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AN ANALYSIS OF THE PRODUCTION CAPABILITIES OF SMALL-SCALE SOYMILK ENTERPRISES IN CALABAR, NIGERIA

I. B. ADINYA and A. D. IDIO

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ABSTRACT

This study was carried out to determine the role of extension services in the activities of the small-scale soymilk enterprises in Calabar. The enterprise level interview scheduled was used for the survey. The study revealed that although 80% of the soymilk enterprises studied have acquire the basic skill for processing soymilk from soybeans, 20% of them lacked proper knowledge about soymilk preservation, prevention of contamination and packaging. The quality control activity in the soymilk enterprises was weak because they did not have quality control laboratories of their own or any external laboratory where they could analyze their products. They therefore depended solely on sensory evaluation, which was inadequate to undertake all aspect of quality evaluation. There is need to further train the soymilk processors in the areas of processing, packaging and quality control and assurance in order to improve their performance and ensure consumer safety.

KEYWORDS: Analysis, production capabilities, soymilk, Calabar.

INTRODUCTION

Soymilk has been accepted as milk from plant source – soybean. The technology for the production of soymilk at the household or small-scale level is relatively simple, inexpensive and requires low start-off capital. The equipment used consists generally of utensils used for household food preparation (Enwere, 1999). Consequently, illiterate and semi-illiterate persons easily understand the technology used at small-scale level of processing even with little extension training in the process technology. This has led to the proliferation of small-scale soymilk enterprises in different parts of Nigeria (Enwere and Madukwe, 2001).

However, the technology for production, preservation, marketing and storage of soymilk for commercial purposes even at small-scale level is much more complicated than just grinding soybeans with water, extracting the milk, formulating, boiling/pasteurization/sterilization, packaging and cooling. In Calabar consumers have observed that there are large variations in soymilk produced by the small-scale commercial enterprises. In addition, spoilage easily occurs either as curding of the soymilk protein and separation from the whey, sliminess or thinning of the soymilk. Consumers have also made various complaints about inconsistent quality in terms of taste, colour, consistency, flavour and shelf life of the soymilk from some small-scale commercial processors. There have also been cases of stomach upset or disorder and sometimes vomiting after the consumption of some commercial soymilk products. The skill, knowledge and procedure for soymilk processing, preservation and storage before and during marketing, known as production capabilities, should be adequately combined for effective operation (STS, 1987).

Lall (1992), Ernest *et al.* (1993) and Biggs *et. al* (1995) defined technological effort required to master new technologies, adapt them to local conditions, improve and diffuse them. These technological capabilities include production capabilities. Production capabilities are the skills, knowledge and improvement, quality control, maintenance, equipment stretching, research, design, innovation and scheduling for reaching prescribed level of machine efficiency. However, extension agents or organizations should cooperate and collaborate with government agencies such as Universities, National Agency for Food and Drug Administration and Control (NAFDAC), Raw Materials Research Council (RMRC), and non-governmental organizations and financial Institutions in Nigeria, so as to improve the production capabilities of the soymilk enterprise.

Halm (1988) observed that extension agents should intervene to improve production capabilities which will help to expand soybean utilization and enhance household food security in Nigeria.

The specific objectives of the study were to investigate

(a) Processing capabilities-pertaining to processing methods;
(b) The packaging capabilities;
(c) Some socio-economic characteristics of processors;
(d) The role of extension in the activities of the small-scale soymilk enterprise and
(e) The quality control and assurance capabilities

METHODOLOGY

This study was conducted in Calabar (Calabar south and Calabar Municipality), of Cross River State. Calabar was selected because of the influence of University of Calabar and Cross River University of Technology and the soybean utilization project, which was carried out by the researchers in Calabar town and the surrounding rural areas in 2003. During this research project, members of Calabar community were taught how to process and utilize soybeans, including preparation of soymilk.

STUDY POPULATION AND SAMPLE SIZE

A sample of 25 small-scale soymilk processors was randomly (stratified random sampling) selected for the study in Calabar. This served as the population for the study. Members of this population were identified by going to the markets, motor parks, restaurants, Universities hostels, walking along the street, and asking processors names of other processors they knew.

DATA COLLECTION AND ANALYSIS

The instrument used for data collection was a modified enterprise level interview guide that contained structured and semi-structured questions. The researcher interviewed each respondent personally. Data obtained from

I. B. ADINYA, Department of Agric. Economic/Extension, Cross River University of technology Obubra, Nigeria
A. D. IDIO, Department of Agric. Economic/Extension, Cross River University of technology Obubra, Nigeria

the study were analysed using means and percentages.

FINDINGS AND DISCUSSION

Some characteristics of soymilk enterprises: Majority of the soymilk enterprises in Calabar were established in 2003, despite the fact that 40% of the people were aware of soymilk before 2000. The reason given by the majority of respondents (60%) for establishing the soymilk enterprise was for income generation. 24% were located in University Of Calabar, while 22% were located in Cross River University of Technology, Calabar campus (table1). Other soymilk enterprises were located outside the university campus within Calabar town. All the soymilk enterprises were located within the respondent's residences. Majority of them (91%) had no business name, and (50%) had no telephone or GSM handset.

Table 1:Some characteristics of the Soymilk enterprises in Calabar

Characteristics	Percentage (n = 25)
Age of establishment of enterprise (years)	
1 – 2	10
2 – 3	60
5 – 6	20
7 – 8	3
9 – 10	3
More than 10	4
Reason for establishment soymilk enterprise	
Income generation	60
Imitate	11
Advice of people	10
To sell – surplus from family consumption stock	3
Response to research objective	3
Location of the enterprises	
University of Calabar, Calabar	24
Cross River University of Technology, Calabar Campus	22
Market areas (Watt market, marine market, Beach market, Eight-miles market, Akim market, Ikot-shie market, Uwanse market, Okpoene-market, Atimbo market, Nbumkpa market, Goldie market close to Abraham Audio stadium Unical)	
Calabar (Calabar South and Calabar Municipality)	18
Housing of the enterprise Respondent's residents	100
Factory-site	0
Possess of business name by enterprise	
Number with business name	9
Number without business	91
Possess of NAFDAC number	
Number with NAFDAC number	0
Number with NAFDAC number	100
Possession of Telephone (handset number)	
Number with telephone (handset number)	43
Number without telephone (handset number)	57

Source: Authors' Field Survey 2003

Table 2, indicates that processing of soymilk involves some basic steps, some of which may be skipped depending on the method adopted. These steps include dehulling, soaking, boiling and grinding of the seeds, slurring in water and sieving to extract milk, and removing fibre or residue, boiling the milk, formulating by adding other ingredients, standardization of the milk, packaging, cooling and storage (STS, 1987).

According to Enwere 1998, grinding, slurring in water and sieving to extract the soymilk and boiling the soymilk are compulsory, while the other steps may be optional depending on the method and final product desired. He further stated that, if the optional steps are incorporated into the process, better quality soymilk is obtained. The production capability is assessed in terms of capability to integrate the processing steps correctly to ensure good quality product with potential for long storage life and consumer safety.

Table 2 revealed that 86% of the enterprises dehulled (decorticated) their soybeans. Dehulling is not critical in soymilk processing if the soybeans are boiled or soaked in mild alkaline water (STS, 1987). All the soymilk enterprises soaked their soybeans, 92% of the enterprises boiled their soybean.

According to Leiner (1980) and STS (1987), this level of processing is enough to eliminate the anti-nutritional factors in soybeans. However, six percent of the enterprises practiced dry dehulling and milling to produce raw soybean flour which was occasionally used for soymilk production. This practiced is not recommended because the soymilk had high beany flavours. 80% of the enterprises correctly formulated soymilk by adding their ingredients while the soymilk was still boiling helps to kill micro-organisms in the ingredients such as the sugar and flavour. If these ingredients are added when the milk is already cooled, the micro-organisms proliferate and cause spoilage of the milk within a very short time (Frazier, 1977). Adding the ingredients after boiling and before cooling (practiced by 7% of enterprises) will help to kill some of the micro-organisms, but spores and thermophilic micro-organisms, which can withstand high temperatures, may survive and help to spoil the milk, although spoilage may take a longer time to occur than when ingredients are added after cooling. 80% of the enterprises had proper knowledge and practiced the correct technology of not contaminating the milk during or after processing but 20% did not. Filtering the soymilk after boiling with sterilized filter is recommended while filtering the soymilk after boiling before cooling with unsterilized filter leads to introduction of micro-organisms into the milk. The heat-resistant ones survive and spoil the milk. Filtering the soymilk after cooling with unsterilized filter leads to gross contamination of the milk, leading to faster spoilage.

Table 3 indicates that 70% of the enterprises practiced one form of cold packaging or the other. While 10% of the respondents packaged hot always, 9% of the respondents packaged hot most of the time and 6% of the respodents packaged hot sometimes. Therefore only 10% of the enterprises that package hot all the time possessed the capability to adhere to the proper packaging requirement of soymilk. To avoid survival of micro-organisms, soymilk should be packaged hot. Cold packaging can only be practiced under aseptic conditions. The packaging environment and equipment of the soymilk enterprises in Calabar were not aseptic. Thus, cold packaging is undesirable and should not be practiced. The type of the packaged used does not matter provided it is sterilized. So packaging in bottles and plastics gallons are accepted provided they are sterilized.

Table 2: Processing Capability of small-scale soymilk enterprise

Production Capability	Percentage (n = 25)
Capability of soymilk enterprise to practise the basic soymilk processing steps	
Dehulling/decorticating soybeans	86
Soaking soybean seeds before grinding	100
Boiling soybean seeds before grinding	92
Adding ingredients to the soymilk while still boiling and filtering/sieving the soymilk after cooling with sterilized filter.	80
Adding ingredients to the soymilk immediately after boiling but before cooling	7
Adding ingredients to the soymilk after cooling	6
Filtering/sieving the soymilk immediately after boiling but before cooling with unsterilized filter	7
Filter/sieving the soymilk after cooling with unsterilized filter	14
Dry dehulling + dry grinding without soaking or boiling before grind	6

Source: Authors' Filed survey 2003

Table 3: Packaging Capability of the soymilk enterprise studied

Packaging Capability	Percentage (n = 25)
Method used in Packaging Soymilk	
Packaging soymilk hot always	10
Packaging soymilk hot most of the time	9
Packaging soymilk hot sometimes	6
Packaging soymilk cold always	50
Packaging soymilk cold most of the time	10
Bulk packaging of soymilk always	0
Bulk packaging of soymilk most of the time	5
Capacity of packages used	
Bulk packaging of soymilk sometimes in gallons	20
Packaging of soymilk in single bottle always	50
Packaging of soymilk in single bottle most of the time	15
Packaging of soymilk in single bottle sometimes	10
Packaging of soymilk in polythene bags always	10
Packaging of soymilk hot in tea cups sometimes	5

Source: Authors' Field Survey 2003

Table 4, revealed methods used to treat soymilk packages before use. Almost all the enterprises (76%) who reused their packages did proper washing with water (hot or cool), detergent and brush. 50% of them rinsed at least two times after washing and only 3% neutralized the soymilk packages. Only 3% the enterprises rinsed once, which is not enough. Re-usable soymilk containers should be properly washed, rinsed, neutralized and sterilized. Washing and rinsing of packages reduces drastically the microbial load, odour and particles from old soymilk while neutralization with mild alkalis eliminates the lactic acid formed by bacteria acting on the soymilk. If the lactic acid is not removed, it lowers the pH of the soymilk leading to curdling and separation (Frazier, 1977).

30% of the soymilk enterprises properly sterilized their packages by boiling in hot water before re-using them. Improper sterilization of packages was done by 22% of the enterprises either by filling the packages with hot water and allowing to stand for some times, soaking in salt water or rising with salt water. 20% of the enterprises did not attempt any form of sterilization of their re-useable packages. 6% of the enterprises used new polythene bags that were not re-useable therefore they were discarded after use and so needed no washing or sterilization. Only 3%of the enterprises neutralized washed re-useable packages. If any of the packages treatment is not done or not properly done, it leads to chemical and microbial contamination, which result in spoilage of the soymilk within, even when refrigerated (STS, 1987).

Table 4: Treatment of packaging materials before use

Treatment method	**Percentage (n = 25)**
Method used in Cleaning Soymilk Packages before use	
No cleaning of polythene bags (new polythene bags not reusable	6
Rinsing out soymilk before washing	18
Washing with cold water + detergent + brush	76
Washing with hot water + detergent + brush	10
Rinsing with cold water once after washing	3
Rinsing once with cold water and once with hot water after washing	10
Rinsing two times with cold water and once with hot water after washing	3
Rinsing once with cold water and once with salt water after washing	6
Rinsing once with cold water and rinsing once with mild alkali after washing	3
Sterilization of soymilk packages after washing and rising	
By boiling in hot water	30
Filling with boiling water and allowed to stand for sometime	6
Soaking in salt water	10
Rinsing with salt water	6
No sterilization of bottles and gallons	20
No sterilization of polythene bags	6

Source: Authors' Field Survey 2003

Table 5, indicates the basic quality control methods used for soymilk include proximate analysis composition for water, solid, protein, fat, carbohydrate and mineral contents, in addition to sensory evaluation. Only 7% of the enterprises had ever done chemical analysis of their soymilk because they are food technologists. About 87% of the enterprises conducted sensory evaluation to determine the quality of their products especially during production. Sensory evaluation involves analysing soymilk for colour, flavour, taste, thickness or consistency and mouth-feel using the human senses of sight, smell, taste and touch. Table 5 also revealed that only 3% of the enterprises were able to determine causes of spoilage linked to micro-organism. The enterprises carried out quality assurance of soymilk by adhering strictly to the quantity of ingredients and water (7%), modifying water contents to suit ingredient quality (10%) and applying sensory evaluation.

According to Parry (1973), quality is the satisfactory conformance to specifications and design, such that the

Table 5: Quality Control and assurance method used in the soymilk enterprises studied

Quality Control and assurance capabilities	Percentage (n = 25)
Method Used quality control of soymilk	
Chemical analysis	7
Sensory evaluation	87
Analysis for causes of spoilage	3
Methods used for quality assurance soymilk during processing	90
Adhering strictly to quantity of ingredients and water	7
Modifying water content to suit ingredient quality	10
Applying sensory evaluation during processing (taste, flavour, thickness colour and mouth-feel consciously	87

Source: Authors' Field Survey 2003.

product gives customer satisfaction, dependable service and reliability. Effective quality control has the primary objective of eliminating the cause of customers to reject the product so that they are unlikely to occur. This implies observed problems such as defects and recording of information and data to facilitate the reporting of undesirable incidences, causes and possible remedies. This provides the basis for effective action to improve methods, facilities, procedures and training as necessary. Quality control of food products is defined as activities directed towards the maintenance and improvement of food products as assessed by chemical, physical, biochemical, microbiological and organoleptic or sensory methods available to the industry. This takes into account all the factors which may influence positively or negatively its quality. Quality assurance on the other hand implies making sure that quality of a product is maintained (Herschdoerfer, 1985).

CONCLUSION

This study has shown that although most of the soymilk processors in Calabar have acquired the basic skills for producing soymilk from soybeans, many still lacked the proper knowledge about packaging and treatment of re-useable packages, and prevention of contamination. The quality control and assurance capability of the soymilk enterprise of Calabar was also very unsatisfactory.

There is need to improve the production capacities of the soymilk enterprises through transfers of appropriate technology, capacity building and linkage formation. Extension organizations (technology transfer agency) should cooperate and collaborate with government agencies such as universities, National Agency for Food and Drug Administration and Control (NAFDAC), Raw MATERIALS Research Council (RMRC) and non-governmental organizations and financial institutions in Nigeria so as to improved the production capabilities of the soymilk enterprise, packaging, quality control and assurance. Since the cost of aseptic packaging is beyond the reach of the small-scale processors, the training should address the method of hot packaging under good sanitary environment in order to ensure customers safety and product quality.

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