning difficulty***:** An estimate of learning difficulty is another dimension of the job-task analysis. It indicates to the trainer the employees' perception of difficulty, which may differ from the trainer's own perception. A scale such as "easy", "moderately difficult", "very difficult", and "extremely difficult" may be used to determine the difficulty indices of job tasks.

Calculate the total score: This can be done by simply adding the scores allocated to the frequency, importance and learning difficulty of each task. The "total score" column in a worksheet indicates the priority tasks for training, if there are training problems.

Review the findings: The results of the job-task analysis should be discussed with significant people in the training system, including government leaders, programme directors and others who are interested in the related training.

b) Task analysis

The output of the job analysis is a list of broad job tasks, based on the importance and learning difficulty of each task, and the frequency with which each task is executed. Each task is a complex set of procedures in itself, and therefore further analysis is required to determine which specific segment of the task is critical in designing a training programme. To do this, it is necessary to follow a method called a "task analysis", which is similar to a job analysis.

Task analysis procedures include preparing a blank task analysis worksheet; writing down the name of the job at the top of each sheet; and then making copies. Each of these forms will be used for breaking down and analysing each of the most important job tasks. Therefore, it is necessary to write one important task identified for training on each of the task analysis worksheets, and to list all component parts of each task on its respective task analysis worksheet. This is followed by the steps used in a job analysis, in order to determine the frequency, importance and learning difficulty of each step of the tasks. Then the score for each component part is put in the "total score" column, and the results are discussed with the

concerned personnel in the organisation. The job analysis and task analysis processes are similar to each other; hence, the model for both worksheets is the same.

The important difference between these two steps of analysis is that "the job analysis helps us identify major blocks of content to include in training; the task analysis helps us understand what comprises an individual block" (Wentling, 1992). Both are very important in the curriculum development process. What needs to be taught, and which steps are involved in the process, are determined by these analyses, and comprise the major steps in curriculum development.

c) Skill-gap analysis

The skill-gap analysis is a process of determining the training needs of individual employees in relation to the important tasks, steps or components of tasks identified for training. The skill-gap analysis determines how skilled or proficient individual employees are in these tasks, steps or components; how much individuals' performance differ from the desired performance; and whether or not they require training (Abdul and Mozahar, 1998). Designing and delivering training on topics and in skills in which trainees are already able and proficient would be a waste of resources, and frustrating to both the trainer and trainees. A priority list of the tasks identified for training according to the total score in the task analysis is made. Then, the steps or components that were identified on each task analysis worksheet are listed on the skill-gap analysis worksheet. This is followed by rating each step or component in terms of the trainee's current proficiency on a scale of 1 to 5, as shown in the legend of the worksheet. Identifying the steps or components in which trainees appear to have a low proficiency is required, as there is a gap between what is desired and the current situation.

Thereafter, a review is conducted to ponder on whether the gap can be decreased or removed through training, and whether training is the most appropriate method to address the gap. There may be some steps or components for which measures other than training is more appropriate. At this stage, key personnel, such as subject matter specialists, supervisors and extension training experts should discuss the findings before finalising the curriculum. This helps to identify different perspectives, and to avoid unnoticed mistakes or biases in curriculum development.

The training needs analyses enable a trainer to determine the training contents, and how deficient the trainees are in these contents, whilst the sequence of tasks provides the sequence of training activity (Abdul and Mozahar, 1998).

2.2.11 Training methods

A variety of training methods are available to a trainer. The most commonly used methods include the following:

Instructor presentation: The trainer orally presents new information to the trainees, usually through lectures. Instructor presentations may include classroom lectures, seminars, workshops, etc.

Group discussion: The trainer leads the group of trainees in the discussion of a topic.

Demonstration: The trainer illustrates the correct steps for completing a task, or provides an example of a correctly completed task.

Assigned reading: The trainer gives the trainees reading assignments that provide new information.

Exercise: The trainer assigns problems to be solved, either on paper or in real situations, related to the topic of the training activity.

Case study: The trainer gives the trainees information about a situation, and directs them to come to a decision or to solve a problem concerning the situation.

Role play: Trainees act out a real-life situation in an instructional setting.

Field visit and study tour: Trainees are given the opportunity to observe and interact with the problem being solved or the skill being learned.

2.2.12 Factors to be considered when selecting training methods

Four major factors are considered when selecting a training method (Wentling, 1992): (i) the learning objective, (ii) the content, (iii) the trainees, and (iv) the practical requirements.

According to Bass and Vaughan (1966), training methods should be selected on the basis of the degree to which they:

- allow the active participation of the learners;
- help the learners transfer learning experiences from training to the job situation;
- provide the learners with knowledge of the results of their attempts to improve;
- provide some means for the learners to be reinforced for appropriate behaviour;
- provide the learners with an opportunity to practise and to repeat, when required;
- motivate the learners to improve their own performance; and
- help learners to increase their willingness to change.

2.2.13 Steps in a training needs assessment

These steps include (Figure 2.2);

- collecting and analysing data;
- design the program objectives, plan, and measures of success;
- testing (prototype the instrument and process);
- implementation and

- analysing and evaluating (reviewing the feedback and the data collected).

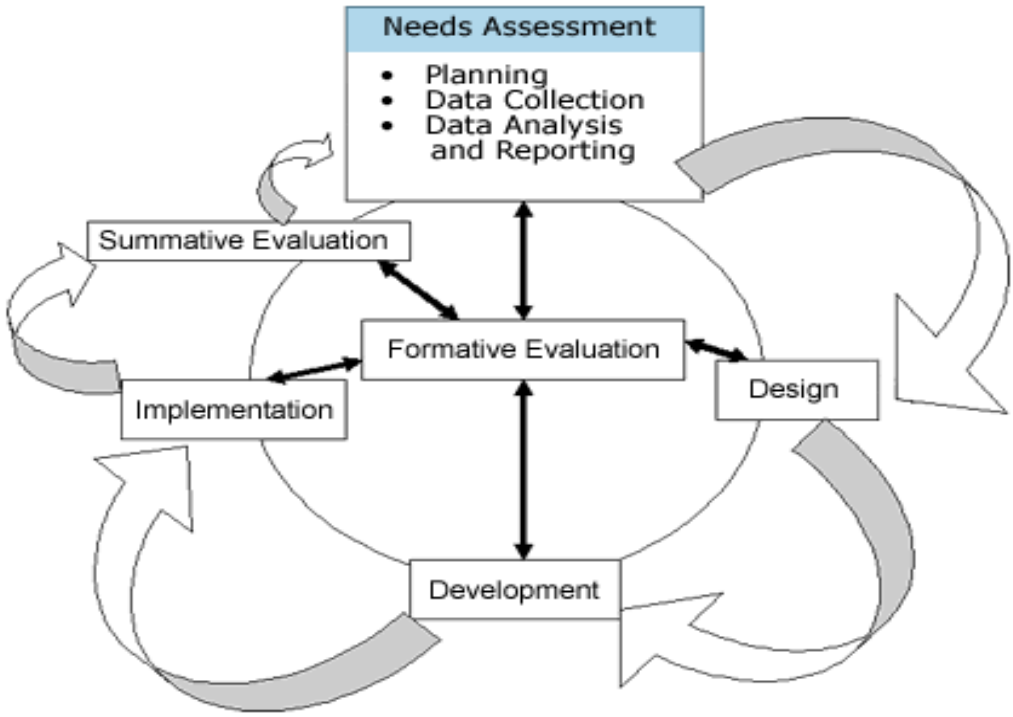

Figure 2.2: Steps in a training needs assessment (hr-survey.com, 2015)

2.2.14 Techniques for training needs assessment

There are several basic needs assessment techniques. Multiple methods of needs assessment should be used in order to obtain a true picture of the actual need (Rouda and Kusy, 1995). Some of the techniques include the following:

- *Direct observation*: This can be structured in an open-ended manner using certain indicators to guide the collection of information. Individuals and groups within an organisation can be observed in order to discover how much they know, what should be reinforced, and which new skills should be learnt. It also involves utilising either human observes (participant observers or judges) or mechanical observers (cameras, tape recorders, interaction chronographs, etc.) to observe the behaviour itself, or some physical traces of the behaviour.

- *Questionnaire:* This involves the preparation of a questionnaire, which is often lengthy and, therefore, time-consuming. It can be used to conduct a needs assessment when intended trainees are far apart and cannot meet as a group (Oyedele, 2005). It can also be used to obtain more in-depth and possibly sensitive information. Trainees' level of knowledge and skill can also be assessed through pre- and post-testing. A questionnaire is constructed around a set of related ideas or situations; i.e., it usually comprises a set of questions that are closely related and reflect the actual problem(s) under study. The questions are either closed-ended or open-ended in nature. Close-ended questions allow a respondent to select an answer from a number of options, and may be used to measure opinions, attitudes, knowledge or statement of facts.

- *Interview guide*: Interviews are more participatory than questionnaires in the sense that they are more oral than questionnaires. They usually are loosely structured schedules that merely list the topics an interviewer has been instructed to cover.

- *In-depth interview (IDI) with key informants*: This is a consultation with persons in key positions and/or with specific knowledge. Information can be obtained through interviewing certain people, such as traditional leaders, female or youth leaders, managers, and supervisors. It provides a relatively easy and inexpensive way to obtain some types of general information about a locality, such as an infrastructure development.

- *Focus group discussion (FGD)***:** It is a tool for studying ideas in a group context. Each FGD should include approximately eight to ten participants who are somehow socially similar. This method also requires an open-ended questionnaire, as well as careful facilitation and analysis, to obtain relevant results. It relies heavily on discussion and interaction within the groups, and yields more useful information when the participants are able to talk to each other about the topic of interest. This method is more participatory than a questionnaire, but less time-consuming than an individual interview.

2.3 Learning theories

Learning theories are the basic material that is usually applied in all educational and training activities. The more a person understands learning theories, the better he/she will be able to make decisions and apply them towards achieving the objectives. The behaviourists, the cognitivists, and the humanists emphasise different aspects of the teaching-learning process in their approaches. The behaviourists stress external conditions (i.e. the environment), resulting in observations and measurable changes in behaviour, whilst the cognitivists are more concerned with how the mind works (i.e. mental processes such as coding, categorising and representing information memory), and the humanists emphasise the affective aspects (e.g. emotions and attitudes) of human behaviour that influence learning (International Rice Research Institute, 1990). In extension, effective training should be able to address all the theories of learning in order to simultaneously change the action, belief and knowledge components of a trainee. Andragogy, a theory of adult learning, rather than pedagogy, a theory of child learning, is usually used in extension training (Abdul and Mozahar, 1998).

2.4 Theoretical framework

A theory is a statement or group of statement established by reasoned argument based on known facts intended to explain a particular fact or event (Oladipo, 2006). Therefore, theories are analytical tools for understanding, explaining, and making predictions about a given subject matter. Many theories have been identified, but those that are considered relevant to this study are discussed below.

2.4.1 Training need analysis model

This model was developed by Wentling (1992). It describes a training need as a condition where a gap exists between “what is” and what ought to be”. The gap is a “problem” that occurs when there is a difference between “desired performance” and “actual performance”. A needs analysis assists in breaking down a training problem into it basic parts, in order to obtain an understanding of the important components of each phase. This is accomplished in four phases, namely: (i) job analysis, (ii) task analysis, (iii) skill estimation, and (iv) gap analysis.

- *Job analysis:* It involves a thorough evaluation of a job by assessing its component parts in order to better comprehend what a trainee does during the course of his/her work. According to Wentling (1992), there are four steps in this phase, namely: (i) identifying the job to be analysed; (ii) listing all tasks included in the job; (iii) listing means of verification; and (iv) determining the frequency with which each task is performed. Tasks with the highest total scores at the end of the phase would be accorded priority for training if revealed as significant in the gap analysis.

- *Task analysis:* In this phase, tasks associated with the job are broken down into their component parts. Each component is then analysed to determine its criticality and relative importance to the accomplishment of the job. Tasks with the highest total scores will then be selected as priority elements upon which training will be focused, if they are found to be significant during the gap analysis.

- *Training skill estimation/gap analysis:* A current skill level is estimated, so that focus can be placed on the most important skills lacked by employees. Tasks with the lowest scores come first on the list. Other tasks are listed in ascending order according to their scores. This will assist in deciding on the most critical tasks.

2.4.2 The problem solver model

The problem solver model postulated by Havelock (1973) view the end-user as the main initiator of a change process (Figure 2.3). The model advocates a strong linkage between the sub-systems of technology generation/dissemination, that is, research, extension and the user (farmers) sub-systems. The effectiveness of this model is contingent on the reciprocal and collaborative relationship that exists between these sub-systems. The end-user in this model is actively involved in finding solution to his problems.

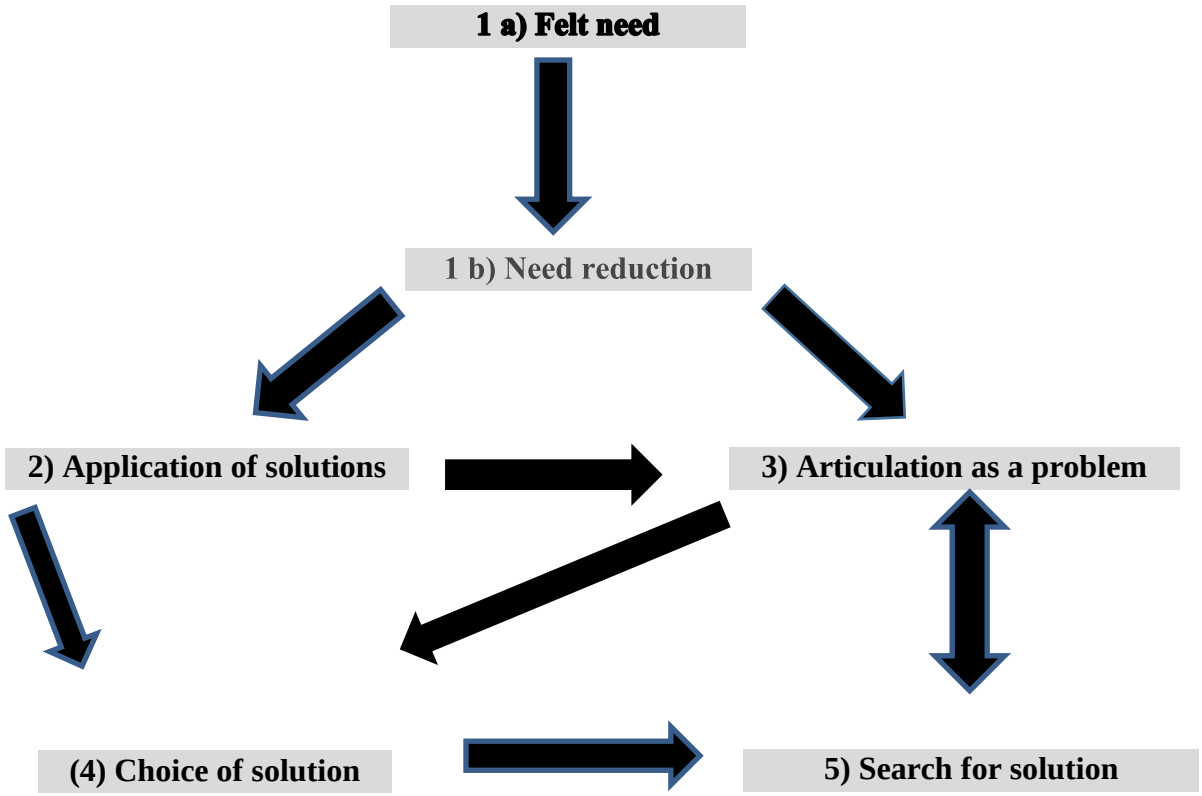

Figure 2.3: The problem-solver model (Severin and Tankard, 1992.)

The problem solver model consists of a number of stages. The first stage in the model involves the identification of felt needs of the end-user, which in stage two is articulated into a problem. Attempts are then made in stage three to search for solution, whilst the fourth stage involves evaluating possible solutions and selection of alternatives. Application of the best solutions is the fifth stage, which in turn is expected to lead to reduction of the original need if the solution is appropriate. The stages within the model are:

- sensing and identifying the need;
- diagnosis and need formation;
- searching for relevant resources to solve the problem;
- retrieving potentially feasible solutions;

- translating the retrieved knowledge into specific solutions and

- applying a solution, which can either be accepted or rejected.

2.4.3 Job description and job analysis model

The detailed responsibilities and duties attached to a position in a system or organisation are identified through a job description. A job analysis, however, describes the content of the job. The gap that exists between the two is referred to as the training need. The job description and job analysis model does not allow trainee participation in the determination process. The trainer examines a written job description, and describes what the duties and responsibilities of a trainee should be. Williams (1978) opined that the use of this model is limited to formal organisations where employees have written job descriptions.

2.4.4 Knowledge gap theory

The knowledge gap theory was first proposed by Tichenor, Donohue and Olien at the University of Minnesota in the 1970s. They believe that the increase of information in society is not evenly acquired by every member of society: people with higher socio-economic status tend to have a better ability to acquire information (Weng, 2000). This leads to a division of two groups: a group of more educated people who know more about most things, and those with less education who know less. People with a lower socio-economic status (SES), defined partly by educational level, have little or no knowledge about public affairs issues; are disconnected from news events and important new discoveries; and are usually not concerned about their lack of knowledge.

The knowledge gap can result in an increased gap between people with a lower socio-economic status and those with a higher socio-economic status. The attempt to improve people's life with information via the mass media might not always work as intended. In fact, the mass media might increase the gap that exists amongst members of different social classes.

2.5 Conceptual framework

A conceptual framework shows the articulate nature of the relationship between the independent variables and the dependent variables (Figure 2.4). It also indicates how intervening variables may affect the relationship. The diagrammatic representation of the framework can be interpreted as a source in which the independent variables (e.g. socio-economics characteristics, awareness, accessibility and adoption of modern shea butter processing technologies, the perceived benefits of those technologies, processors' knowledge and the constraints hindering processors' effective performance in the use of modern shea butter processing technologies for shea butter extraction activities affect the dependent variable (the training needs of shea butter processors in modern shea butter processing technologies).

The process is interactive and predictive. For instance, respondents' age, gender and level of education will directly affect their training needs in modern shea butter processing technologies. The processors' level of education will also affect their awareness of modern shea butter processing technologies. Between the independent and dependent variables are the intervening variable, which may affect processors' level of training in modern shea butter processing technologies. Examples of such intervening variables include the political environment, the state of the economy, and job satisfaction.

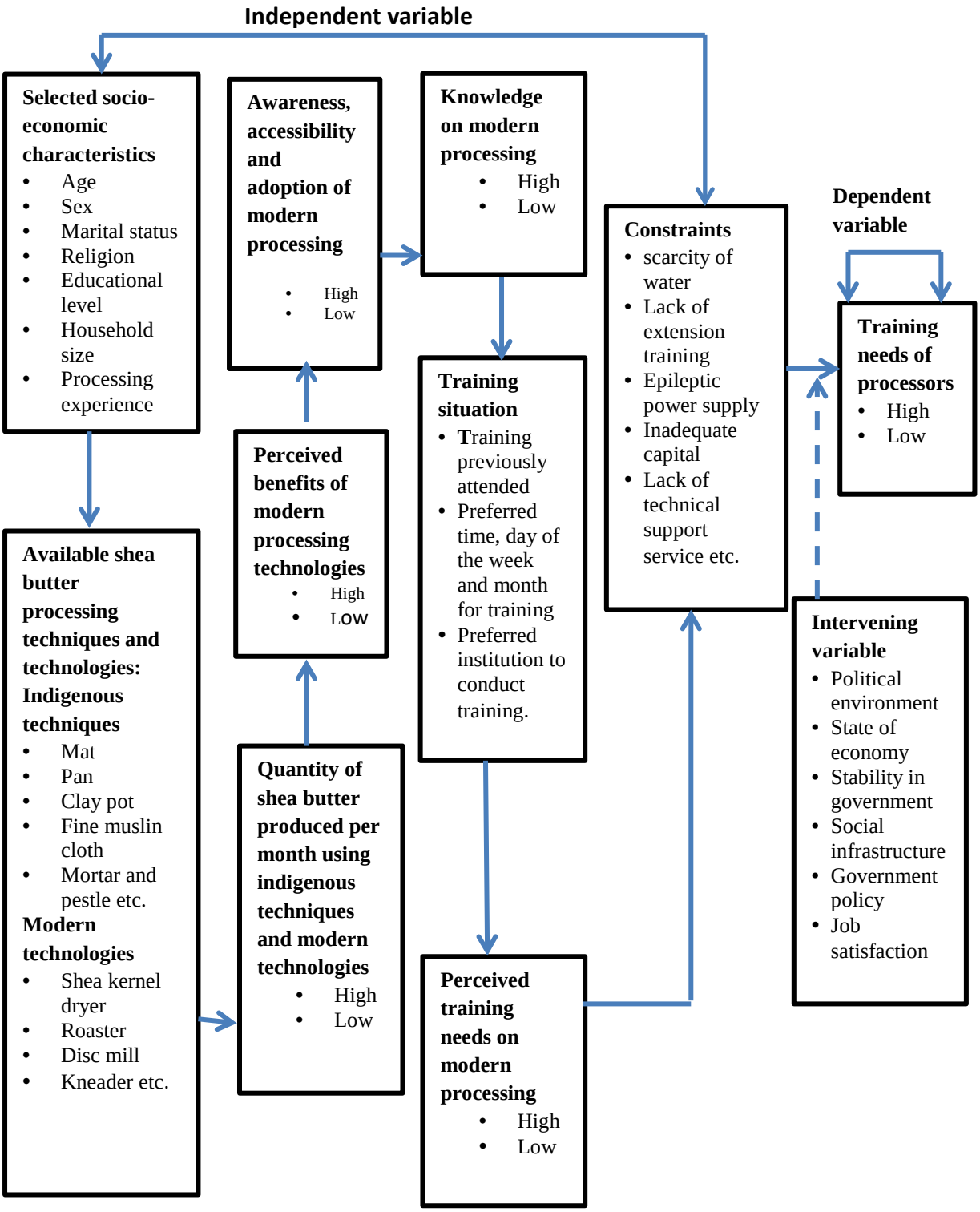

Figure 2.4: Conceptual framework for identifying training needs of shea butter processors on modern processing technologies in North Central Agro-ecological zone of Nigeria.

CHAPTER 3

METHODOLOGY

3.1 Background to the area of study

The study was conducted in the North-Central Agro-ecological Zone of Nigeria between the months of April and July 2016. The zone is located at an elevation of 115 m above sea level. Its co-ordinates are 8° 30' 0.00" N and 5° 0' 0.00" E in Degrees Minutes Seconds (DMS) or 8 and 8 in Decimal Degree. The zone consists of seven states, namely Kwara, Kogi, Plateau, Nassarawa, Benue, Niger and FCT Abuja (Figure 3.1), which are situated in the Middle Belt region of the country, spanning from the west, around the confluence of the River Niger and the River Benue. The region is characterised by a heterogeneity and diversity of people and cultures, with Yoruba, Nupe, Igala, and Tiv, respectively, as the major languages spoken by the people.

This zone is notable for farming, fishing, dyeing, weaving, carving and blacksmithery. Crops grown in this zone include potatoes, cassava, yam, soya bean, guinea corn, sesame, rice, flax and groundnuts, as well as tree crops such as cocoa, cashew and oil palm. The population of this region is approximately 20,712,567 (twenty million, seven hundred and twelve thousand, five hundred and sixty-seven) (National Population Commission, 2007). Niger and Kwara states were purposively selected for this study due to the high concentration of modern shea butter extraction activities in these states.

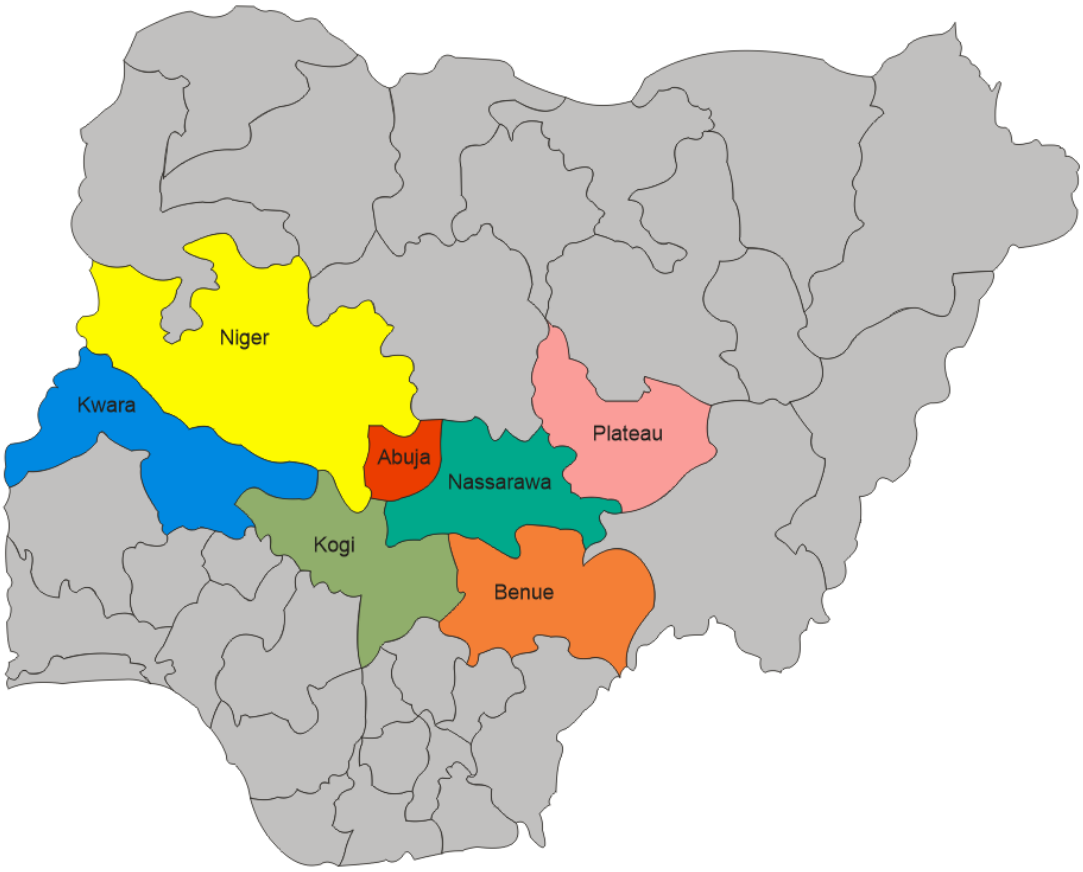

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Figure 3.1: Map showing regions of the study area, Niger and Kwara States of Nigeria (Aregheore, 2009).

3.2 Study population

The population of the study refers to the entire group or category of individuals selected for the research (Bell, 1993). In this study, the study population consists of all shea butter processors in the study areas.

3.3 Sampling procedure and sample size

Sampling enables the researcher to study a relatively small number of units of the target population, and to obtain data that are representative of the entire population. In most cases, the researchers opt for an incomplete coverage, and study only a small proportion of the population – a sample.

Sampling, therefore, is the process of choosing the research units of the target population that are to be included in the study (Sarantakos, 1993). A sample is a subset or portion of the total population. It is as an approximation of the whole, rather than the whole itself (Bailey, 1987). A representative sample occurs when there is an accurate representation of the population studied. The process of sampling entails gathering information from a cross-section of a population used to represent the entire population (Nwabueze, 2009). There are different techniques involved in the selection of a sample for any study. A sampling technique refers to the researcher's method of appropriately selecting the type, size and representativeness of the sample.

As a result of the absent of lists of registered shea butter processors in the study areas, the sample frame for the study was obtained using FGDs. Respondents for the study were selected via a multi-stage sampling procedure. The first stage involved the purposive selection of two states (Niger and Kwara) from the seven states that comprise the North Central Agro-ecological zone of Nigeria, due to the high concentration of shea butter extraction activities. The second stage involved the purposive selection of three Local Government Areas (LGAs) from each of the state to obtain 6 LGAs based on the availability of modern shea butter processing technologies. The selected LGAs were Borgu, Bosso and Katcha from the Niger State, Barutten, Moro and Kaiama from the Kwara State (Figure 3.2). The third stage involved the use of simple random sampling technique to select three communities from each of the three LGAs of the two states selected to obtain 18 communities based on the use of modern shea butter processing technologies. From each of these communities, twelve respondents were randomly selected to give a sample size of 216 (two hundred and sixteen) respondents for the fourth and final stage of the multi-stage sampling technique proposed for this investigation.

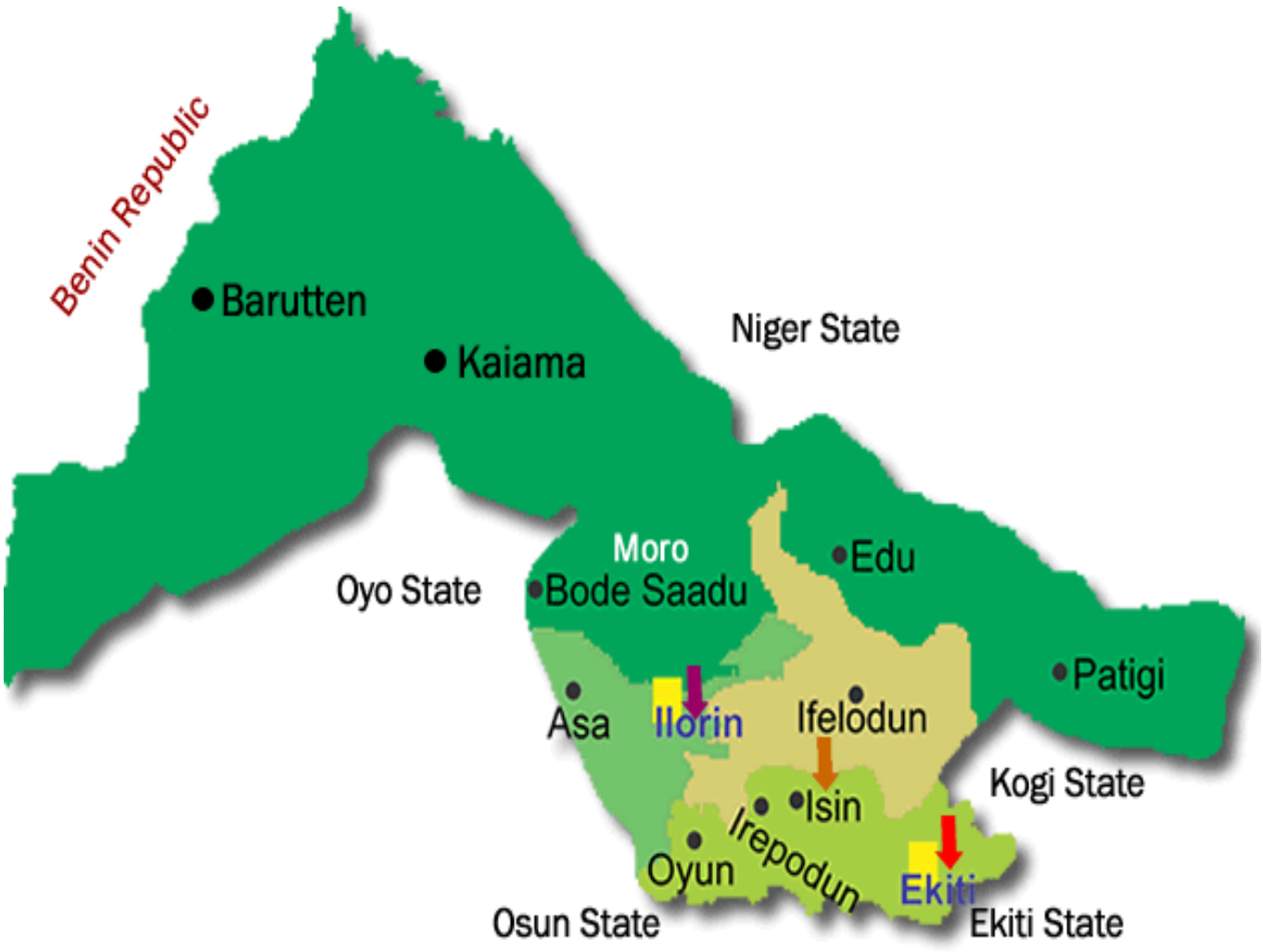

Figure 3.2: Map of Kwara State showing its Local Government Areas from which Barutten, Kaiama and Moro LGAs were selected for the study (Ololade and Ibrahim, 2014).

3.4 Methods of data collection

Data obtained from primary sources were used and were obtained from an interview guide and a well-structured questionnaire (see *Appendix A*), comprised of open- and closed-ended questions. The open-ended questions allowed the respondents to express their own opinions about specific situations. For interviews guide a face-to-face interview with the respondents, during focus group discussions (FGDs) were used. The questionnaire was administered by the researcher, trained extension agents from Agricultural Development Programmes (ADPs), and a Principal Women Development Officer (PWDO) from the State Ministry of Agriculture during the FGDs in each location.

The questions in the research instruments were organised into 12 sections namely, Section A, B, C, D, E, F, G, H, I, J, K and L.

The research instruments (120 questionnaires) were pre-tested at the Illua Community of the Saki West LGA of Oyo State, Nigeria, because of the high rate of modern shea butter extraction activities in this community. The process exposed all inconsistencies, incorrect expressions and inappropriate words in the prepared questionnaire, which resulted in the necessary corrections, were made prior to the use thereof in the field of study.

3.5 Measurement of variables

Independent variables and dependent variable were measured in this study. The independent variables included; (i) the socio-economic characteristics of the respondents, such as age, gender, marital status, religion, educational level, household size, processing experience, membership of cooperative, monthly generated income; (ii) the availability of indigenous shea butter processing techniques and modern shea butter processing technologies, (iii) the quantity of shea butter produced per month using indigenous processing techniques versus using modern processing technologies; (iv) the perceived benefits of modern processing technologies; (v) respondents' awareness of, accessibility to, and adoption of modern processing technologies; (vi) respondents' knowledge; (vii) training situations in terms of areas of training previously attended; number of trainings attended from 2010 to 2015; preferred training methods; preferred time of training and preferred institutions to conduct training; (viii) perceived level of competence; (ix) perceived level of training needs; (x) perceived constraints hindering effective performance of shea butter processors in the use of modern shea butter processing technologies for shea butter extraction activities.

Independent variable

Section A: Selected socio-economic characteristics

i) *Age:* Respondents were requested to state their actual age in years.

ii) *Gender:* Respondents were provided with "male" or "female" options from which to select a gender, and they were requested to tick the category to which they belonged, and scored as follows: male = 1; female = 2.

iii) *Marital status:* Respondents were requested to indicate their marital status, and scored as follows: single = 1; married = 2; divorced = 3; and widowed = 4.

iv) *Religion:* Respondents were requested to indicate their religion from the following options provided, and scored as follows: Christian =1; Muslim =2; traditional =3; and others = 4 (not specify).

v) *Educational level:* Respondents were requested to indicate the highest academic qualification they had obtained, and scored as follows: no formal education = 1; Quranic = 2; primary= 3; secondary = 4; tertiary = 5; and others (specify) = 6.

vi) *Household size:* Respondents were requested to indicate their household size from the following options, and scored as follows: 1 to 4 = 1; 5 to 8 = 2; 9 to 12 = 3; above 12 = 4.

vii) *Processing experience:* Respondents were requested to indicate their processing experience in years, and scored as follows: 1 to 5 years = 1; 6 to 10 years = 2; 11 to 15 years = 3; above 15 years = 4.

viii) *Membership to co-operatives:* Respondents were requested to indicate whether or not they were members of co-operatives, and scored as follows: yes = 2; no = 1.

ix) *Monthly generated income:* Respondents were requested to indicate, from the following option, the monthly income they generated from the sales of shea butter, scored as follows: Up

to ₦5,000 = 1; ₦ 5001 to ₦ 10,000 = 2; ₦10,001 to ₦15,000 = 3, ₦15,001 to ₦ 20,000 = 4 and above ₦20,000 = 5

Section B: Availability of indigenous shea butter processing techniques and modern shea butter processing technologies

Respondents were requested to indicate, from a list of items, the indigenous shea butter processing techniques and modern shea butter processing technologies that were available to them. An "available" response was allocated a score of one (1), whilst a "not available" response was allocated a score of zero (0) (see *Appendix A*).

Section C: Quantity of shea butter produced per week using modern processing technologies versus using indigenous techniques

Respondents were requested to indicate the quantity, in kilogram, of shea butter produced per week using modern processing technologies vs. the quantity, in kilogram, of shea butter produced per week using indigenous techniques, by selecting one of the following options: 1 to 10 kg; 10.1 to 20 kg; 20.1 to 30 kg; 30.1 to 40 kg; 40.1 to 50 kg; and above 50 kg. (see *Appendix A*).

Section D: Perceived benefits of modern shea butter processing technologies

Respondents were requested to indicate their perception of the benefits derived from the use of modern processing technologies. A list of 11 items was provided in the instrument, and each item had to be scaled as "strongly agree" (5); "agree" (4); "undecided" (3); "disagree" (2); or "strongly disagree" (1). The level of benefits derived from modern processing technologies was identified as either high or low through the use of the mean value that was obtained (see *Appendix A*).

Section E: Awareness of, accessibility to, and adoption of modern shea butter processing technologies

Respondents were requested to indicate their awareness of, accessibility to, and adoption of selected modern shea butter processing technologies (e.g. shea kernel dryer, shea nutcracker

and separator, shea kernel roaster, etc.). An “aware” response was allocated a score of one (1), whilst a “not aware” response was allocated a score of zero (0). Similarly, an “accessible” response was allocated a score of one (1), whilst a “not accessible” response was allocated a score of zero (0); and an “adopted” response was allocated a score of one (1), whilst a “not adopted” response was allocated a score of zero (0) (see *Appendix A*).

Section F: Respondents’ knowledge of available modern shea butter processing technologies

Respondents were requested to respond to 11 statements to test their knowledge of the use of available modern shea butter processing technologies for shea butter extraction. For each statement, a correct response was allocated a score of two (2), whilst an incorrect response was allocated a score of one (1). The results were computed to determine the knowledge mean score. A qualitative assessment of the correct-response knowledge levels of the respondents was conducted by converting the means of the knowledge indices to percentages. A correct knowledge mean score of more than 70% was regarded as a high knowledge level; 50% – 69% as a moderate knowledge level; and less than 50% as a low knowledge level (Iliyasu, Kabir and Galadanci, 2005) (see *Appendix A*).

Section G: Respondents’ situation in terms of training in modern shea butter processing technologies

In this study, "respondents' situation in terms of training in modern shea butter processing technologies" refers to:

- areas of training in modern processing technologies for shea butter extraction previously attended by respondents;
- number of trainings in modern processing technologies for shea butter extraction attended by respondents from 2010 to 2015;
- training methods preferred by respondents;
- time of training preferred by respondents; and

- training institutions preferred by respondents (See *Appendix A*).

Section H: Respondents' level of competence in available modern shea butter processing technologies

Respondents' level of competence in the available modern shea butter processing technologies, in terms of a range of processing tasks, was determined by using McCaslin and Tibezinda (1997) model of assessing training needs (see *Appendix A*). A Likert-type scale was developed, which scale included four categories of competence, namely: (i) not competent, with a score of one (1); (ii) little competence, with a score of two (2); competent, with a score of three (3); and (iv) very competent, with a score of four (4). The scores were computed to obtain a competence mean score. Respondents who obtained a competence mean score and above were categorised as competent, whilst those who obtained less than the competence mean score were categorised as incompetent. The competence mean scores on each of the processing tasks were also ranked to determine those tasks in which shea butter processors have a high level of competence, vs. those skills in which they have a low level of competence.

Section I: Respondents' perceived needs in terms of training in modern shea butter processing technologies

In ascertaining the perceived level of training in modern shea butter processing technologies required by shea butter processors, a five-point Likert-type scale, with the options "strongly agree", "agree", "undecided", "disagree" and "strongly disagree", with nominal values of 5, 4, 3, 2 and 1, respectively, was used to obtain responses from shea butter processors on a list of items presented (e.g. shea kernel dryer, shea nutcracker and clarifier, etc.) (see *Appendix A*). A mean score was computed. Respondents who obtained the mean score and above were categorised as having a high perception of training, whilst those who obtained less than the mean score were categorised as having a low perception of training.

Section J: Respondents' perception of constraints hindering their effective performance in the use of modern processing technologies for shea butter production

Respondents were requested to respond to a list of constraints (e.g. scarcity of water, lack of extension training, inadequate capital in shea butter processing, high cost of equipment maintenance, etc.) using a four-point Likert-type scale with the options "very severe", "severe", "not severe" and "not a constraint", with values of 3, 2, 1 and 0, respectively, assigned to each option.

In order to categorise the constraints as "very severe" and "not severe", a mean score was computed. Constraints with a mean score and above were categorised as very severe, whilst constraints with a score below the mean score were categorised as not severe in terms of constraints hindering their effective performance in the use of modern shea butter processing technologies for shea butter extraction activities.

Dependent variable

The dependent variable of this study is the innovative methods for identifying the training needs of shea butter processors in the North-Central Agro-ecological Zone of Nigeria.

Innovative methods for identifying training needs

Amongst the methods available for identifying training needs, a questionnaire, interview guide, FGD, and task and skill-gap analyses, as propounded by Abdul and Mozahar (1998), were used in this study as the innovative methods for identifying the training needs of shea butter processors in modern processing technologies for shea butter extraction in the study areas. These methods are considered innovative because:

- The questionnaire assisted the researcher to deal with the actual problem(s) under study. It will also assist the researcher to obtain more in-depth, and possibly sensitive, information from the processors;

- The interview guides assisted the researcher to address the problem of illiteracy amongst the processors. As processors were interviewed on a one-on-one basis, it assisted the researcher to obtain accurate or correct data from the illiterate processors;

- The FGD is participatory and less time-consuming. This method afforded the researcher and the trained enumerators the opportunity to identify literate processors, giving them questionnaires to complete, and illiterate processors, who were interviewed. In this way, time and resources were saved;

- The task analysis assisted the researcher to determine which segments of processing tasks are critical, and therefore require a high level of training; and

- The skill-gap analysis assisted the researcher to determine how proficient individual processors were on the available processing tasks, or how much processors' performance differed from the desired performance, and whether or not they required training.

Assessment of training needs via task and skill-gap analyses

Task analysis: This refers to the analysis of tasks performed by shea butter processors in the extraction of shea butter using modern processing technologies.

The tasks that considered for analysis in this study were based on the tasks that are executed in the course of producing shea butter by using the available modern processing technologies. These tasks included the drying of kernels; cracking and separation of nuts; roasting of kernels; crushing of roasted kernels; milling of crushed kernels; kneading of milled kernels; extraction of shea butter; clarification of shea butter oil; and storing of shea butter.

The task analysis were based on the importance of each task, the frequency with which it is performed, as well as the difficulty involved in learning how to do it. The frequency with which each task is performed was measured by using a five-point Likert scale with the options "seldom", "occasionally", "monthly", "weekly" and "daily", with scores of 1, 2, 3, 4 and 5, respectively.

The level of importance of each task was measured by using a three-point Likert scale with the options "marginally important", "moderately important' and "extremely important", with scores of 1, 2 and 3, respectively.

The difficulty involved in learning how to perform each task was measured by using a four-point Likert scale with the options "easy", "moderate difficulty", "very difficult" and "extremely difficult", with scores of 1, 2, 3 and 4, respectively.

The combined mean score based on the frequency with which each task is performed, the importance of the task, and the difficulty involved in learning how to perform the task, was used to categorise processors' training needs as either high or low. Therefore, processors who obtained the mean score and above were categorised as requiring a high level of training, whilst those who obtained less than the mean score were categorised as requiring a low level of training. Tasks with mean scores and above would be recorded priority for training.

Skill-gap analysis: The skill-gap analysis was used to estimate the skills level of respondents from a list of tasks that had been identified from the task analysis. Each “task” was rated on a scale of 1 to 5 in terms of the respondents’ current proficiency therein, with the following descriptors:

- Cannot do at all = 1
- Can do less than half of the task = 2
- Can do more than half of the task, but less than the complete task = 3
- Can do the complete task, but cannot maintain the time schedule = 4
- Can do the task within the time schedule = 5

A proficiency mean score was used to categorise respondents as either requiring training, or not requiring training. A low proficiency means that there is a gap between what is desired and the current situation. Hence, processors who obtained the mean score and above require no

training to solve their problems, whilst processors who obtained less than the mean score require training to solve their problems. Processors with a low proficiency mean score would be accorded priority for training.

3.6 Procedure of data analysis

The data collected were analysed with the aid of Statistical Package for the Social Science (SPSS), Version 20. Descriptive statistics, such as frequency count, means and percentages, were used to organise and summarise the data. Other statistical tools, such as Chi-square, Pearson Product Moment Correlation (PPMC), and t-test analysis were used to determine the significance of, and differences in, the relationship between the selected variables.

Hypothesis 1 was tested using Pearson Product Moment Correlation (PPMC) and Chi-square.

Hypotheses 2, 3 and 4 were tested using Pearson Product Moment Correlation (PPMC).

Hypothesis 5 was tested using t-test analysis.

CHAPTER 4

RESULTS AND DISCUSSION

In this chapter, the results of the analysed data are presented, and discussed. The results are presented in sections and subsections according to the objectives and hypotheses of the study.

4.1 Selected socio-economic characteristics of respondents

The socio-economic characteristics may influence shea butter processing in the areas of study. Characteristics considered in this study include age, gender, marital status, household size, religion, level of education, years of processing experience, membership to co-operative societies, and the monthly generated income from shea butter processing activities.

Age of respondents

Table 4.1 indicates that 30% of the respondents were between the ages of 21 to 30 years; 51.4% were between the ages of 31 to 40 years; 11.6% were between the ages of 41 to 50 years; 5.6% were between the ages of 51 to 60 years; and 1.4% were 60 years of age or older. The mean age of the respondents was 39.4 years, with a standard deviation of 8.19 years. This result indicates that the majority of the respondents (81.4%) were in their economic and productive ages (21 to 40 years old). As the processors' age is important in determining productivity and the adoption of innovation (Chikwendu, Chinaka and Omotayo, 1994; Kebede, 2001; Nwaru, 2004, as cited by Ironkwe, Ekwe, Okoye and Chukwua (2009), this result implies that there is a great prospect for increased and sustainable shea butter production amongst the younger processors in the study areas. Similarly, Obeta and Nwagbo (1999) opined that younger farmers are more adaptable to new ideas and risks; hence, it can be deduced that the majority of the respondents in the study areas will embrace and attend training in modern processing technologies, as they are young.

Gender of respondents

The productive activities of males and females in agriculture are very important, and should thus be taken into consideration. The result in Table 4.1 reveals that the majority of the processors (93.1%) are female, corroborating the Cocoa Research Institute of Ghana (2007)'s statement that women are more involved in the processing of shea butter. This finding is also aligned with Ekong (2003), as cited by Igene, Solomon, Orji, Akagbosu and Osifo (2015), who posited that the women in Nigeria are more involved in the processing of agricultural products than the men.

Marital status of respondents

Marital status indicates whether a respondent is single, married or divorced. The general assumption made is that married couples are regarded as responsible citizens. Taiwo (2010) posited that married men have more labour force compared to single men. Table 4.1 indicates that 11.6% of the respondents were single; 85.6% were married; 1.4% was divorced; and 1.4% was widowed. The fact that the highest percentage of respondents was married corroborates Tologbose and Adekunle (2000), who observed that 98.5% of the rural farmers in Benue State were married. Married people with a large family size have an alternative supply of labourers who could work during processing, especially when their children are available to support them in processing activities. This is in agreement with Lovett (2004); Daniel *et al*. (2005); Adgidzi (2008); Ademola *et al*. (2012); and Phillip *et al*. (2014), who reported that married people have the advantage of employing family labourers to assist in processing activities.

Household size of respondents

Household size plays an important role in determining family labour. The larger the household size, the greater its productivity, through labour they provide in the farming activities (Odusile, 2008). The result in Table 4.1 reveals that, with a household mean size of 10.15, and a standard deviation of 3.76, household sizes comprising between 9 and 12 members constituted the highest percentage (55.6%), whilst the household sizes of 22.2%, 12% and 10.2% of the respondents were in the following range, respectively: 5 to 8 members; 1 to 4 members; and more than 12 members. Based on this finding, it can be inferred that large household sizes are common in the study areas, where most households consist of up to 12 family members each.

Hence, family members are capable of providing labour during the processing activities. This is also in line with the findings of Ademola *et al*. (2012); Bonkoungou (2005) and Aboyella (2002).

Religion of respondents

The most common religions in Nigeria are Christianity, Islam and traditional worship. Table 4.1 indicates that 6.9% of the processors were Christian, whilst 93.1% were Muslims. From the result, it can be inferred that the majority of the respondents in the study areas were Muslims. However, the presence of the two religions in the areas of study suggests religious tolerance amongst the respondents.

Educational level of respondents

Respondents' level of education is an important factor, which brings about desirable changes in processors' skills and awareness, and enhances processors' training in modern processing technologies, which, in turn, may affect their socio-economic status. The attainment of an education by a farmer does not only raise his productivity, but also increases his ability to understand and evaluate information on new techniques and processes that are disseminated via extension (Ani, Achamber and Asogwa, 2009). The result of the analysis reveals that 50% of the respondents had no formal education, whilst 28.7% had a primary school education; 12% had a Quranic (Islamic) education; 8.3% had a secondary school education; and 1% had a tertiary education (Table 4.1). It can therefore be deduced that most processors had a low level of education, which could have a negative impact on their adoption of innovation in new techniques. This finding agrees with the view of Quisumbing and Meinzen-Dick (2001), namely that: "Many countries in Sub-Saharan Africa have a low level of education, and improving their education would probably increase agricultural productivity and reduce poverty".

Years of processing experience

The results of the analysis of respondents' years of processing experience, as presented in Table 4.1, reveal that the majority of the respondents (74.1%) had 6 to 15 years' processing experience, whilst 5.1% had 1 to 5 years' processing experience. This result corroborated the finding of Fakayode, Akangbe, Akinseye and Adesuyi (2013) that the majority of shea butter processors in the Kwara State had between 9 and 15 years' processing experience. It can be inferred from this finding that most of the processors in the study areas are experienced in shea butter processing.

Membership to cooperative societies

Table 4.1 indicates that 89.8% of the respondents were members of co-operative societies, whilst 10.2% were not members of co-operative societies. This implies that the majority of the respondents in the study are members of co-operatives.

Monthly income generated by respondents

Approximately 63.9% of the respondents generated between ₦5, 001 and ₦15, 000 per month from shea butter processing activities, whilst 20% generated up to ₦5, 000 per month (see Table 4.1). Based on this finding, it can be inferred that most respondents in the study areas are making a living (₦15, 000 per month) from the sales of shea butter.

Table 4.1: Distribution of respondents according to selected socio-economic characteristics

Selected Socio-economic Characteristics	Frequency	Percentage
Age		
Below 20	0	0
21 – 30	65	30
31 – 40	111	51.4
41 – 50	25	11.6
51 – 60	12	5.6
Above 60	3	1.4
Gender		
Male	15	6.9
Female	201	93.1
Marital status		
Single	25	11.6
Married	185	85.6
Divorced	3	1.4
Widowed	3	1.4
Household size		
1 – 4	26	12.0
5 – 8	48	22.2
9 – 12	120	55.6
Above 12	22	10.2
Religion		
Christian	15	6.9
Muslim	201	93.1
Traditional	0	0
Educational level		
No formal education	108	50.0
Quaranic	26	12.0
Primary	62	28.7
Secondary	18	8.3
Tertiary	2	1.0
Years of processing experience		
1 – 5	11	5.1

6 – 10	55	25.5
11 – 15	105	48.6
Above 15	45	20.8
Membership to cooperatives		
Member	194	89.8
Non-member	22	10.2
Monthly generated income		
Up to ₦5, 000	45	20.8
₦5, 001 – ₦10, 000	47	21.8
₦10, 001 - ₦15, 000	91	42.1
₦15, 001 – ₦20, 000	21	9.7
Above ₦20, 000	12	5.6

n=216 Source: Field survey, 2016

4.2 Availability of shea butter processing techniques and technologies

As indicated in Table 4.2 below, the most common indigenous processing techniques available to respondents in the study areas were pans for boiling water (100%), clay pots for roasting kernels (100%), legs/hands for kneading (100%), calabash and nylon for butter storage (100%), and baskets for winnowing (100%). Similarly, Table 4.2 also indicates that the shea kernel dryer (100%); shea nutcracker and separator (100%); shea kernel roaster (100%); hammer mill crusher (100%); disc mill (100%); kneader (100%); manual screw press (100%); clarifier (100%); and storage tank (100%) were the common modern processing technologies for sea butter extraction available to respondents in the study areas. These findings confirmed the reports that the Federal Government of Nigeria, via the Raw Material Research Development Council (RMRDC) and some non-governmental organisations (NGOs) such as the World Trade Organisation (WTO) and German Technical Co-operation (GTZ), provided some modern shea butter processing technologies to shea butter processors in the shea butter-producing areas of Nigeria.

Table 4.2: Distribution of respondents according to the availability of shea butter processing techniques and technologies

Indigenous processing techniques	**Available**	**Not available**
Mats for drying Shea kernels	215 (99.5)*	1 (0.5)
Pan for boiling water	216 (100)	0
Mortar and pestle for breaking kernels and pounding roasted kernels	201 (93)	15 (7)
Clay pots for roasting kernels	216 (100)	0
Iron and clay pots, basin or bowls for extraction of shea butter	197 (91)	19 (9)
Fine muslin cloth for clarification	205 (95)	11 (5)
Use of legs/hands for kneading	216 (100)	0
Calabash/ Nylon for butter storage	216 (100)	0
Fine grinding stone for grinding crushed roasted kernels	203 (94)	13 (6)
Leaves for storage and marketing	186 (86)	30 (14)
Basket for winnowing	216 (100)	0
Modern extraction technologies		
Parboiling tank (for boiling of fresh shea fruits)	0	216 (100)
Parboiled Shea fruit digester (for digesting of boiled shea fruits)	0	216 (100)
Shea kernel dryer (for drying of shea nuts)	216 (100)	0
Shea nut cracker and separator (for cracking and separation of nuts)	216 (100)	0
Shea kernel roaster (for roasting of kernels)	216 (100)	0
Hammer mill crusher (for crushing of roasted kernels)	216 (100)	0
Disc mill (for milling of crushed kernels)	216 (100)	0
Kneader (for kneading of milled kernels)	216 (100)	0
Manual Screw press (for extraction of shea butter)	216 (100)	0
Decanting vessel (for scooping shea butter oil)	0	216 (100)
Clarifier (for clarification of shea butter oil)	216 (100)	0
Storage tank/ drum (for storage of shea butter)	216 (100)	0

* Figures in parenthesis are percentages

n=216 Source: Field survey, 2016

4.3 Quantity of shea butter produced per month using modern processing technologies and indigenous processing techniques

Table 4.3 indicates the distribution of respondents according to the quantity of shea butter produced per month using modern processing technologies, versus the quantity of shea butter produced per month using indigenous processing techniques. When using modern shea butter processing techniques, 72.7% of the processors produce between 30.1 kg and 50 kg of shea butter per month (thus, between 361.2 kg and 600 kg per annum). On the other hand, 98.8% of the processors when using indigenous processing techniques produced between 1 kg and 20 kg shea butter per month (thus, between 12 kg and 240 kg per annum). This level of shea butter output is low for a sustainable income. This finding is aligned with the findings of Ademola *et al.* (2012), who reported a similar level of shea butter production in the Atisbol Local Government Area of the Oyo State. These findings imply that the use of modern techniques results in an increase in shea butter production, reinstating Ibrahim, Muhammad-Lawal, Adesina, Muhammad and Ibrahim (2016) stated that a larger quantity of shea butter is produced when modern techniques are used than when indigenous techniques are used. The findings are also in agreement with Addaquay (2004), who opined that the extraction rate of shea butter using modern processing techniques is higher than when using indigenous processing techniques.

Table 4.3: Distribution of respondents according to the quantity of shea butter produced per month using (quantity produced per month) modern and indigenous processing techniques respoctively

Quantity of shea butter produced per month	Modern processing technologies		Indigenous processing techniques	
	Frequency	%	Frequency	%
1 - 10 kg	_	_	75	4.7
10.1 – 20 kg	4	1.9	140	64.8
20.1 – 30 kg	20	9.3	1	0.5
30.1 – 40 kg	58	26.9	-	-
40.1 - 50 kg	99	45.8	-	-
Above 50 kg	35	16.2	-	-

n=216 Source: Field survey, 2016

4.4 Respondents' perception of the benefits of modern shea butter processing technologies

Table 4.4 shows respondents perceived benefits in the use of modern shea butter processing technologies. Specifically, statement were respondents indicate high level of benefits in the use of modern shea butter processing technologies includes increase in high yield of shea butter ($\bar{x}$ = 4.93). This finding conforms to view point of Matanmi, Adesiji, Olasheinde and Oladipo (2011) that new technology increases the yield of shea butter. Other high benefits of modern shea butter processing technologies derived by the respondents include:

- greatly increased household income ($\bar{x}$ = 4.83);
- improved the appearance and quality of shea butter ($\bar{x}$ = 4.80);
- strongly increased the value of products ($\bar{x}$ = 4.79);
- reduced the drudgery of shea butter processing ($\bar{x}$ = 4.73);
- enhanced their ability to pay children's school fees ($\bar{x}$ = 4.66);

In addition, Table 4.4 also reveals low level of benefits derived by the respondents in the use of modern shea butter processing technologies such as:

- increased their access to health facilities ($\overline{x}$ = 4.45);
- increased their ability to invest in livestock and other farming activities ($\overline{x}$ = 4.40);
- nutritional benefits ($\overline{x}$ = 4.11) and employment creation ($\overline{x}$ = 4.10).

Table 4.4: Distribution of respondents' according to the perceived benefits of modern shea butter processing technologies

Benefit of modern processing technologies	**Perceived benefits score**
It increases high yield of shea butter	4.93±0.34
It has greatly increased my household income	4.83±0.50
Improved appearance and quality of shea butter	4.80±0.54
It has strongly increased the value of my products	4.79±0.53
It reduces drudgery of shea butter processing	4.73±0.82
Enhanced my ability to pay children school fees	4.66±0.92
Access to health facilities has greatly increased	4.45±0.87
Increased my ability to invest in livestock and other farming activities	4.40±0.93
Nutritional benefits	4.11±1.14
Employment creation	4.10±1.55
It has enhanced the provision of social infrastructures in my village	4.00±1.55

(Strongly agree = 5, Agree = 4, Undecided = 3, Disagree = 2, Strongly disagree = 1)

Decision rule: ≥ 4.53 = High benefit, < 4.53 = Low benefit

n = 216 Source: Field survey, 2016

Respondents' perception of the level of benefits of modern shea butter processing technologies

Table 4.5 represents the distribution of the level of benefits processors derive from the use of modern shea butter processing technologies. The results indicate that 53.7% of the respondents derived a high level of benefits from the use of modern processing technologies, whilst 46.3% of them derived a low level of benefits. This implies that more than half of the processors in the study areas derived many benefits from the use of modern shea butter processing technologies.

Table 4.5: Distribution of respondents' level of benefits derived from the use of modern shea butter processing technologies

Level of benefits	**Frequency**	**Percentage**	**Mean ($\bar{x}$)**
Low (11 – 33)	100	46.3	1.54±0.50
High (34 – 55)	116	53.7	
Total	216	100	

Source: Field survey, 2016

4.5 Respondents' awareness of, accessibility to, and adoption of selected modern shea butter processing technologies

The result of the analysis indicates that all the respondents (100%) in the study areas were aware of, and access the following modern processing technologies for shea butter extraction: shea kernel dryer, shea nutcracker and separator, shea kernel roaster, hammer mill crusher, disc mill, kneader, manual screw press, clarifier, and storage tank, respectively (see Table 4.6). This is an indication that the modern processing technologies are not new to any of the processors, and awareness of these technologies had been created by the concerned government agency and NGOs. Table 4.6 also indicates that 88%, 86% and 77% of the respondents were aware of the parboiling tank, shea fruit digester, and decanting vessel, respectively, but none of them were able to access them, as they were not available in their areas. Furthermore, from all the

modern technologies, the shea nutcracker and separator (5%) was the one most adopted by the respondents.

Table 4.6: Distribution of respondents according to awareness of, accessibility to, and adoption of selected modern shea butter processing technologies

Selected Modern Processing Technologies	**Awareness**		**Accessibility**		**Adoption**	
	Aware	**Not Aware**	**Accessible**	**Not accessible**	**Adopted**	**Not adopted**
Parboiled tank	186 (86)*	30 (14)	0	0	0	0
Shea fruit digester	190 (88)	26 (12)	0	0	0	0
Shea kernel dryer	216 (100)	0	216 (100)	0	5 (2)	211 (98)
Shea nut cracker and separator	216 (100)	0	216 (100)	0	11 (5)	205 (95)
Shea kernel roaster	216 (100)	0	216 (100)	0	1 (0.5)	215 (99.5)
Hammer mill crusher	216 (100)	0	216 (100)	0	6 (3)	210 (97)
Disc mill	216 (100)	0	216 (100)	0	9 (4.2)	207 (95.8)
Kneader	216 (100)	0	216 (100)	0	3 (1.4)	213 (98.6)
Manual screw press	216 (100)	0	216 (100)	0	6 (3)	210 (97)
Decanting vessel	166 (77)	50 (23)	0	0	0	0
Clarifier	216 (100)	0	216 (100)	0	0	0
Storage tank	216 (100)	0	216 (100)	0	2 (1)	214 (99)

* Figures in parenthesis are percentages

n: 216 Source: Field survey, 2016

4.6 Respondents' knowledge of available modern shea butter processing technologies

Processors were requested to respond to nine knowledge-related statements on the use of available modern shea butter extraction technologies. An overall percentage mean knowledge score of 44.33% was recorded for the nine knowledge statements (see Table 4.7). Specifically, 43% of the respondents correctly indicated that kernels are roasted by using roasters; 38% that roasted kernels are crushed by using hammer mill crushers; 25% that crushed kernels are milled by using disc mills; and 25% that milled kernels are kneaded by using kneaders. This implies a relative low level of knowledge about the processing activities of shea butter using the above-mentioned technologies (Iliyasu *et al.,* 2005). At the moderate level (i.e. 50% to 69%), most of the processors provided correct answers to the use of shea kernel dryers (63%); shea nutcrackers and separators (59%); and storage tanks (53%). Hence, this set of processors possessed moderate knowledge of the aforementioned technologies (Iliyasu *et al.,* 2005). It can thus be inferred from the findings that more than half (55.66%) of the respondents are not knowledgeable about the use of modern shea butter processing technologies for shea butter extraction (see Table 4.7 below).

Table 4.7: Distribution of respondents' knowledge on available modern processing technologies

Knowledge statements	Correct responses	Incorrect responses
Shea kernel dryers are used for drying fresh shea nuts.	136 (63)*	80 (37)
Cracking and separation of nuts are done by using shea nutcrackers and separators.	128 (59.)	88 (41)
Roasting of kernels are carried out by using shea kernel roasters.	94 (43)	122 (57)
Hammer mill crushers are used for crushing roasted kernels.	83 (38)	133 (62)
Milling of crushed kernels is done by using disc mills.	60 (28)	156 (72)
Kneaders are used for kneading milled kernels.	53 (25)	163 (75)
Extraction of shea butter is done by using a manual screw press.	99 (46)	116 (54)
Clarification of shea butter oil is carried out by using a clarifier.	95 (44)	120 (56)
A storage tank is used for the storing of shea butter.	115 (53)	101 (47)
Percentage mean knowledge score	44.33	55.66

*Figures in parenthesis are percentages

n: 216 Source: Field survey, 2016

4.7 Respondents' situation in terms of training in modern shea butter processing technologies

This refers to areas of training in modern shea butter processing technologies for shea butter extraction previously attended by respondents; the amount of training attended from 2010 to 2015; respondents' preferred training methods; the time of training preferred by respondents; and the training institutions preferred by respondents.

Previous training attended by respondents

Previous training attended by respondents refers to any training in modern processing technologies for shea butter extraction ever attended by the respondents. The results in Table 4.8 indicate that respondents in the study areas had not previously attended training in

the following available modern shea butter processing technologies for shea butter extraction: kneading (using kneader technology) (70.8%), milling (using disc technology) (67.1%), and crushing (using hammer mill crusher technology) (63.4%). The implication of this finding is that this set of respondents will encounter difficulties at these stages of shea butter extraction using the available modern technologies, which may lead to a low production of shea butter in the study areas. However, training in drying (using shea kernel dryer technology) (56.9%) and cracking and separation (using shea kernel cracker and separator technology) (50.9%), in modern shea butter processing were the most attended areas by the respondents in the study areas, although still relatively low.

Table 4.8: Distribution of respondents according to previously attended areas of training in modern shea butter processing technologies

Areas of training in modern technologies attended	**Attended**	**Not attended**
Drying (shea kernel dryer)	123 (56.9)*	106 (49.1)
Cracking and separation of nuts (shea kernel cracker and separator)	110 (50.9)	93 (43.1)
Roasting (shea kernel roaster)	90 (41.7)	126 (58.3)
Crushing (hammer mill crusher)	79 (36.6)	137 (63.4)
Milling (disc mill)	71 (32.9)	145 (67.1)
Kneading (kneader)	63 (29.2)	153 (70.8)
Extraction (manual screw press)	96 (44.4)	120 (55.6)
Clarification (clarifier)	98 (45.4)	118 (54.6)
Storing of butter (storage tank)	100 (46.3)	116 (53.7)

* Figures in parenthesis are percentage

n: 216 Source: Field survey, 2016

Level of training in modern shea butter processing technologies previously attended by respondents

Table 4.9 represents the distribution of the level of areas of training in modern shea butter processing technologies previously attended by respondents. The mean score for the respondents was 2.55. Thirty-four comma nine percent of respondents had a higher score than the mean score (i.e. a high level of areas of training previously attended), whilst 65.1% had a

lower score than the mean score (i.e. a low level of areas of training previously attended). This implies that most of the respondents had not attended adequate training in modern shea butter processing technologies for shea butter extraction, which could result in inadequate skills for the effective use of the available modern shea butter extraction technologies. As a result, most of the respondents' productivity will drastically reduce, thereby resulting in a decrease in the quantity of shea butter produced in the study areas.

Table 4.9: Distribution of the level of training in modern shea butter processing technologies previously attended by respondents

Previously attended training	**Frequency**	**Percentage**	**Mean ($\bar{x}$)**
Low (10 – 14)	166	65.1	2.55±0.49
High (15 – 20)	50	34.9	
Total	216	100	

Source: Field survey, 2016

Amount of training in modern shea butter processing technologies attended by respondents from 2010 to 2015

None of the respondents had attended training in modern shea butter extraction technologies from 2010 to 2015. From this finding, it can be inferred that processors in the study areas were not exposed to training in modern shea butter extraction technologies in the period under review.

Training methods preferred by respondents

Table 4.10 indicates the methods of training in modern shea butter processing technologies for shea butter extraction preferred by respondents. The training methods most preferred by the respondents included the processors' workshop ($\bar{x}$ = 2.89), field or factory training ($\bar{x}$ = 2.80), proficiency course ($\bar{x}$ = 2.56), field trips ($\bar{x}$ = 2.37), and field days ($\bar{x}$ = 2.22), respectively. The training methods least preferred by the respondents included exhibition/trade fairs ($\bar{x}$ = 1.36) and agricultural shows ($\bar{x}$ = 1.27).

Table 4.10: Distribution of methods of training in modern shea butter processing technologies preferred by respondents

Training methods	**Preference scale ($\bar{x}$)**
Proficiency course on shea butter processing technologies	2.56±0.72
Processors workshop	2.89±0.34
Agricultural Shows	1.27±0.56
Field or factory training	2.80±0.51
Field days	2.22±0.69
Exhibition/ trade fairs	1.36±0.74
Field trips	2.37±0.69

(highly preferred = 3, less preferred =2, Not preferred =1)

Decision rule: ≥ 2.21 = Highly preferred training method, < 2.21 = Less preferred training method

n = 216 Source: Field survey, 2016

Month, day, time and duration of training preferred by respondents

Table 4.11 indicates that 85.2% and 93% of the respondents preferred morning and half-day training, respectively. Eighty percent of the respondents preferred one to three days' training. Furthermore, the majority (99.5%) of the respondents preferred training that commences on Mondays, and ends on Wednesdays. About 73.1% of the respondents preferred training between March and April. This may be due to the fact that shea fruits are harvested in the months of May and September and, therefore, they would like to acquire the necessary processing skills in modern processing technologies, in order to enhance their shea butter extraction activities before that time.

Table 4.11: Distribution of month, day, time and duration of training in modern shea butter processing technologies preferred by respondents

Time variable	Frequency	Percentage
Time of the day training		
Morning	184	85.2
Afternoon	11	5.1
Evening	21	9.7
Duration of day training		
Half day	201	93
Full day	15	7
Training duration (days)		
1 – 3	173	80.1
4 – 6	27	12.5
7 – 9	16	7.4
Day of the week		
Monday	108	50.0
Tuesday	59	27.3
Wednesday	48	22.2
Thursday	–	–
Friday	–	–
Saturday	1	0.5
Sunday	–	–
Month of the year		
January	16	7.4
February	8	3.7
March	70	32.4
April	88	40.7
May	3	1.4
June	1	0.5
July	8	3.7
August	20	9.3
September	1	0.5
October	1	0.5
November	–	–
December	–	–

n = 216 Source: Field survey, 2016

Training institutions preferred by respondents

As indicated in Table 4.12, most of the respondents preferred the Raw Materials Research and Development Council (RMRDC) ($\bar{x}$ = 2.42); Nigerian Institute for Oil Palm Research (NIFOR) ($\bar{x}$ = 2.35); Agricultural Development Programme (ADP) ($\bar{x}$ = 2.28); Nigerian Export Promotion Council (NEPC) ($\bar{x}$ = 2.25); and non-governmental organisations (NGOs) ($\bar{x}$ = 2.16) for the provision of quality extension training in the available modern shea butter processing technologies. The International Institute for Tropical Agriculture (IITA) ($\bar{x}$ = 1.59); Local Government Council (LGC) ($\bar{x}$ = 1.47); and Federal Ministry of Agriculture and Rural Development (FMARD) ($\bar{x}$ = 1.11) were the training institutions least preferred by respondents for the provision of training in modern shea butter processing technologies. Respondents' preference for the RMRDC and NIFOR provides an indication of their confidence in the RMRDC's and NIFOR's ability to deliver high-quality training in modern shear butter processing technologies. RMRDC and NIFOR are also the organisations in charge of conducting research on all matters pertaining to shea tree production in Nigeria.

Table 4.12: Distribution of institutions preferred by respondents to conduct training in modern shea butter processing technologies

Preferred institutions	**Preference scale ($\bar{x}$)**
Nigerian Institute for Oil Palm Research (NIFOR)	2.35±0.66
Raw Materials Research and Development Council (RMRDC)	2.42±0.77
Federal Ministry of Agriculture and Rural Development (FMA RD)	1.11±0.43
Agricultural Development Programme (ADP)	2.28±0.85
Nigerian Export Promotion Council (NEPC)	2.25±0.75
Local Government Council (LGC)	1.47±0.47
Non-Governmental Organizations (NGOs)	2.16±0.80
International Institute for Tropical Agriculture	1.59±0.71

(Highly preferred = 2, less preferred =1, Not preferred = 1)

Decision rule: ≥ 2.0 = Highly preferred institution, < 2.0 = Less preferred institution

n = 216 Source: Field survey, 2016

4.8 Respondents' level of competence in the use of modern shea butter processing technologies with respect to available processing tasks, and the ranking thereof

The results revealed that the shea butter processors possessed the highest competence in the drying of kernels ($\bar{x}$ = 3.44), ranked first. This is followed by the cracking and separation of nuts ($\bar{x}$ = 3.31), ranked second; the clarification of shea butter oil ($\bar{x}$ = 3.25), ranked third; the storing of shea butter ($\bar{x}$ = 3.19), ranked fourth; and the extraction of shea butter ($\bar{x}$ = 3.00), ranked fifth (see Table 4.13). It is therefore, concluded that processors do not have a problem with the aforementioned tasks during those stages of shea butter extraction, as they were competent in carrying out these operations. This set of processors will not require a high level of training, as they are already skilled in those operations. However, processors lacked competence in the roasting of kernels ($\bar{x}$ =1.86); the crushing of roasted kernels ($\bar{x}$ = 1.76); and the milling of crushed kernels ($\bar{x}$ = 1.63), ranked sixth, seventh and eighth, respectively (see Table 4.14). The least level of competence for shea butter processors' is found in kneading of milled kernels ($\bar{x}$ = 1.57) ranked ninth (see Table 4.13). This implies that respondents in this category will require a high level of training in order to improve their skills, for purposes of enhancing their extraction abilities.

Table 4.13: Distribution of respondents' level of competence in the use of modern shea butter processing technologies with respect to available processing tasks, and the ranking thereof

Tasks	**Competency score ($\bar{x}$)**	**Rank**
Drying of kernels	3.44±2.97	1st
Cracking and separation of nuts	3.31±2.93	2nd
Clarification of shea butter oil	3.25±0.95	3rd
Storing of shea butter	3.19±0.97	4th
Extraction of shea butter	3.00±1.10	5th
Roasting of kernels	1.86±0.90	6th
Crushing of roasted kernels	1.76±0.88	7th
Milling of crushed kernels	1.63±0.72	8th
Kneading of milled kernels	1.57±1.52	9th

(Not competent = 0, little competence = 2, competent = 3 and very competent = 4)

n = 216 Source: Field survey, 2016

4.9 Respondents' perception of the required level of training needs in modern shea butter processing technologies

Table 4.14 shows that respondents were of the opinion that they require a high level of training in the following modern shea butter processing technologies: kneader ($\bar{x}$ = 4.34)**,** disc mill ($\bar{x}$ = 4.33), hammer mill crusher ($\bar{x}$ = 4.33) and shea kernel roaster ($\bar{x}$ = 4.15). The high demand for training in the aforementioned processing technologies by the majority of the respondents may be because of the difficulties they encountered in using these technologies during shea butter extraction. The results also revealed that respondents were of the opinion that they require a low level of training in the following modern shea butter processing technologies: storage tank ($\bar{x}$ = 3.76), shea kernel dryer ($\bar{x}$ = 2.57), and shea nutcracker and separator ($\bar{x}$ = 2.50). This implies that respondents are competent in the use of these technologies for shea butter production.

Table 4.14: Distribution of respondents' perception of the required level of training in modern shea butter processing technologies

Modern processing technologies	**Perception score ($\bar{x}$)**
Shea kernel dryer	2.57±1.65
Shea nut cracker and separator	2.50±1.56
Shea kernel roaster	4.15±1.05
Hammer mill crusher	4.33±0.97
Disc mill	4.33±0.85
Kneader	4.34±0.80
Manual screw press	4.13±1.07
Clarifier	4.03±1.09
Storage tank/drum	3.76±1.41

(Strongly agree = 5, agree = 4, undecided = 3, disagree = 2 and strongly disagree = 1)

Decision rule: ≥ 3.79 = High perception, < 3.79 = Low perception

n: 216 Source: Field survey, 2016

4.10 Respondents' perception of constraints hindering effective performance in the use of modern processing technologies, and the ranking thereof

In relation to the respondents' perception of constraints hindering their effective performance in the use of modern processing technologies for shea butter production, scarcity of water is ranked highest ($\bar{x}$ = 2.95) (see Table 4.15). This finding conforms to the findings of Akangbe, Adesiji, Fakayode and Aderibigbe (2011). This was followed by lack of extension training ($\bar{x}$ = 2.90) ranked second, implying that, in terms of training, there was no contact between extension agents and the processors during the period under review. Ranked third was inadequate capital ($\bar{x}$ = 2.87), implying that respondents did not invest sufficient capital in their processing activities, and ranked fourth is epileptic power supply ($\bar{x}$ = 2.36). Least constraint was expressed for unavailability of shea fruits for processing ($\bar{x}$ = 0.20), which implies that shea nuts are available for processing into butter in the study areas.

Table 4.15: Distribution of respondents' perception to constraints hindering effective performance in the use of modern processing technologies and the ranking thereof

Constraints	**Constraints hindering performance score ($\bar{x}$)**	**Rank**
Scarcity of water	2.95±0.23	1st
Lack of extension training	2.90±0.37	2nd
Inadequate capital	2.87±0.34	3rd
Epileptic power supply	2.36±0.65	4th
Lack of technical support services	2.28±0.79	5th
High cost of equipment maintenance	1.50±1.17	6th
High cost of labour	0.70±0.87	7th
Poor packaging and market	0.61±1.05	8th
Low patronage of shea butter products	0.29±0.65	9th
Unavailability of shea fruits for processing	0.20±0.44	10th

(Very severe = 3, severe = 2, not severe = 1, not constraint =0)

n = 216 Source: Field survey, 2016

4.11 Respondents' task analysis on modern shea butter extraction activities

Table 4.16 indicates the distribution of respondents' task analysis on modern shea butter extraction activities. The analysis covers each processing activity, how frequently each task is performed, each task's level of importance, and the level of difficulty encountered in learning the task. The result of the analysis revealed the task areas that require a high level of training, include kneading ($\bar{x}$ = 11.2), milling ($\bar{x}$ = 11), crushing ($\bar{x}$ = 10.8) and roasting ($\bar{x}$ = 10.5). The total task mean score of these operations was 70.36, whilst the average mean score was 7.8. Therefore, respondents whose task scores were more than, or equal to, 8 were considered priority areas that required a high level of training in order to improve their skills and increase the overall production level of shea butter. This finding is in conformity with the finding in Table 4.8. In addition, the study showed that respondents do not require a high level of training in the following task areas: extraction ($\bar{x}$ = 6.0), clarification ($\bar{x}$ = 5.9), storage ($\bar{x}$ = 5.33), cracking and separation of nuts ($\bar{x}$ = 5.05), and drying of kernels ($\bar{x}$ = 4.57) (see Table 4.16).

Table 4.16: Distribution of respondents' task analysis on modern shea butter extraction activities

Tasks	Freq. of performance	Level of importance	Level of difficulties	Mean score ($\bar{x}$)	Priority areas for training	Implication
Drying of kernels	1.37	1.60	1.60	4.57	No	Require no training
Cracking and separation of nuts	1.72	1.72	1.61	5.05	No	Require no training
Roasting of kernels	4.00	3.17	3.31	10.5	Yes	Require training
Crushing of roasted kernels	4.10	3.35	3.33	10.8	Yes	Require training
Milling of crushed roasted kernels	4.19	3.39	3.37	11	Yes	Require training
Kneading of milled kernels	4.31	3.44	3.44	11.2	Yes	Require training
Extraction of shea butter	2.20	1.94	1.85	6.0	No	Require no training
Clarification of shea butter oil	2.20	1.85	1.86	5.91	No	Require no training
Storing of shea butter	2.11	1.66	1.56	5.33	No	Require no training

Decision rule: ≥ 7.8 = require training/ priority area for training; < 7.8 = require no training

n=216 Source: Field survey, 2016

4.12 Respondents' skill gap analysis on modern shea butter extraction activities.

Table 4.17 represents the level at which respondents' task proficiency requires improvement/training in modern shea butter extraction activities. The analysis indicates whether or not a task can be improved upon by providing training for such respondents. Tasks deficiencies that can be solved through training, as indicated in Table 4.16, include kneading ($\bar{x}$ = 1.4), milling ($\bar{x}$ = 1.4), crushing ($\bar{x}$ =1.5) and roasting ($\bar{x}$ = 1.6). These areas are also considered priority areas that require training. In addition, the results in Table 4.17 also indicate that respondents do not require training in drying ($\bar{x}$ = 4.5), cracking and separation of nuts ($\bar{x}$ = 4.4), storage ($\bar{x}$ = 4.2), and clarification ($\bar{x}$ = 3.6), as the respondents were already proficient in these areas of operations or tasks.

Table 4.17: Distribution of respondents' skill gap analysis on modern shea butter extraction activities

Tasks	Level of proficiency	Mean score ($\bar{x}$)	Is proficiency a problem	Can problem be solved by training	Priority areas for training
Drying of kernels	1234**(**5**)**	4.5	No	No	No
Cracking and separation of nuts	123**(**4**)**5	4.4	No	No	No
Roasting of kernels	1**(**2**)**345	1.6	Yes	Yes	Yes
Crushing of roasted kernels	1**(**2**)**345	1.5	Yes	Yes	Yes
Milling of crushed kernels	**(**1**)**2345	1.4	Yes	Yes	Yes
Kneading of milled kernels	**(**1**)**2345	1.4	Yes	Yes	Yes
Extraction of shea butter oil	123(4)5	3.5	No	No	No
Clarification of shea butter oil	123**(**4**)**5	3.6	No	No	No
Storing of shea butter	123**(**4**)**5	4.2	No	No	No

Level of proficiency: 1 = cannot do at all, 2 = can do less than half of the task, 3 = can do more than half but less than total, 4 = can do total but cannot maintain time schedule, 5 = can do within time schedule.

Decision rule: ≥ 2.9 = Problem cannot be solved by training, < 2.9 = Problem can be solved by training/ priority area for training

n=216 Source: Field survey, 2016

4.13 Hypotheses testing

This section presents the relationships between the variables in the study. Inferential statistics such as Chi-square, Pearson Product Moment Correlation (PPMC) and t-test analysis used for hypotheses.

Hypothesis 1

$H0_1$: There is no significant relationship between respondents' socio-economic characteristics (age, gender, marital status, religion, educational level, household size, years' processing experience, membership to co-operatives, and the monthly income generated by them) and their training needs.

Table 4.18: Relationship between the selected socio-economic characteristics of respondents and their training needs

Variables	**Chi-square (χ^2)**	**Df**	**p-value**	**Decision**
Age	χ^2 =38.865	-	0.000	Significant
Gender	χ^2 = 22.076	3	0.000	Significant
Marital status	χ^2 = 22.076	3	0.000	Significant
Religion	χ^2 = 14.196	1	0.000	Significant
Educational level	χ^2 = 69.018	4	0.000	Significant
Household size	χ^2 = 86.983	4	0.000	Significant
Years' of processing experience	χ^2 = 40.118	3	0.000	Significant
Membership to cooperatives	χ^2 = 30.413	1	0.000	Significant
Monthly income generated	χ^2 = 85.983	4	0.000	Significant

r = correlation coefficient, df = Degree of freedom, p = probability level of significance at $p \leq 0.05$ (significant).

n=216 Source: Field survey, 2016

The hypothesis was tested using both the PPMC and the Chi-square test of association. The PPMC was used to test the association between age of respondents and their training needs. The result as shown in Table 4.18 indicates that there is a significant relationship between age of respondents and their training needs ($r = 38.865$, $p < 0.00$). Therefore, the null hypothesis was rejected. Age is positively significant, which implies that the younger the processors are, the more they will favour training. This may be because younger farmers are often exposed to trying new innovations, and have a lower risk aversion and longer planning horizon (Akinwumi, Mbila, Nkamleu, Endamana, 2000). Also in line with this finding are Oladoja, Adedoyin and Adeokun (2008) statement that young processors will be more in favour of training than older processors. According to Gul Unal (2008), other reasons why young farmers are more in favour of training than older processors is that old age might pose disadvantages in agriculture, as most of the work is physically demanding, and that older household heads might be too conservative to try new and more efficient techniques.

In the same vein, Table 4.18 shows Chi-square analysis of relationship between respondents' selected socio-economic characteristics and their training needs in modern processing technologies. The result indicates that gender ($\chi^2 = 22.076$, $p < 0.00$), marital status ($\chi^2 = 22.076$, $p < 0.00$) and religion ($\chi^2 = 14.196$, $p < 0.00$) all had significant relationships with respondents' training needs. This implies that processors' needs in terms of training in modern shea butter processing technologies are influenced by gender, marital status and religion. Furthermore, there is a significant relationship between respondents' training needs and their level of education ($\chi^2 = 69.018$, $p < 0.00$). Thus, the higher respondents' level of education, the more they are in favour of training. This result agrees with Adesiji (2006), who reported a similarly significant association between extension agents' educational level and their training needs. This finding also conforms to that of Nkonya, Schroeda and Normal (1997), who states that the utilisation of some agricultural technologies in Tanzania was positively related to farmers' educational level. The attributes and usefulness of any technology are better appraised by highly educated end-users, who also have a more positive attitude towards innovation.

In addition, Table 4.18 indicates that household size ($\chi^2 = 51.048$, $p < 0.00$) and years' processing experience ($\chi^2 = 40.118$, $p < 0.00$) had a significant relationship with respondents' training needs. This implies that the household size of the respondents, and their years' of processing experience, influence their needs in terms of training in modern processing technologies.

Furthermore, there was a positive, significant relationship between respondents' membership to co-operatives and their training needs ($\chi^2 = 38.865$, p =0.000) (see Table 4.19). This implies that respondents who are members of co-operatives are more likely to be in favour of training than those who are not members of co-operatives.

Finally, there was a significant relationship between the monthly income generated by respondents and their training needs ($\chi^2 = 85.983$, p =0.000). This implies that respondents who earned more income in a month will favour training more than those who earned less. Hence, the null hypothesis was rejected.

Hypothesis 2

$H0_2$: There is no significant relationship between respondents' training situations (areas of training previously attended and the time for training preferred by respondents) and their needs in terms of training in modern shea butter processing technologies.

Using a correlation analysis, the results (as revealed in Table 4.19) indicate that there is a significant relationship between the area of training previously attended by respondents and their training needs (r = -0.159, p = 0.019). Therefore, the null hypothesis was rejected. The relationship indicated is negative and significant, meaning that respondents will favour training despite their low level of training in modern shea butter processing technologies.

In addition, results in Table 4.19 indicate that there is a significant relationship between respondents' preferred time for training and their training needs (r = 0.240, p = 0.000). Hence, the null hypothesis was rejected. The implication of this finding is that processors will attend training if they considered the timing right. A good training programme may be frustrating if the timing is wrong. This aligns with Adeokun and Adereti (2005)'s statement that timing is vital for the success of a good training programme.

Table 4.19: Relationship between respondents' training situations (areas of training previously attended and the time for training preferred) and their training needs

Variable	r-value	p-value	Decision
Areas of training previously attended	-0.158*	0.019	Significant
Preferred time for training	0.240**	0.000	Significant

r = correlation coefficient, p = probability level of significance $p < 0.05$ (Significant)

n = 216 Source: Field survey, 2016

Hypothesis 3

$H0_3$: There is no significant relationship between respondents' knowledge of modern shea butter processing technologies and their training needs.

The results in Table 4.20 indicate that there is a significant relationship between respondents' knowledge of modern shea butter processing technologies and their training needs ($r = 0.412$, $p = 0.000$), resulting to the rejection of the null hypothesis. The implication of this is that respondents who are more knowledgeable about modern shea butter processing technologies will favour training more than those who have less knowledge of modern shea butter processing technologies.

Table 4.20: Relationship between respondents' knowledge of modern shea butter processing technologies and their training needs

Variable	r-value	p-value	Decision
Knowledge	0.412**	0.000	Significant

r = correlation coefficient, p = probability level of significance at the 0.01 level (2-tailed)

n=216 Source: Field survey, 2016

Hypothesis 4

*Ho_4***:** There is no significant relationship between respondents' processing competence and their training needs.

The results in Table 4.21 indicate that there is a significant relationship between respondents' processing competences and their training needs (r = -0.598, p = 0.000). Therefore, the null hypothesis was rejected. The relationship is negative and significant, meaning that respondents with a low level of processing competence will favour training, whilst those with a high level of processing competence may not favour training in modern shea butter processing technologies.

Table 4.21: Relationship between respondents' processing competence and their training needs

Variable	**r-value**	**p-value**	**Decision**
Competence	-0.598**	0.000	Significant

r = correlation coefficient, p = probability level of significance at the 0.01 level (2-tailed)

n=216 Source: Field survey, 2016

Hypothesis 5

Ho_5: There is no significant difference between the training needs of shea butter processors from the Niger State and those from the Kwara State.

Table 4.22 indicates the result of t-test of difference between the training needs of respondents from the two states. The results indicate that there is no significant difference between the training needs of respondents from the two states (t=0.636, $p \leq 0.05$). The null hypothesis is accepted. The implication of this result is that the training needs of shea butter processors from the two states are similar; i.e., the same level of training is required for all the processors from the two states. This finding is in agreement with Agbamu (2005) findings that there is no difference between the training needs of agricultural media practitioners from the Delta, Rivers and Edo states.

Table 4.22: t - test analysis of the training needs from Niger State and Kwara States

State	**No of respondents**	**df**	**Mean**	**Mean difference**	**t – test**	**p-value**	**Decision**
Niger	108	107	34.2593	0.3334	0.636	0.526	Not significant
Kwara	108	107	33.9259				

df=degree of freedom, p = probability level of significance $p \leq 0.05$ (significant).

n= 216 Source: Field survey, 2016

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

A summary of the preceding chapters and major findings are presented in this chapter. The conclusions made are based on the findings, and suggested recommendations are also discussed. Furthermore, an indication of the contributions to knowledge, the developed training needs assessment model and areas for further research are presented.

This study was conducted to identify the needs of shea butter processors in terms of training in modern processing technologies for shea butter extraction in the North-Central Agro-ecological Zone of Nigeria by using innovative methods. A multistage sampling technique was used to select 216 respondents, which constituted the sample size. The innovative methods used in this study to identify the training needs of shea butter processors were well-structured questionnaires and interview guides, which were used during focus group discussions, and task and skill-gap analyses, as propounded by Abdul and Mozahar (1998) for assessing processors' training needs.

The results revealed the following:

- The majority (81.4%) of the respondents were between the ages of 20 and 40 years, with a mean age of 39.4 years, and a standard deviation of 8.9 years.

- Most (93.1%) of the respondents were female.

- The majority (85.6%) of the respondents were married, whilst 11.6% and 1.4% were single and divorced, respectively.

- A large proportion (55.6%) of the respondents had a household size of 9 to 12 members.

- Most (93.1%) of the respondents were Muslims.

- Half (50%) of the respondents had no formal education, whilst 28.7%, 12% and 8.3% had primary, Quranic and secondary education, respectively.

- The majority (74.1%) of the respondents had 6 to 15 years' processing experience.

- The majority (89.8%) of the respondents were members of co-operative societies.

- The majority (63.9%) of the respondents generated an income of ₦5,001 to ₦15, 000 per month from their various shea butter processing activities, whilst 20% generated an income of up to ₦5, 000 per month in this regard.

- The most common indigenous processing techniques and modern processing technologies available to respondents for shea butter extraction activities included: pan for boiling water (100%), clay pots for roasting kernels (100%), leg/hand for kneading (100%), calabash and nylon for butter storage (100%), basket for winnowing (100%), shea kernel dryer (100%), shea nutcracker and separator (100%), shea kernel roaster (100%), hammer mill crusher (100%), disc mill (100%), kneader (100%), manual screw press (100%), clarifier (100%) and storage tank (100%).

- The majority (72.7%) of the respondents produced between 361.2 kg and 600 kg of shea butter per month using modern processing technologies, whilst 98.8% of them produced between 12 kg and 240 kg of shea butter per month using indigenous processing techniques.

- The major benefits respondents derived from using modern processing technologies were the following: increased yield of shea butter ($\bar{x}$ = 4.93), increased household income ($\bar{x}$ = 4.83) and improved appearance and quality of shea butter ($\bar{x}$ = 4.80).

- In terms of the level of benefit respondents derived from modern processing technologies, approximately 53.7% indicated many benefits, whilst 46.3% indicated less benefits.

- All the respondents (100%) were aware of, and had access to, the following modern processing technologies: shea kernel dryer, shea nutcracker and separator, shea kernel roaster, hammer mill crusher, disc mill, kneader, manual screw press, clarifier and storage tank.

- More than half (55.66%) of the respondents were not knowledgeable about modern shea butter processing technologies, whilst approximately 43.33% of them were knowledgeable about modern shea butter processing technologies.

- Majority of the respondents had not previously attended training in the following areas of modern shea butter processing technologies for shea butter extraction: kneading (70.8%), milling (67.1%) and crushing (63.4%).

- All (100%) of the respondents had not attended any form of training in modern shea butter processing technologies from 2010 to 2015.

- Workshops ($\bar{x}$ = 2.89), field or factory training ($\bar{x}$ = 2.80), proficiency course ($\bar{x}$ = 2.56), field trips ($\bar{x}$ = 2.37) and field days ($\bar{x}$ = 2.22) were the methods most preferred by respondents for training in modern shea butter processing technologies.

- The majority of the respondents preferred that training in modern shea butter processing technologies for shea butter extraction be conducted during the morning (85.2%), from Mondays to Wednesdays (99.5%), and in March to April (73.1%) of the year.

- The Raw Materials Research and Development Council (RMRDC) (($\bar{x}$ = 2.42), Nigerian Institute for Oil Palm Research (NIFOR) (($\bar{x}$ = 2.35), Agricultural Development Programme (ADP) ($\bar{x}$ = 2.28), non-governmental organisations (NGOs) ($\bar{x}$ = 2.25) and Nigerian Export Promotion Council (NEPC) ($\bar{x}$ = 2.16) were the institutions most preferred by respondents to conduct training in modern shea butter processing technologies.

- Respondents were not competent in the roasting of kernels ($\bar{x}$ =1.86), crushing of roasted kernels ($\bar{x}$ = 1.76), milling of roasted kernels ($\bar{x}$ = 1.63) and kneading of milled kernels ($\bar{x}$ = 1.57).
- Respondents were of the opinion that they require a high level of training in the following modern processing technologies: kneader ($\bar{x}$ = 4.34)**,** disc mill ($\bar{x}$ = 4.33), hammer mill crusher ($\bar{x}$ = 4.33) and shea kernel roaster ($\bar{x}$ = 4.15).

- Scarcity of water ($\bar{x}$ = 2.95), a lack of extension training ($\bar{x}$ = 2.90), inadequate capital ($\bar{x}$ = 2.87) and the epileptic power supply ($\bar{x}$ = 2.36) were the major constraints hindering the effective performance of processors in the use of available modern processing technologies for shea butter extraction activities.

- The training needs assessment by means of a task analysis indicated that kneading ($\bar{x}$ = 11.2), milling ($\bar{x}$ = 11), crushing ($\bar{x}$ = 10.8) and roasting ($\bar{x}$ = 10.5) were the tasks in which processors require training.

- The training needs assessment by means of a skill-gap analysis also indicated that kneading ($\bar{x}$ = 1.4), milling ($\bar{x}$ = 1.4), crushing ($\bar{x}$ = 1.5) and roasting ($\bar{x}$ = 1.6) were the tasks in which processors require training.

- Respondents' age (r = 38.865, $p < 0.00$), gender (χ^2 = 22.076, $p < 0.00$), marital status (χ^2 = 22.076, $p < 0.00$), religion (χ^2 = 14.196, $p < 0.00$), level of education (χ^2 = 69.018, $p < 0.00$), household size (χ^2 = 51.048, $p < 0.00$), years' processing experience (χ^2 = 40.118, $p < 0.00$), membership to co-operatives (χ^2 = 38.865, p =0.000) and monthly income (χ^2 = 85.983, p =0.00) had significant relationships with their training needs.

- Significant relationships existed between respondents' training needs and the areas of training previously attended (r = -0.159, p = 0.019), the time of training preferred (r = 0.240, p = 0.000), knowledge (r = 0.412, p = 0.000), and competence (r = -0.598, p = 0.000).

- A t-test analysis indicated that there was no significant difference between the training needs of respondents from the Niger State and those from the Kwara State ($t=0.636$, $p \leq 0.05$).

5.2 Conclusion

Based on the empirical findings of the study, it can be concluded that:

- the respondents were mostly young, female, married Muslims with a low level of education;

- a large proportion of the respondents had large household sizes;

- majority of the respondents had 6 to 15 years' processing experience;

- the respondents were mostly members of co-operative societies;

- majority of the members were capable of generating an income of ₦5,001 to ₦15,000 per month from their various shea butter processing activities;

- the shea kernel dryer, shea nutcracker and separator, shea kernel roaster, hammer mill crusher, disc mill, kneader, manual screw press, clarifier and storage tank were the common modern shea butter processing technologies available to respondents for shea butter extraction activities;

- a larger quantity of shea butter was produced using modern shea butter processing technologies in comparison to indigenous processing techniques;

- more than half (53.7%) of the respondents derived benefits from modern shea butter processing technologies;

- respondents were aware of the available modern shea butter processing technologies;

- respondents had access to the available modern shea butter processing technologies;

- respondents' adoption of modern shea butter processing technologies was low;

- about 55.66% of the respondents were not knowledgeable about modern shea butter processing technologies. Few (43.33%) of the respondents were knowledgeable about modern shea butter processing technologies;

- from 2010 to 2015, all (100%) of the respondents had not attended training in modern shea butter processing technologies;

- respondents preferred the following methods of training in modern shea butter processing technologies: processors' workshop, factory training, proficiency courses, field trips, and field days;

- respondents preferred training be conducted in the morning, from Monday to Wednesday, and in March to April of the year;

- the RMRDC, NIFOR and ADP were the institutions most preferred by respondents to conduct training in modern shea butter processing technologies;

- respondents were not competent in the roasting of kernels, crushing of roasted kernels, milling of roasted kernels and kneading of milled kernels;

- respondents were of the opinion that they require a high level of training in modern processing technologies such as the kneader**,** disc mill, hammer mill crusher and shea kernel roaster;

- kneading**,** milling, crushing and roasting were tasks in which respondents required a high level of training;

- scarcity of water, a lack of extension training, inadequate capital and the epileptic power supply were the major constraints hindering the effective performance of processors in

the use of modern shea butter processing technologies for shea butter extraction activities;

- respondents' age, gender, marital status, religion, level of education, household size, years' processing experience, membership to co-operatives and monthly income all had a significant relationship with their training needs;

- the areas of training previously attended by respondents, the time for training preferred by them, and their knowledge and competence also had significant roles in determining their training needs; and

- the training needs of shea butter processors from the Niger State did not differ from the training needs of those from the Kwara State.

5.3 Recommendations

Based on the findings of the study, the following are recommended:

- Extension agents and other government agencies should organise adult literacy classes for shea butter processors. This may contribute significantly towards reducing processors low level of education in the study area.

- Extension service providers should give urgent attention to the identified training needs, in order to reduce the high incidence of lack training, and to improve processors' skills in, and knowledge of shea butter processing.

- Efforts in terms of training in modern shea butter processing technologies by the various government institutions (RMRDC, NIFOR, ADPs and NEPC) and NGOs involved in shea butter development should cover all aspects of modern shea butter processing technologies, but emphasis and priority should be given to the identified areas of training needs.

- Training in modern processing technologies should be conducted in the early hours of the morning, from Mondays to Wednesdays, and in March to April of the year.

- Greater extension contact with shea butter processors should be encouraged and supported, as increased extension contact with shea butter processors may enhance their competencies in modern shea butter processing technologies. This could be done by imputing shea butter-related activities into the various fields and extension programmes of the ADPs, especially during the annual Zonal Research-Extension-Farmer-Input-Linkage-System Workshops.

- Government should provide water in the study areas. This could be done by seeking boreholes in shea butter extraction vicinities.

- Government should provide loans to processors via co-operative societies, in order to increase their production of shea butter.

- Government should provide and install more transformers in the study areas to ensure regular supply of electricity.

- A concerted effort should be made to determine the training needs of shea butter processors on a regular basis. This may enhance the delivery of relevant competencies and expertise to processors, as well as address the identified needs of processors, which, in turn, may have implications for capacity building in shea butter production in Nigeria.

5.4 Contributions to knowledge

In this study, the specific training needs of shea butter processors in the North-Central Agro-ecological Zone of Nigeria were identified by means of innovative methods.

Furthermore, it was established that the majority of shea butter processors were not exposed to training in modern processing technologies for shea butter production. There were no empirical data reported on when shea butter processors would like to undertake training.

However, in this study, it was found that shea butter processors preferred trainings in the mornings, from Mondays to Wednesdays, and in March to April of the year. Furthermore, the major constraints hindering the effective performance of processors in the use of modern extraction technologies for shea butter extraction was found to be scarcity of water and the lack of extension training. In addition, the results from the study will have a high implication for extension activity on shea production activity in Nigeria.

The study contributed to the body of knowledge by providing base data and references for future study on the training needs of shea butter processors in the North-Central Agro-ecological Zone of Nigeria.

Finally, this aspect of the study is important, as the research findings will be added to the literature, and will provide one of the policy paradigms towards fulfilling the Nigerian Government's Sustainable Development Goal (SDG) of poverty eradication.

5.5 Areas for further research

- Shea butter processing activities is most common in the North Central Agro-Ecological zone of Nigeria than in the South-West Zone, South-South Zone and South-East Zone, where shea butter can also be processed. A similar study should therefore be conducted in these zones, in order to determine whether significant differences exist in the training needs of shea butter processors in Nigeria.

- A study is recommended to establish relationships amongst the identified training need parameters in terms new processors entering into the shea butter industry.

5.6 Training needs assessment model for shea butter processors

The new model developed on this study (Figure 5.1) was in line with the problem-solving model postulated by Havelock (1973); and the training needs assessment model developed by Stanley (1990). This model consists of six stages, namely:

Stage 1: The identification, through stakeholder meetings, of processors' perceived needs on the processing activities in which they are involved. This stage can also be termed the "problem-identification stage".

Stage 2: Attempts are made to diagnose the problem, and to prioritise the processors' needs through the use of task and skill-gap analyses.

Stages 3 & 4: Developing a training plan or programme, and identifying the institutions that should conduct the training.

Stages 5 & 6: Evaluating the training attained by processors to determine whether or not there was a change in knowledge.

The advantage of this model is the involvement of all stakeholders – the trainers (researchers or scientists), institutions and trainees – in the entire training process, from the identification of problems to the solving of the identified problems.

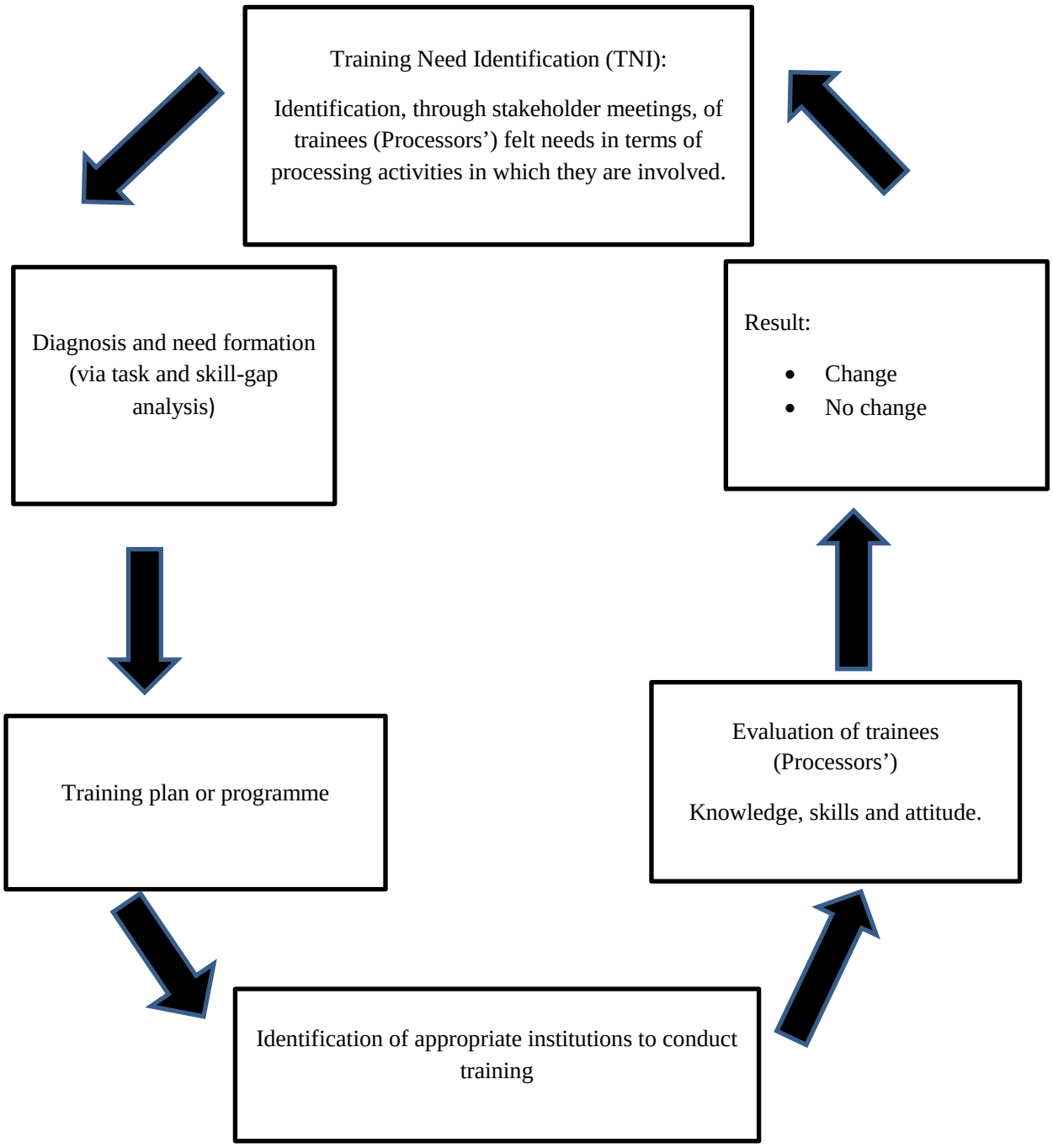

Figure 5.1: Model of training needs assessment developed through the use of innovative methods for Nigerian shea butter processors

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APPENDIX A

QUESTIONNAIRE

THE CENTRAL UNIVERSITY OF TECHNOLOGY FREE STATE
DEPARTMENT OF AGRICULTURE
FACULTY OF HEALTH AND ENVIRONMENTAL SCIENCES

Dear Respondent,

I am a doctoral candidate in the Faculty of Health and Environmental Sciences, Central University of Technology, Free State, South Africa carrying out a study on the **Innovative methods for identifying training needs of shea butter processors in the North Central Agro-ecological zone of Nigeria** as part of the requirements for the award of a D.Tech. degree in Agriculture. Kindly assist in filling out this questionnaire as candidly as possible. All the data you supply will be used only for research purposes and your responses will be kept confidential.

Thank you.

Igene Lucky (E- mail: igenelucky@gmail.com)

SECTION A: SELECTED SOCIO-ECONOMIC CHARACTERISTICS

(1) Age in years……

(2) Gender: Male ( ) Female ( )

(3) Marital Status: (a) Single ( ) (b) Married ( ) (c) Divorced ( ) (d) Widowed ( )
(e) Widower ( )

(4) What is your household size?…….……...

(5) Religion :(a) Christianity ( ) (b) Islam ( ) (c) Traditional ( ) (d) Others (specify)
(6) Educational Level (a) No formal education ( ) (b) Quaranic ( ) (c) Primary education ( ) (c) Secondary education ( ) (d) Tertiary education ( ) (e) Others (Specify) …….……

(7) Years of processing experience: (a) 1- 5years ( ) (b) 6-10years ( ) (c) 11-15years ( ) (d) Above 15years ( )

(8) Membership of cooperative societies: (a) Member ( ) (b) Non – member ( )

(9) Please tick from the options provided your monthly generated income on shea butter processing: (a) Up to ₦5000 ( ) (b) ₦ (5,001 – 10,000) (c) ₦ (10,001 – 15,000) (d) ₦ (15,001 – 20,000) (e) Above ₦20,000

SECTION B: PROCESSING TECHNIQUES AND TECHNOLOGY AVAILABLE TO RESPONDENT

(10) Please kindly indicate from the list below the processing techniques and technologies available to you.

Table 1: Availability of respondents' Shea butter processing techniques and technologies

Indigenous shea butter processing techniques	Available	Not available
Mats for drying Shea kernels		
Pan for boiling water		
Mortar and pestle for breaking kernels and pounding of roasted kernels		
Clay pots for roasting kernels		
Iron and clay pots, basin or bowls for extraction of Shea butter		
Fine muslin cloth for clarification		
Use of legs/hands for kneading		
Calabash/ Nylon for butter storage		
Fine grinding stone for grinding crushed roasted kernels		
Leaves for storage and marketing		
Basket for winnowing		
Modern shea butter processing technologies		
Parboiling tank		

Parboiled Shea fruit digester		
Shea kernel dryer		
Shea nut cracker and separator		
Shea kernel roaster		
Hammer mill crusher		
Disc mill		
Kneader		
Manual screw press		
Decanting vessel		
Clarifier		
Storage tank/ drum		

SECTION C: QUANTITY OF SHEA BUTTER PRODUCED PER MONTH UNDER MODERN PROCESSING TECHNOLOGIES AND INDIGENOUS PROCESSING TECHNIQUES

(11) Please indicate from the list below the quantity of Shea butter produced per month using indigenous techniques or modern technologies

Quantity of shea butter produced per month	**Modern processing technologies**		**Indigenous processing techniques**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
1 - 10 kg				
10.1 – 20 kg				
20.1 – 30 kg				
30.1 – 40 kg				
40.1 – 50kg				
Above 50kg				

SECTION D: PERCEIVED BENEFITS OF MODERN PROCESSING TECHNOLOGIES

(11) Please indicate the degree to which you agree or disagree with the following statements concerning benefits of modern shea butter processing technologies.

Benefits	**Strongly agree**	**Agree**	**Undecided**	**Disagree**	**Strongly disagree**
It has greatly increased my household income					
It has strongly increased the value of my products.					
Access to health facilities has greatly increased					
Enhanced ability to pay children school fees					
It has enhanced the provision of social infrastructures in my village					
It increases the yield of shea butter					
Improved appearance and quality of shea butter					
It reduces the drudgery of shea butter processing					
Job creation					
Nutritional benefit					
It increased my ability to invest in livestock and other farming activities					

SECTION E: AWARENESS, ACCESSIBILITY AND ADOPTION OF MODERN PROCESSING TECHNOLOGIES

(12) Please, tick as appropriate, the under listed selected modern shea butter processing technologies that you are aware of, access to and adopted.

Selected modern processing technologies	**Awareness**		**Accessibility**		**Adoption**	
	Aware	**Not Aware**	**Accessible**	**Not accessible**	**Adopted**	**Not adopted**
Parboiled tank						
Shea fruit digester						
Shea kernel dryer						
Shea nut cracker and separator						
Shea kernel roaster						
Hammer mill crusher						
Disc mill						
Kneader						
Manual screw press						
Decanting vessel						
Clarifier						
Storage tank/drum						

SECTION F: KNOWLEDGE OF MODERN PROCESSING TECHNOLOGIES

(13) Please, tick as appropriate, your knowledge on the use of modern shea butter processing technologies for shea butter extraction.

Knowledge statements on available modern shea butter processing technology	Yes	No
Shea kernel dryers are used for drying fresh shea nuts		
Cracking and separation of nuts are done by using shea nut crackers and separators.		
Roasting of kernels are carried out by using shea kernel roaster		
Hammer mill crushers are used for crushing roasted kernels		
Milling of crushed kernels is done by using disc mills		
Kneaders are used for kneading milled kernels		
Extraction of shea butter oil is done by using a manual screw press		
Clarification of shea butter oil is carried out by using clarifier		
Storage tank is used for the storing of shea butter		

SECTION G: TRAINING SITUATION IN MODERN PROCESSING TECHNOLOGIES

(14) Please specify the areas of training on modern shea butter processing technologies you had previously attended in terms of shea butter extraction from the table below.

Areas of training previously attended/technology	**Yes**	**No**
Drying (using shea kernel dryer)		
Cracking and separation (using shea kernel cracker and separator)		
Roasting (using shea kernel roaster)		
Crushing (using hammer mill crusher) kernel		
Milling (using disc mill)		
Kneading (using kneader)		
Extraction (using manual screw press)		
Clarification (using clarifier)		
Storing (using storage tank)		

Others (specify)……
……..

(15) How many times have you attended training on modern shea butter processing technologies for shea butter extraction within the past 5 years? None [ ], Once [ ], Twice [ ], Thrice [ ], Fourth [ ], Fifth and more [ ]

(16) Kindly indicate from the table below, your preferences for training methods on modern shea butter processing technologies.

Training methods	**Highly preferred**	**Less preferred**	**Not preferred**
Proficiency courses on shea butter processing technologies			
Processors workshop			
Agricultural Shows			
Field or factory training			
Field days			
Exhibition/ trade fairs			
Field trips			

Others, please (specify)……
……

(17) In your own opinion what time do you consider as the most appropriate for trainings on modern shea butter processing technologies?

Time of the Day: Morning [ ], Afternoon [ ], Evening [ ]

Day of the week……...

Month of the year……...

(18) Please indicate your preferred institution(s) to conduct training on modern shea butter processing technologies

Preferred institutions of training	**Highly Preferred**	**Less Preferred**	**Not Preferred**
Nigerian Institute for Oil Palm Research (NIFOR)			
Raw Materials Research and Development Council (RMRDC)			
Federal Ministry of Agriculture and Rural Development (FMA RD)			
Non-Governmental Organizations (NGOs)			

Agricultural Development Programme (ADP)			
Local Government Council (LGC)			
Nigerian Export Promotion Council (NEPC)			
International Institute for Tropical Agriculture			

SECTION H: PERCEIVED COMPETENCE ON MODERN PROCESSING TECHNOLOGIES WITH RESPECT TO AVAILABLE PROCESSING TASKS

(19) For each of the following shea butter processing task, please kindly indicate your level of competence from the table below.

Selected shea butter processing tasks	**Not competent**	**Little competence**	**competent**	**Very competent**
Drying of kernels				
Cracking and separation of nuts				
Roasting of kernels				
Crushing of roasted kernels				
Milling of crushed kernels				
Kneading of milled kernels				
Extraction of shea butter oil				
Clarification of shea butter oil				
Storing of shea butter				

SECTION I: PERCEIVED NEED FOR TRAINING

(20) For each of the following modern processing technologies please indicate by ticking (√) where applicable, your opinion of technologies you will require training on.

Modern shea butter processing technologies	**Strongly agree**	**Agree**	**Undecided**	**Disagree**	**Strongly disagree**
Shea kernel dryer					
Shea nut cracker and separator					
Roaster					

Hammer mill crusher					
Disc mill					
Kneader					
Manual screw press					
Clarifiers					
Storage tank/drum					

SECTION J: PERCEIVED CONSTRAINTS HINDERING EFFECTIVE PERFORMANCE OF RESPONDENTS IN THE USE OF MODERN PROCESSING TECHNOLOGIES

(21) Kindly indicate how severe you consider the under listed constraints hindering your effective performance in the use of modern processing technologies for shea butter extraction activities.

CONSTRAINTS	**NOT A CONSTRAINT**	**NOT SEVERE**	**SEVERE**	**VERY SEVERE**
Scarcity of water				
Lack of technical support services				
Inadequate capital				
Poor packaging and market				
Unavailability of shea fruits for processing				
Lack of extension training				
High cost of equipment maintenance				
Epileptic power supply				
High cost of labour				
Low patronage of shea butter products				

SECTION K: TASK ANALYSIS

(22) Please **circle the number** for each of the tasks below, the frequency of performance, the importance you attached to each tasks and the learning difficulties you encountered when using modern shea butter processing technologies for shea butter extraction.

Tasks (Activities)	Frequency of performance					Important			Learning difficulties			
Drying of kernels	1	2	3	4	5	1	2	3	1	2	3	4
Cracking and separation of nuts	1	2	3	4	5	1	2	3	1	2	3	4
Roasting of kernels	1	2	3	4	5	1	2	3	1	2	3	4
Crushing of roasted kernels	1	2	3	4	5	1	2	3	1	2	3	4
Milling of crushed roasted kernels	1	2	3	4	5	1	2	3	1	2	3	4
Kneading of milled kernels	1	2	3	4	5	1	2	3	1	2	3	4
Extraction of shea butter oil	1	2	3	4	5	1	2	3	1	2	3	4
Clarification of shea butter oil	1	2	3	4	5	1	2	3	1	2	3	4
Storing of shea butter	1	2	3	4	5	1	2	3	1	2	3	4

Where,

Frequency, 1=Daily, 2= Weekly, 3= Monthly, 4= Occasionally, 5= Seldom

Importance, 1= Marginally important, 2= Moderately important, 3= Extremely important

Learning difficulties, 1= Easy, 2= Moderate difficulty, 3= Very difficult, 4= Extremely difficult

SECTION L: SKILL GAP ANALYSIS

(23) Please kindly circle the number that best represent your view of your current proficiency from the under listed tasks.

Tasks (Activities)	Current proficiency				
Drying of kernel	1	2	3	4	5
Cracking and separation of nuts	1	2	3	4	5
Roasting of kernels	1	2	3	4	5
Crushing of roasted kernels	1	2	3	4	5
Milling of crushed kernels	1	2	3	4	5
Kneading of milled kernels	1	2	3	4	5
Extraction of shea butter oil	1	2	3	4	5
Clarification of shea butter oil	1	2	3	4	5
Storing of shea butter	1	2	3	4	5

Where:

1. Cannot complete any part,

2. Can complete less than half the task,

3. Can complete more than half the task,

4. Can complete the entire task but takes too long

5. Complete the task within time standard.