

# THE ARCHITECTURE OF COTTAGE PLANT AND ANIMAL CHEESE INDUSTRY FOR A TRANSFORMED ENTREPRENEURSHIP DEVELOPMENT

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## ABSTRACT

Cheese is a nutritious food is one of the numerous products from processing of milk of cows, goats, sheep, buffalos and camels, etc. or from processing cowpea specie of soya beans. It is processed from either milk by acidification and coagulation and the application of a juice extract from Sodom apple, lime, etc. However, “AWARA” the plant cheese from cowpea specie of soya beans is mostly common and popular in the environment. The awareness in this project work showcases an eye opener to the process, procedure and development of cheese from milk producing animals such as cow and sheep etc. Due to lack of household refrigerator facilities and poor electricity supply in mostly parts of Nigeria and other parts of West Africa, several attempts to increase the shelf life of cheese abound. Notable examples include use of small and medium cottage industry to obtain, process, produce and use the final cheese as a product for entrepreneurship development. The Bauchi environment is endowed with all the natural ingredients, resources and materials that will facilitate the making of a conducive ambience which will accommodate the final products. It will be recommended that the stakeholders should improve on the sensitization strategies and carry everybody along in the development, further research, empowerment, consumption, production and nutritional values of these cheeses.

***Key words:** Cheese, cottage, development, entrepreneurship*

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## Introduction

Milk (plant/animal) and its other various products forms the major portion of food for infant and adult all over the universe. It is a main source of acid protein in northern Nigeria where it is mostly consumed inform of Nono and wara (Yunusa & Adedibu). Also, cheese is another nutritious food and one of the numerous products from processing milk of cows, goats, sheep, buffalos, camels, yaks and from processing cowpea specie of soya beans milk.

Cheese is therefore produced by coagulation of the milk protein known as casein. Warankashi according to Malomo, Adekoyeni and Jimoh (2015) is a traditional soft cheese consumed in several parts of West Africa which originates from the Fulani cattle herdsmen from northern Nigeria who refer to the liquid cows milk as Wara and the curd-like texture of the cheese as ‘Kashi’(Ogundiwin 1978).

It is processed from milk by acidification and coagulation that is by the application of a juice extract of Sodom apple leaf (*Calotropis Procera*). This Sodom apple (*Calotropis Procera*) extract has used for traditional cheese making West African countries such as Nigeria and the Republic of Benin. Another method of coagulation is with the use of lime, pawpaw etc.

One of the key ingredients in cheese making is coagulant and rennet which serves as coagulants from animal origin is the commonest coagulant (Roseiro et al. 2003). The shelf-life of cheese which varies from 4days to 5days depend largely on variety. Thus, cheese is a form of milk that is solidified to preserve its valuable nutrients.

### **Background of the Study**

Cattle are well known to be the major source of milk worldwide, however, the milk production by local cattle breeds in Nigeria have been reported to be low due to the poor quality and insufficient feeds and feedstuffs especially during the dry season). Cattle also serve as a reserve of family wealth and as a mark of responsibility and status in the country (Oyedapo et al 2014).

In Nigeria, the Fulani pastoralists process surplus fresh milk into various stable products like West African soft Cheese (Warankasi) Nono (fermented skimmed milk) and mai-shanu. The West African soft cheese which is the typical type of cheese found in Nigeria has a shelf life of 2-3 days when immersed in the whey. (Oladapo and Jadesimi, 2011).

Due to lack of household refrigerator facilities and poor electricity supply in mostly parts of Nigeria and other parts of West Africa, several attempts to increase the shelf life of cheese abound. Notable examples include use of antibiotics such as natamycin and various chemical preservatives such as propionic acid, sodium benzoate and sorbic acid in the preservation of cheese. Most methods include freezing, refrigeration, drying, frying, use of lemon juice as coagulant and use of lemon grass oil, etc. Other researchers are thinking of ginger, garlic, and tiger nuts.

As a result of the above, a cottage industry according to Wiktionary, (2015) means a small-scale industry, with relatively few employees or a limited customer base. To establish a low key industry, some of the locally sourced inputs include bricks, thatch, timber, purpose made doors and windows using dry construction method coupled with modular co-ordination. Also, the concept of ‘thinking globally and acting locally also play an important role; by always making reference to food standards, regulations and international best practices.

### **Statement of the Problem**

The use of vegetable extracts as milk coagulants according to Adetunji and Salam (2013) in soft cheese processing has been known since antiquity. Milk coagulants of plant origin have over-ridden the use of animal rennet. Presently speaking, the animal cheese from cow is not so popular in Bauchi despite the availability of milk producing animals, lack of Industrial manufacture of cheese and the nutritional benefit have not been fully derived. However, “AWARA” the plant cheese from cowpea specie soya beans is mostly common and popular. The awareness in this project work shows cases an eye opener to

the process, procedure and development of cheese from milk producing animals such as cow and sheep etc towards marketing systems and empowerment of youths for future national development.

### **Justification of the Study**

Cheese making in Africa according to (Omotosho, Oboh and Iweala, 2011) is not properly documented and is largely dictated by tradition. The cheese is used as a form of preserving essential nutrients in milk and excellent source of nutrients such as proteins, fat, minerals and vitamins. As a result, the strong effects of Local vegetable coagulants on the amount of cheese production locally can never be under estimated. The Bauchi environment is endowed with all the natural ingredients resources and materials that will facilitate how to obtain, process, produce and use the final cheese product in a small scale cottage industry in the Federal Polytechnic, Bauchi.

### **Scope of the Study**

The scope of this study is to investigate the process and procedure of final plant and animal cheese products determined by the small scale industrial structure that will accommodate all the needed functions and fancy.

### **Aim of the Study**

The aim is to think locally but act globally by transforming the surplus fresh milk obtained from cow/sheep and soya beans due to lack of refrigeration facilities into soft, unripened cheese called wara or warankashi or wagashie in a well constructed small scale modular industry to facilitate Entrepreneurship Development.

### **Objectives of the Study**

The objective of this study will

- 1 Determine easy ways of processing cheese made from plant/animal using local vegetable coagulants.
- 2 Propose a conducive small scale cottage cheese industry within Federal Polytechnic, Bauchi.
- 3 To synchronize a multi-disciplinary approach into solving problems of basic needs such as food and housing.

### **LITERATURE REVIEW**

The milk coagulation is a basic step in cheese manufacturing. For a long time, calf rennet, the conventional milk clotting enzyme obtained from the fourth stomach of sucking calves is the most widely used coagulant in cheese making all over the world to manufacture most of the cheese varieties. The worldwide reduced supply of calf rennet and the ever increased cheese production and consumption have stimulated substitutes. However, some research works have been conducted on the use of certain plants as alternative coagulants (Adeniyi et al, 2007).

Also, (Uaboi-Egbenni et al, 2005) noted that for the production of high quality cheese, rennet enzyme is added for effective curdling and in its absence, it is possible to use extract from leaves of Sodom apple (*Calotropis Procera*) as alternative in recent

development it has been observed that milk coagulants of plant origin have over-ridden the use of animal rennet. The reason being that animal rennet may be limited for diet (vegetarianism) religious reasons (Judaism and Islam) or being generally engineered food of which the Germans and the duct for example forbid the use of recombinant calf rennet (Roseiro et al, 2003).

Wara/Cheese is the fresh solid or semi-solid product obtained from coagulating milk. Most cheese types are made by the use of rennet to coagulate the case in micelles in the milk and addition of starter culture to produce lactic acid (Chikpah, 2015).

Wara is an unripened cheese consumed in several part of West Africa, the cheese is prepared by coagulating fresh cow milk with a leaf extract of Sodom apple (*Calotropis Procera*) (OladipoJ and Jadesimi, 2013). Lemon juice was introduced into the processing of wara soft cheese to reduce microbial load (Adetunji et, al 2007).

The notation by (Yunusa, 2011) made it known that one of the basic ingredients that the one of the basic ingredients that the body requires for effective growth is protein in which milk is one of the primary source of protein.

### **General Information on Cheese Production**

In this study, plant milk and animal milk were used to serve as basic ingredients for cheese production. The procedure involved in cheese making is such that the coagulants are washed with distilled water and sliced with a knife. The leaves coagulants were manually mixed with clean water in order for the extract to be collected (Augustine et al, 2014). The mixture of milk and the extract were strained into warm milk with constant stirring and heating. Coagulation starts with 15-20mins after the addition of the coagulant.

The curd will be boiled for 20minutes to inactivate the plant enzyme and facilitate whey expulsion. The curd was then strained through a sieve (a small curved raffia basket) which facilitates whey drainage and gives a cheese strength, shape and size, to the cheese (Oladipo and Jadesimi, 2013). Cheese can be preserved by biological or chemical methods using garlic and ginger or sodium benzoate and lactic acid respectively.

### **Flow Chart Of Wara/Cheese Production**

**Sampling Point I:** Raw Milk (Water in pot)

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Heat the milk to 45 – 50<sup>0</sup>c

**Sampling Point II:** Add leaf extract of Sodom apple (*Calotropis Procera or lime*)

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**Sampling Point II:** Heat the Mixture of milk and leaf extract of 95<sup>0</sup>C till curd formation

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Pour the milk curd into moulds for whey drainage

**Sampling Point IV:** Cheese in moulds

*Source: Adetunji V.O and Babalobi*



## Materials and Methods

### Site of the Experiment

The study area of the experiment will be carried out at the location of the Proposed small scale modular cheese industry near the Department of Food & Science Technology and Architectural Technology, Federal Polytechnic, Bauchi.

### Collection of Samples

The cow milk will be purchased from Fulani herdsmen in kafin Galadima area of Bauchi State, while the Sodom apple (*Calotropis Procera*) succulent leaves and stems of the plant were harvested locally and dried for four days and later grounded with pestle and mortar to extract the juice. Also, lime will be purchased from Muda lawal market. The lime was washed and sliced into pieces. The plant milk will be processed from soya beans purchased from Muda lawal market of Bauchi State . After all the samples were ready, the two experiments were carried out as one portion of the milk is processed for animal cheese with the used of Sodom apple (*Calotropis Procera*) or lime while the other portion was proceed with the use of plant milk that will yield plant cheese.

### Process and Procedures of Cheese Preparation

#### Experiment 1

A well labelled samples A will be made for the production of cheese using cow milk and Sodom apple (*Calotropis Procera*) or lime. The coagulants are to be washed with distilled water and sliced with knife. The mixture of the milk and the dried extracts were strained into warm milk with constant heating and stirring to about 95<sup>0</sup>C with curd formation. Coagulation starts with 15-20 minutes. To inactivate the plant enzyme and facilitate whey expulsion, the curd was strained through a sieve which facilitates whey drainage and gives a characteristics shape and size of the cheese

#### Experiment 2

Another well labelled sample B will be made for the production of cheese using soya milk and Sodom apple (*Calotropis Procera*) or lime. The limes are washed with distilled water and sliced with knife to extract the juice. The mixture of the milk and the dried extract were strained into warm milk with constant heating and stirring to about 95<sup>0</sup>C until curd formation. Coagulation starts within 15-20minutes. Also, to inactivate the plant enzymes and facilitate whey discharge, the curd was strained through a sieve which facilitates whey drainage and gives characteristic shape and size to the cheese. The experiment 1 and experiment 2 will scheduled in the results/findings below.

### Results/ Findings

Based on the experiment conducted the qualitative analysis between the plant and animal cheese has been scheduled in Table 2 below:

**Table 2:** A qualitative analysis between the plant and animal cheese

Parameters	Yield	Texture	Dry matter	Whey volume	pH
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Animal Cheese	Above average	Very soft	Higher weight	Moderate whey volume	Slightly acidic
Plant Cheese	Average	Soft	Moderate Weight	Higher whey volume	More acidic
Overall comparison and acceptability	The yield of animal cheese is well above that of the plant cheese	The texture of the cheese with animal cheese is as softer than that of plant	The dry matter of cheese produced with animal cheese has higher weight than that of the plant	The whey volume recovered with plant cheese was higher than that animal cheese	The acidity of plant cheese was more than that of animal

**Source:** Researchers' Field work, 2015

From the observations noted in the background, the objective of this study will determine ways of processing cheese made from cow milk with either Sodom apple (*Calotropis procera*) or lime as a local vegetable coagulants and preservatives (Ginger, Clove and black pepper) abound in our environment in a proposed conducive small scale industry within Federal Polytechnic, Bauchi (See Table 1).

**Table 1:** Various Pictorial views of the Proposed Cottage Cheese Industry.



PLATE: A

PLATE: B

### Summary and Conclusion

The study will be expected to show that the cottage industry with specific mention to the flow chart could be added to improvement of the life expecting of the produced cheese(plant/animal) apart from frying, drying, and refrigerating. Hence it can be concluded that using Sodom apple (*Calotropis Procera*) or lime as coagulants in cheese production using cow milk are preferred over plant cheese for good yield and better cheese quality without risk for human intake and health. With Entrepreneurship Development experience, marketing of the final cheese product will be profitable as well as create job opportunities.

### Recommendations

1. The government, NGOs, and stakeholders should improve on the sensitization and awareness workshop, seminars, symposiums and other interactions to carry

everybody along in the consumption production and nutritional values of cheese intake.

2. Empowerment opportunities abound in cheese making. The northern part of the country especially should engage more in animal cheese as alternative food supplement to plant cheese.
3. For further research, architects should team up with food scientist, nutritionist and dietetics to develop easier and improved quantity and quality cheese production.
4. By the global best practices, the cattle varieties could be generally improved for dairy products and specializing on commercial quantity production of cheese by adopting best modern techniques and also, plant cheese should be improved for youth development.

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