International Journal of Multidisciplinary and Current Research

Research Article

ISSN: 2321-3124
Available at: http://ijmcr.com

Socio-economic study of a Fermented Drink "Dèguè" made with Milk and Cereals in Benin

TCHEKESSI C. K. Célestin[1]*, BANON Jultesse[1], SENI Isac[1], GANDEHO Justin[1], AGBANGLA Clément[2], AZOKPOTA Paulin[3], ANGELOV Angel[4] and BOKOSSA YAOU Innocent[1]

[1]Laboratory of Microbiology and Food Technology (LA.MI.TA), Department of Vegetable Biology, Faculty of Sciences and Techniques (FAST), University of Abomey-Calavi (UAC); 04BP 1107 Cotonou, Benin; Tel. ++ 229 95 96 29 42;
[2]Laboratory of Genetics and Biotechnology, Faculty of Sciences and Techniques (FAST), University of Abomey-Calavi (UAC); BP526-Commune of Abomey-Calavi, Benin; Tel. ++ 229 66 44 50 07;
[3]Laboratory of Molecular Biology and Formulation of Food, Department of Nutrition, Food Science and Technology, Faculty of Agronomic Sciences (FSA), University of Abomey-Calavi (UAC); 01BP 526 Cotonou, Benin; Tel. ++ 229 97 22 12 49;
[4]Department of Biotechnology, University of Food Technologies; 26 Maritza Blvd, 4000 Plovdiv, Republic of Bulgaria; Tel. ++ 35932603608.

*Corresponding author: TCHEKESSI C. K. Célestin; 04BP 1107 Cotonou, Republic of Benin; Tel. ++ 229 97 81 00 40.

Accepted 30 May 2014, Available online 01 June 2014, **Vol.2 (May/June 2014 issue)**

Abstract

Dèguè is a fermented drink made from a mixture of dumplings cereals steamed and fermented milk. The present study aims at evaluating the production technologies and the marketing of dèguè in Benin. For this, a socio-economic survey was conducted in the municipalities of greater production and consumption of dèguè in the south, the centre and the north of Benin. The results obtained show that dèguè is of Fulani origin and came mainly from Benin and many other countries of West Africa. All producers (100%) use as raw materials millet and milk powder bought in local markets in Benin. In addition, 30.10% use more millet, couscous of wheat to make a second variety of dèguè called dèguè-couscous. Statistic analysis revealed that, dèguè producers use almost the same technology in Benin. The production of this drink is based on the traditional technology that most producers have inherited from their parents. Today, dèguè is sold in schools, universities, markets and along the public roads. It is consumed by people of all ages. According to the consumers dèguè is rich in vitamin, it gives energy and it is as refreshing. Dèguè production is a profitable business that provides a significant daily gain.

Keywords: *cereals, milk, dèguè, socio-economy.*

Introduction

The preparation and marketing of food activity in African cities is not a recent phenomenon. This business offers urban populations foods ready for consumption at popular taste and acceptable costs [1].

Preparation and sale of these foods provide a steady source of income for millions of men and women in developing countries and also contribute to local and national economic growth. These foods called street foods are defined as ready for consumption prepared and/or sold by street vendors or fixed, especially in streets and other similar places [2], [3].

The area of street food has taken on a special significance in African urban centers where rapid urbanization and economic difficulties have led to the increasing number of food vendors on public roads [4]. It offers both traditional food using local products and also new dishes adapted to urban living conditions and low incomes of many urban residents. Thus, these foods are an important part of daily urban food consumption of millions of consumers with low or average income in urban areas.

Many elements show that the informal food sector contributes to the economy in terms of gross domestic product (GDP) and employment [4]. The informal sector's contribution to GDP, when such statistics exist, is ranging from 13% in Mexico to 58% in Ghana [5]. The contribution of the informal food sector employment is 48% of non-agricultural employment in North Africa to 72% in sub-Saharan Africa [6]. In Benin, the phenomenon of street food has grown strongly in recent years. Among these foods placed between other streets dèguè.

Indeed, dèguè is a fermented beverage obtained from a mixture of dumplings steamed cereals and fermented milks, especially popular in urban areas in Benin. Today, the sale and consumption of dèguè took a large and considerable growth in Benin, under the combined effect of rural depopulation and urban population growth. Therefore, the production sector plays an increasingly

significant role in the daily lives of many people to whom this food is an important source of income. However, production, marketing and consumption of dèguè remain little studied. This study aims at evaluating the production technologies and marketing of dèguè in Benin. It is specifically about identifying the different raw materials and the technologies of production of dèguè as well as the profitability economic of the product.

Material

A record of investigations involving issues of socio-cultural orders, technological and economic developed for this study was used.

Methods

The methodology was based on a field study. This study was conducted in the form of semi-structured interviews based on a questionnaire and observation of actors at work according to Bokossa *et al.*, 2013 [7]. It involved four main phases namely:

- exploratory phase;
- a sampling phase;
- a phase of data collection;
- a phase of data analysis.

Exploratory phase

The exploratory phase identified different areas of production, sales and consumption of dèguè. The choice of joint investigation is based on a preliminary study of the Ministry of Agriculture, Livestock and Fisheries (MAEP) at the National Institute of Statistics and Economic Analysis (INSAE) and in the Agricultural Rural Development Centers (CADER). This preliminary investigation has revealed that there is no statistical data on the production of dèguè in Benin. The heads nutrition services of the centers visited were interested in our research. Through their experiences, we targeted the territorial divisions of Abomey-Calavi, Cotonou, Porto-Novo, Comé, Bohicon, Tchaourou, Parakou and Djougou as places where dèguè is highly produced, sold and consumed in Benin. Once the pre-investigation, the cities of Abomey-Calavi, Cotonou, Porto-Novo, Comé, Bohicon, Tchaourou, Parakou and Djougou were selected in all Departments of Benin as cities to investigate given their strategic position.

Sampling phase of the respondents

The number of producers and consumers to investigate is determined according to Dagnelie's formula (1998) [8]. Thus, the size of the sample is obtained from 113 producers and 113 consumers. The proportion of respondents (producers or consumers) by municipality is shown in Table 1.

Table 1: Distribution of respondents by municipality

Municipality	Number of women	Rate of poll	Number of respondents	Percentage of respondents
Abomey-Calavi	334 003	0.252	28	24.779
Cotonou	353 590	0.267	30	26.549
Porto-Novo	138 733	0.105	12	10.619
Comé	41 407	0.031	4	3.540
Bohicon	89 474	0.067	8	7.080
Tchaourou	110 414	0.083	9	7.965
Parakou	127 753	0.095	11	9.735
Djougou	133 549	0.100	11	9.735
Total	1 328 923	1	113	100

Source: INSAE, 2013[9]

Phase of data collection

Survey preparation technologies of dèguè

This survey aims at identifying the different stages of production of dèguè, different varieties of raw materials used and identifying critical moments associated with this production. It consisted of interviews hundred and thirteen (113) producers and the sellers of dèguè in full activity in the above cities in the south, centre and north of Benin. Three (03) producers and sellers of dèguè having a long experience of production and good mastery of the manufacturing technology of dèguè were selected and monitored during their activities.

Consumer survey

This investigation focused on one hundred thirteen (113) dèguè consumers randomly selected in these urban centers. It was conducted in the immediate vicinity of production sites, markets and streets of Abomey-Calavi, Cotonou, Comé, Porto-Novo, Bohicon, Tchaourou, Parakou and Djougou. The questionnaire presented to the consumers enables to have an idea of the frequency of consumption, consumer preferences and possible reasons for consumption.

Phase analysis of statistical data

The collected data were entered and processed using the Excel software. This software has to perform calculations to determine proportions and draw graphs. Analysis of variance (ANOVA) and Tukey's test pair comparison were performed using SPSS 16.0 software. The significance level of 5% is selected ($p < 0.05$).

Results

Socio-economic and demographic characteristics of producers and sellers

The following figures have translated the socio-economic and demographic characteristics of the producers and sellers of dèguè.

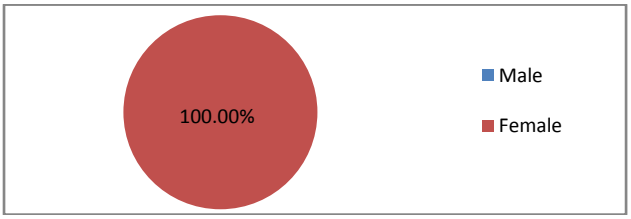

Figure 1: Diagram of distribution of producers and sellers according to sex

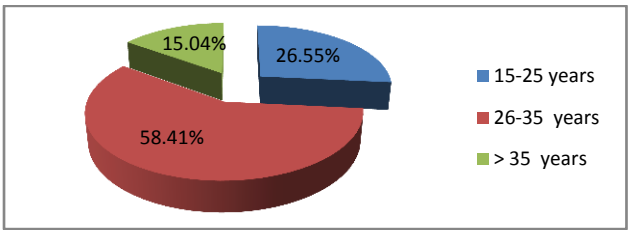

Figure 2: Diagram of distribution of producers and sellers according to age

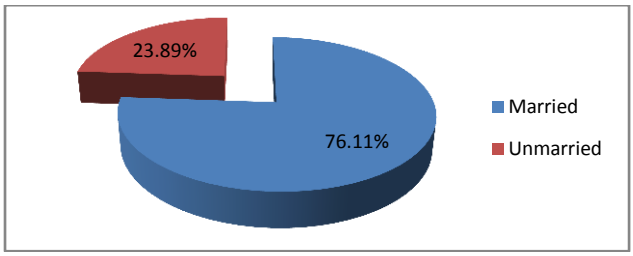

Figure 3: Diagram of distribution of producers and sellers according to their matrimonial situation

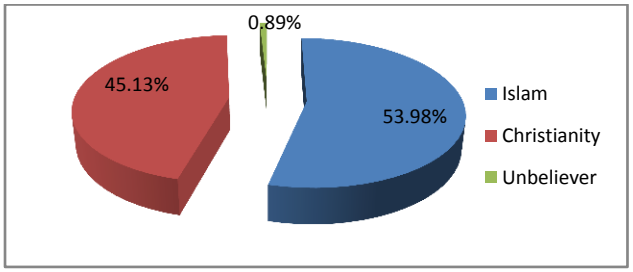

Figure 4: Diagram of distribution of producers and sellers according to their religion

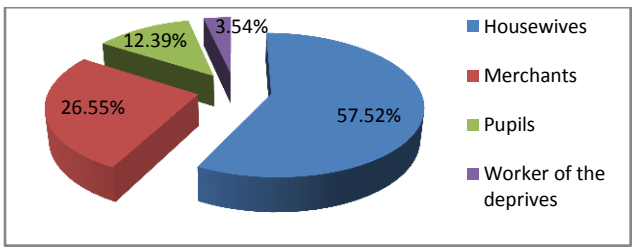

Figure 5: Diagram of distribution of producers and sellers according to the social status

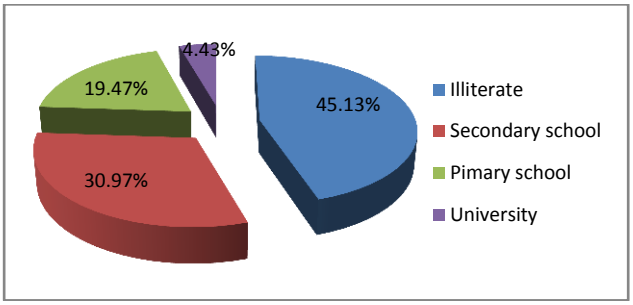

Figure 6: Diagram of distribution of producers and sellers according to education

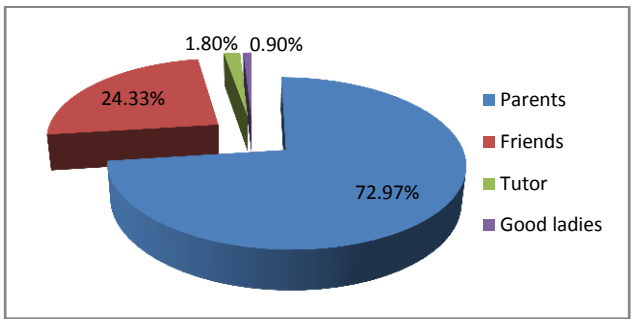

Figure 7: Diagram of distribution of producers and sellers according to the source of technology acquisition

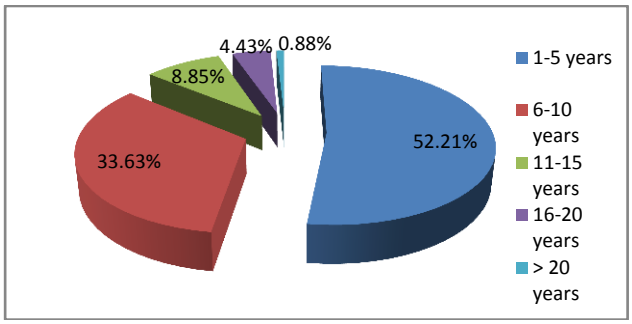

Figure 8: Diagram of distribution of producers and sellers according to their seniority

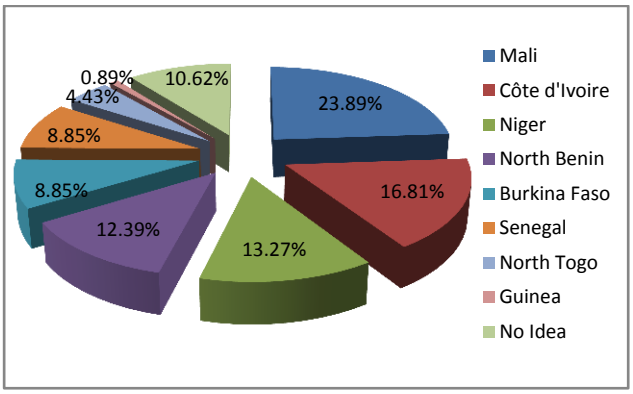

Figure 9: Diagram of distribution of producers and sellers according to the origin of dèguè

Data on the different production technologies of dèguè
Raw materials

Table 2: Comparison of technological parameters

Distinctive parameters	Study areas				P-value
	South Benin	Benin Centre	North Benin	National	
Amount of water recovery / kg of milk (liter)	8.82±2.22[a]	8.50±1.31[a]	9.03±1.90[a]	8.85±2.07[a]	0.788
Water temperature reconstitution (°C)	43.54±9.12[a]	42.40±6.94[a]	42.82±6.03[a]	43.26±8.17[a]	0.929
Duration of fermentation (hours)	8.00±2.47[a]	6.12±0.99[a]	7.42±2.11[a]	7.71±2.34[a]	0.070
Duration of sun drying of cereals (hours)	35.68±13.63[a]	31.50±8.93[a]	32.52±11.25[a]	34.51±12.74[a]	0.405
Cooking time of dumplings (minutes)	20.36±5.05[a]	18.37±6.95[a]	18.42±3.69[a]	19.68±4.92[a]	0.136
Cooking method	Steam cooking	Steam cooking	Steam cooking	Steam cooking	-

Mean values with the same letter on the same line are not significantly different at the 5% level.

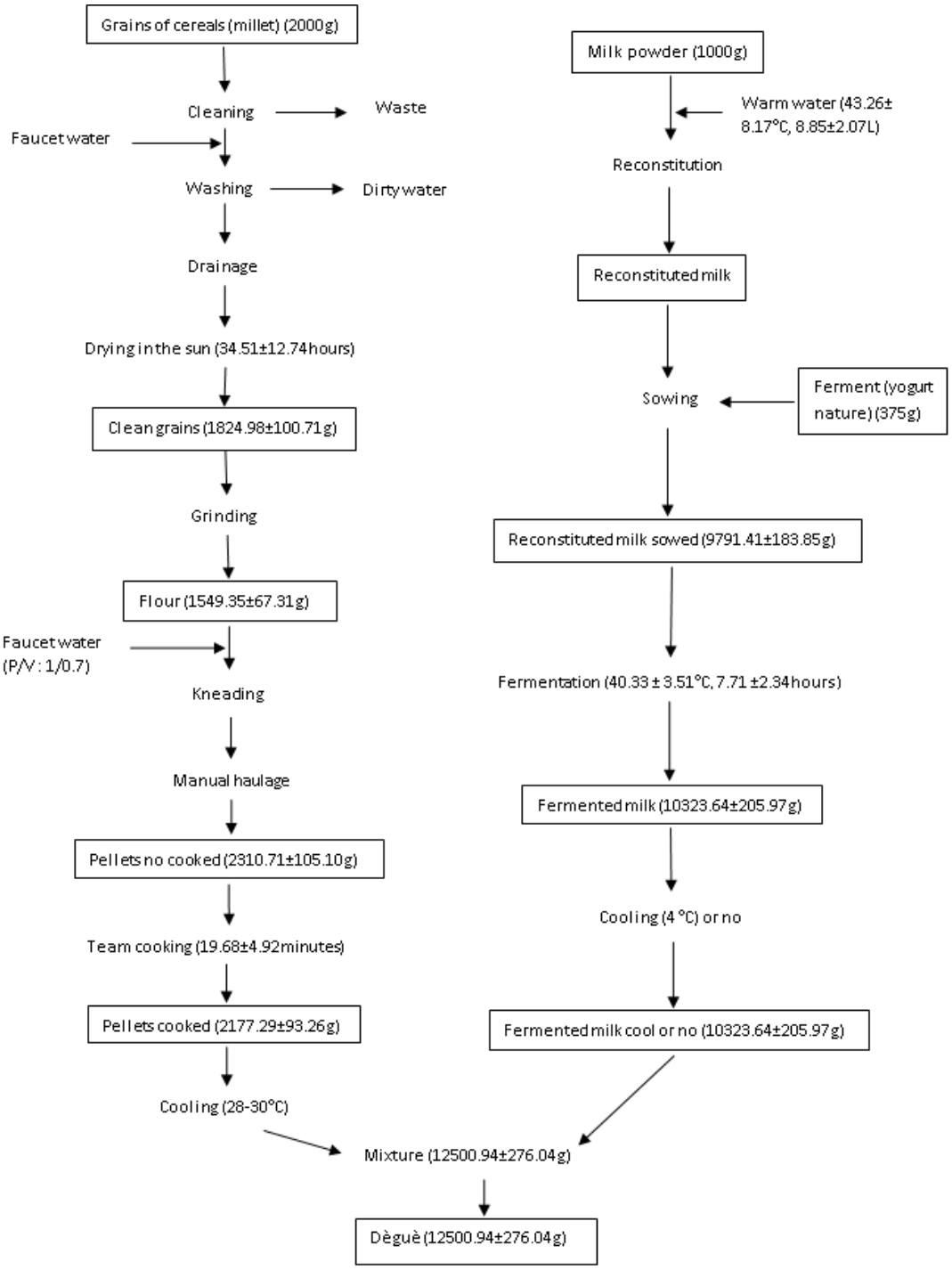

Figure 10: Traditional technology of production of dèguè accompanied by the balance of matters

Data on the different production technologies of dèguè

Raw materials

Raw materials identified during our investigations are: millet, couscous of wheat, rice and milk powder.

Materials of production and sales

The production equipment used is limited to kitchen utensils such as pots, pans, cups, jugs, basins, plastic buckets, trays, whips, gas stoves, coal pots, baskets, refrigerators, bowls, spoons, paddles, gloves, strainers, filters, coolers, screens and drinking water. The packaging materials identified during our investigations consists of plastic bags, jars and bottles.

Comparison of technological parameters
The results of the statistical study of some technological parameters are presented in Table 2.

Technology of production of dèguè

The data from the field helped develop technological flow diagram of figure 10.

Distribution of the producers according to the daily profits, for income and reasons for choosing the profession

The tables 3, 4 and 5 show the daily income from the production and sale of dèguè as well as the utility of income and reasons for choosing the profession.

Table 3: Distribution of producers according to the daily profits in FCFA

Profit margin /day (FCFA)	Proportions of the producers (%)
[500 - 1000[	0.0000000
[1000-2000[	53.2110092
[2000-3000[	33.0275229
[3000-4000[	10.0917431
[4000-5000[	2.75229358
[5000-6000[	0.91743119
Total	100

Table 4: Distribution of producers according to the intended income

Utility of income	Proportions of the producers (%)
Personal needs, household expenditure, school fees, school supplies and breakfast	83.4862385
Tontine and personal savings	16.5137615
Total	100

Table 5: Distribution of the producers according to the reasons for choosing the profession

Reason for choosing	Proportions of the producers (%)
Profitability and little capital to start	48.2142857
Unemployment and poverty	51.7857143
Total	100

Consumer's appreciation

Respondent consumers consist of women (29.20%) and men (70.80%). Their ages are as follows : 61.06% were aged between 15 and 25 years ; 26.55% with age ranging between 26 and 35 years, while 12.39% have a greater than 35 years age . They are university (55.75%), high (23.89%), primary (9.74%) and illiterate (10.62%). Frequency of consumption indicates that 54.87% of consumers take 200FCFA of dèguè per day while consuming 15.93% of 500FCFA dèguè per day. Furthermore 66.37% buy dèguè in good ladies and 25.66% among street sellers while 7.97% in themselves or in houses. 53.10%; 31.86%; 7.08% and 2.66% respectively of respondents consume the product after meals, when the weather it is hot, the snack and breakfast. For consumers, a good dèguè should be slightly fermented (79.65%) and medium viscosity (77.88%). As a result, 47.79% like a dèguè slightly sweet; 33.63% appreciate moderately sweet dèguè and 18.58 % prefer a very sweet dèguè. Finally, 90.27% of consumers consider the cleanliness of sellers against 9.73% and 95.58% take into account the protection of the product against 4.42%.

Discussion

Various surveys show that the production and sale of dèguè is an exclusively female activity (Figure 1). The majority of producers surveyed are housewives (57.52%) followed by 26.55% of traders. They have a minimum age of 15 with 58.41% having between 26 and 35 years; 26.55% between 15 and 25 years and 15.04% have beyond 35 years. Most producers (45.13%) were illiterate; 50.44% have secondary or primary level, while 4.43% are university graduates. Producers primarily comprises married women (76.11%), 53.98% are Muslim followed by Christian (45.13%) (Figure 2 to 6). These results indicate that the production and sale of dèguè affect several layers of the Beninese population. These surveys also helped to understand the reasons for choosing this business. Thus, most of the producers and sellers of dèguè chose this business for one or more of the following reasons: the economic viability of the product, unemployment, poverty and the fact that the activity requires not a lot of capital to start (Table 5). This is also the little investment required to start and easy to enter the trade of dèguè which partly explain the development of the industry in recent years in Benin. In addition, the

production equipment of dèguè is confined to kitchen utensils that most women already possess. These results are consistent with those obtained Randrianomenjanahary Ranaivoarimanana (2006) [10]. In fact, most producers have entered this sector through inheritance. These are producers who received a transfer of knowledge from their parents (72.97%), their friends (24.13%), their guardians or other women (2.70%) (Figure 7). Due to the fact that they have served alongside these trainers since childhood dèguè producers have a good mastery of their job. The number of producers and sellers has increased dramatically over the past decade. Thus, 52.21% have a length between 1 to 5 years followed by 33.63% whose age is between 6 and 10 years and 8.85% who started the business from 11 to 15 years. Then, 4.43% and 0.88% respectively have seniority between 16 and 20 years and above 20 years (Figure 8). As for the origin of the product, the results show that dèguè is of Fulani origin and comes from Mali, Côte d'Ivoire, Niger, Burkina Faso, Senegal, North-Benin, North-Togo and Guinea (Figure 9). Furthermore, the production and sale of dèguè is an activity that provides benefits ranging from 1000 to 5000FCFA about a day depending on the level of investment of the producer and the location of the point of sale. The majority (86.24%) some producers realizes a daily gain between 1000 and 3000FCFA (Table 3). These results are consistent with daily incomes (1500 to 15000FCFA) from street food in Benin according to FAO in 1996 [11]. According to 83.49% of the producers, revenues obtained are used primarily to ensure personal needs (body maintenance) and expenditure at the household level (education, school supplies, lunch). These benefits also allow some of the tontine paid or savings (Table 4). In addition, this study identified a single traditional production technology of dèguè in Benin (Figure 10). For the analysis of variance performed on the different production parameters indicates that there is no significant difference at 5% ($p < 0.05$) between the production technologies of dèguè in the South, Centre and North Benin (Table 2). Therefore, producers use the same manufacturing technology of dèguè in Benin. The identified technology is similar to that described by Agbanzoume in 2005 [12]. However, there are two main types of dèguè depending on the raw material used for the production. Thus, it has no name dèguè means dèguè prepared with millet and dèguè-couscous which means dèguè prepared out of the imported wheat couscous. The main raw materials used in the production are made of millet, rice, imported wheat couscous and milk powder. The producers do not use fresh cow's milk because of its high cost and its smell. Most consumers do not like the smell of cow's milk. In addition, our survey was conducted from April to September 2013, fresh milk is sold 500FCFA the litre in the southern part of Benin and 400FCFA in the north. Besides, the majority of consumers surveyed have university level (55.75%) followed by high school level (23.89%), primary level (9.74%) and illiterate (10.62%). Most of them (54.87%) consume 200FCFA of dèguè per day, while 15.93% eat 500FCFA of dèguè per day. Their suppliers are essentially composed of women (66.37%) and street vendors (25.66%). According to 53.10%, dèguè is often consumed after meals especially when the weather is hot. This is a refreshing drink very appreciated by consumers especially when it's hot. They believe that dèguè is rich in vitamin and energy and clean producers, and sellers products protection influence a lot people's consumption. According to the consumers, a good dèguè should be slightly fermented (79.65%) and medium viscosity (77.88%). As for the addition of sugar, it varies from one individual to another: 47.79% like dèguè slightly sweet; 33.63% appreciate dèguè medium sweet while 18.58% prefer a very sweet dèguè. Finally, the majority (80.53%) of respondents consume dèguè fresh (frozen).

Conclusion

This study identifies a production technology of dèguè in Benin. However, there are currently two varieties of dèguè on the market depending on the type of cereals grain. The main raw materials involved in the production of dèguè are millet, milk powder and wheat couscous. Dèguè is appreciated by consumers during periods of high heat. This is a slightly fermented, slightly sweet drink. The field of production and sale of dèguè is an activity that generates significant benefits for producers.

Acknowledgements

The authors warmly thank the Ministry of State in Charge of Higher Education and Scientific Research (MECESRS) of Benin for having made available the financial resources for the carrying out of this study.

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