



Microbiological Survey and Appraisal of Local Milk Production in Kwara and Niger State, Nigeria

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Abstract

The study appraised Information regarding the demographic data, milk production practices, cattle feeds management, transportation and marketing of milk products. A well-structured questionnaire and field observations was used to collect data from local milk producers with lactating cows and vendors from Niger and Kwara State. There was a great variation in dairy production practises across the two states. Result indicates that more than 70% of respondents were females below 20years of age. The respondents were mostly Fulani 80%-100%, across the two States. In terms of Educational qualifications, 90%-100% of the Pastoralists in all the LGAs did not attend Western education. The use of bottles in marketing of milk products was observed in Agaie LGA. Eight out of ten LGAs surveyed revealed 45%-100% no sanitary inspector visitation or inspection of their milk product. This study presents findings that could be used for planning strategies for standardization of processing methods of dairy products and forming of policies that can lead to the improvement of the dairy industry as well as public health safety

Key words: dairy farm, microbiological survey, milk products, Traditional Technology,

1.0 Introduction

Dairy production contributes about 12.7% of agricultural gross domestic products in Nigeria. The dairy industry provides a means of livelihood for a significant proportion of rural pastoral families in the sub humid and semi-arid ecological zones of Nigeria (Olafadehan and Adewumi, 2008). According to FAO (2013) the local production of milk is less than 1% of the total annual demand that has been estimated at 1.45b litres making the total milk consumption in Nigeria less than 10 litre per head whereas the global average is about 40litres per head in South Africa, 50litres in New Zealand, and 70 litres in U.S. In order part of Africa, it is 28 litres per head. Average world's annual milk production by country in 2012 was 3.1 million tonnes, while that of Nigeria was 566,000 tonnes; South Africa and Kenya were 3.36million and 3.73million respectively. South Africa is able to produce about 6 times more milk than Nigeria with about 42.5% of the number of cows in Nigeria.

The Nigerian dairy industry is highly underdeveloped, relying heavily on importation of dairy products worth about US300million per annum, which meets the majority of the 1.45 billion litre domestic demand of dairy products (Akinyosoye, 2015). The domestic production of milk is continues to be hampered by low milk yields of domestic cattle, low level of cattle nutrition and traditional method of processing milk products. Local milk production in Nigeria is done mainly by the Fulani who control upto 96 percent of the cattle population (Olafadehen and Adewumi, 2008) and the milk production is from indigenous cattle breeds which are kept primarily by the pastoralist tribesmen. Production practices are grossly underdeveloped. Of major concern is the lack of veterinary control of producing animal which when linked with direct use of raw milk and milk products results in conditions which may cause milk borne diseases and food poisoning (such as tuberculosis, diphtheria, shigellosis, brucellosis/staphylococcal food poisoning and aflatoxicosis) at least damage the reputation of traditional milk products (Ijah *et al.*, 2002; Aberer and Dardir, 2009, Okeke *et al.*, 2014).

Niger and Kwara State is one of the food baskets of Nigeria, milk and milk products are been circulated across borders to countries such as Niger Republic and Chad. Food products which would have added to our gross Domestic production are restricted from entering into international world market. Since microorganisms and their toxins cause obvious reduction in milk yield, quality and diseases in human. Again, in monetary terms, thousands of tons of food products are constantly being prevented from entering the world market especially in countries with stringent safety legislations due to mould and mycotoxin contamination above certain levels. This is seriously affecting regional trade between Nigeria and its trading partners

This paper presents the results of a microbiological survey on the traditional production techniques, marketing of milk and milk products and identification of the various constraints of the development and commercialisation of

fermented milk products that will serve as baseline information needed to provide guidelines for upgrading the production and the enhancing of the quality of milk products.

2.0 Materials and Methods

2.1 Area of Study

The study was carried out in Niger and Kwara State, Nigeria. Kwara State shares boundary with Ondo, Oyo, Osun, Niger and Kogi State and an international border with the republic of Benin along its north western part on Baruteen local Government area. The state also has a land area of about 32,500 square kilometres and a population of over 1.5 million which is made up of three main ethnic groups namely Yoruba, Nupe and Baruba. More than 90% of the rural populations who form the bulk of the state total population are engaged in farming. The main stay of the state's economy is agriculture. Kwara State has two main climates seasons the dry and wet seasons. The natural vegetation consists broadly of rainforest and wooded Savannah while the land forms consist of undulating hills, valleys and plains which are transverse by the Niger River and its tributaries. Annual rainfall ranges from 1000-1500mm, while maximum average temperature ranges, between 30°C. The vegetation which is namely the wooded Savannah is well suited for the cultivation of a wide variety of food crops. These crops include yam, cassava, maize, cowpea, rice, sugar cane, fruit and vegetables. Livestock are also reared in different parts of Kwara State (Fakayode *et al.*, 2012).

Niger is within south guinea savannah (SGS). The SGS zone lies within latitudes 8°4' and 11°3' N and longitudes 2°41' and 13° 33' E, with a bimodal rainfall averaging between from 1000 mm to 1300 mm per year, and maximum temperatures ranging from 26 to 38 °C. The NGS lies within latitudes 9°10' and 11°59' N and longitudes 3°19' and 13°37' E and has a unimodal rainfall distribution averaging between from 900 mm to 1000 mm annually, and maximum temperatures varying from 28 to 40 °C

2.2 Data Collection

A well-structured questionnaire and a checklist for observations were designed and used to obtain information from milk producers.

2.3 Sampling Techniques

The target population for the study was six hundred (600) local producers of milk products consisting of smallholder Livestock keepers with lactating cows and milk vendors from Kwara and Niger State. The respondents were from 10 different Local Government Areas of the two States which includes: Agaie, Mokwa, Bida, Lavun, Bosso (Niger State) and Illorin East, Illorin South, Moro, Ifelodun, Illorin West (Kwara State)

Also, the questionnaire was structured into four sections; demographic data related to gender, age, religion, social status and academic qualifications; milk production; cattle and cattle feeds; transportation of milk and milk products animal health and management (occurrences of mastitis), milk production: types and practices of milking and milk handling, sanitary measures during milking, utensils used for milking, milk storage and storage conditions, uses of milk (for selling or domestic purposes), habit of drinking raw milk and milk products, Other information collected includes *nono* and *kindirmo* production process, materials and equipment used for milking animals and other ingredient used for production process and knowledge and practices about aflatoxin in milk products.

Data generated were analysed using descriptive statistics (mean, frequency and percentages)

3.0 Results and Discussion

3.1 Demographic Characteristic of Respondents

As shown in Table 1 the demographic characteristics of Respondents. Majority of the respondent from LGAs in Niger State were men and majority were women in Kwara State LGAs. Those that had Islamic religion were between 90-100% in all the LGAs sampled, few Traditionalists but none was a Christian. The Local milk producers were mostly Fulani 80-100%, Hausa 1.7-6.7% and Yorubas 5-30% across the two States. No Igbo and Nupes were noted. With respect to the literacy status of the respondents, in overall, majority of the nomads 33.3%-100% did not attend Western Education. 54% attended Nomadic School in Bida LGA (Table 2). This agrees with the findings of Osotimehin *et al.* (2006) but in contrast with the work of Nguyen *et al.* (2007) and Ngongoni *et al.* (2006) which find out that all the respondent in their study area were literate. One of the major factors limiting the productivity of operators in the small scale dairy enterprise was their low literacy level, which might make it difficult for them to fully appreciate the need to adopt improved milk processing and handling techniques (Girei *et al.*, 2013). Since education is of great importance to agricultural development, the Nigerian government is making frantic efforts to reduce the high illiteracy level prevalent among the nomads. One of such efforts is the establishment of the Nomadic Education Programme to cater for the educational needs of these important pastoralists. Again the respondents from Niger State were mostly house wives (Agaie 66.7%, Mokwa 60%, Bida 70% and Lavun 66.7%) except in Bosso LGA were 53.3% were traders. In contrast, female milk producers from Kwara State were mostly farmers and traders. No civil servant was recorded in all the LGAs except Bosso LGA (40%).

Table 1: SOCIO-DEMOGRAPHIC INFORMATION OF LOCAL DAIRY VENDORS n=600

Variables	NIGER STATE LOCAL GOVT AREA					KWARA STATE LOCAL GOVT AREA														
	Agaie		Mokwa		Bida		Lavun		Bosso		Illorin East		Illorin South		Moro		Ifelodun		Illorin West	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Sex																				
Male	6	(10)	20	(33.3)	51	(85)	10	(16.7)	16	(26.7)	56	(93.3)	50	(83.3)	25	(41.7)	50	(93.3)	40	(66.7)
Female	54	(90)	40	(66.7)	9	(15)	50	(83.3)	44	(73.3)	4	(6.7)	10	(16.7)	35	(58.3)	10	(16.7)	20	(33.3)
Age Group																				
Below 20	30	(50)	10	(16.7)	51	(85)	15	(25)	0	(0)	10	(16.7)	40	(66.7)	20	(33.3)	3	(5)	10	(16.7)
21-25	16	(26.7)	0	(0)	0	(0)	15	(25)	0	(0)	20	(33.3)	2	(3.3)	20	(33.3)	20	(33.3)	20	(33.3)
26-30	6	(10)	0	(0)	0	(0)	10	(16.7)	39	(65)	20	(33.3)	9	(15)	4	(6.7)	20	(33.3)	5	(8.3)
31-35	0	(0)	30	(50)	0	(0)	15	(25)	7	(11.7)	10	(16.7)	5	(8.3)	10	(16.7)	10	(16.7)	20	(33.3)
36-40	6	(10)	10	(16.7)	0	(0)	0	(0)	7	(11.7)	0	(0)	3	(5)	6	(10)	7	(11.7)	2	(3.3)
Above 40	2	(3.3)	10	(16.7)	9	(15)	5	(8.3)	7	(11.6)	0	(0)	1	(1.7)	0	(0)	0	(0)	3	(5)
Religion																				
Isam	60	(100)	56	(93.3)	54	(90)	55	(91.7)	60	(100)	60	(100)	60	(100)	56	(93.3)	60	(100)	59	(98.3)
Christianity	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	6	(10)	0	(0)	0	(0)
Africa traditional religion	0	(0)	4	(6.7)	0	(0)	5	(8.3)	0	(0)	0	(0)	0	(0)	4	(6.7)	0	(0)	1	(1.7)
Tribe																				
Fulani	56	(93.3)	60	(100)	60	(100)	58	(96.7)	60	(100)	56	(93.3)	48	(80)	55	(91.7)	50	(93.3)	40	(66.7)
Hausa	4	(6.7)	0	(0)	0	(0)	2	(3.3)	0	(0)	1	(1.7)	8	(13.3)	0	(0)	3	(5)	2	(3.3)
Igbo	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Yoruba	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	3	(5)	4	(6.7)	5	(8.3)	7	(11.7)	18	(30)
Nupe	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)

Sampling size for each Local Govt is 60, values in brackets are percentages

Table 2: SOCIO-DEMOGRAPHIC INFORMATION OF LOCAL DAIRY VENDORS CONTD n=600

Variables	NIGER STATE LOCAL GOVT AREA						KWARA STATE LOCAL GOVT AREA													
	Agaie		Mokwa		Bida		Lavun		Bosso		Illorin East		Illorin South		Moro		Ifeludun		Illorin West	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Acedemic Qualification																				
No School	48	(80)	40	(66.7)	6	(10)	20	(33.3)	60	(100)	40	(66.7)	25	(41.7)	35	(58.3)	60	(100)	45	(75)
Primary School	4	(6.7)	0	(0)	0	(0)	2	(3.4)	0	(0)	10	(16.7)	20	(33.3)	5	(8.3)	0	(0)	5	(8.3)
Secondary School	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Normadic	8	(13.3)	20	(33.3)	54	(90)	38	(63.3)	0	(0)	10	(16.7)	15	(25)	20	(33.3)	0	(0)	10	(16.7)
Tertiary School	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Occupation																				
Civil Servant	0	(0)	0	(0)	0	(0)	0	(0)	24	(40)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
House wife	40	(66.7)	36	(60)	42	(70)	40	(66.7)	0	(0)	5	(8.3)	10	(16.7)	30	(50)	30	(50)	10	(16.7)
Farmer	20	(33.3)	4	(6.7)	6	(10)	15	(25)	32	(53.3)	30	(50)	18	(30)	20	(33.3)	20	(33.3)	20	(33.3)
Trading/Business	0	(0)	20	(33.3)	12	(20)	5	(8.3)	4	(6.7)	25	(41.7)	32	(53.3)	10	(16.7)	10	(16.7)	30	(50)
Student	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Milk production only source of income																				
Yes	48	(80)	20	(33.3)	54	(90)	50	(83.3)	48	(80)	40	(66.7)	25	(41.7)	30	(50)	22	(36.7)	20	(33.3)
No	12	(20)	40	(66.7)	6	(10)	10	(16.7)	12	(20)	20	(33.3)	35	(58.3)	30	(50)	38	(63.3)	40	(66.7)

Sampling size for each Local Govt is 60, values in brackets are percentages

3.2 Information on Cattle and Cattle Feeds from Local Dairy Farmers

Table 3 shows information of cattle and cattle feeds, the findings revealed that 93.3% and 75% of the respondents in Bida and Illorin East LGAs feed their cows with grasses except in Lavun and Illorin West were 8.3% and 5% were recorded for commercial feed usage. Green forages were from two major sources; cultivated and natural grasses. The farmers planted grass in the backyard, fallow land and used manure the cattle to fertilize the plots. In Nigeria most herdsmen move from one place to another in search for pastures. No standard concentrate are given to the cattle. However, the type of animal, its quality, and its diet can lead to differences in the colour, flavour, and composition of milk (Douglass, 2010).

3.3 Information on Milk Production

In terms of attribute of good milk, 93.3% and 91.7% respondents from Bosso and Bida LGAs Indicated that good milk has yellow colour and smells. Table 6 shows a high per cent of the respondent make use of well and river water in processing of milk products. Notably 90% - 93.3% of the respondent from Bosso and Bida LGAs make use of river water in production of milk products. 16.7%-70% of respondent across the ten LGAs do not wash their hands before milking the cows. According to Okeke *et al.* (2014), the use of well and river water could be a source of microbial contamination. It was observed that the Respondents who milk the cattle were mostly male and occasionally their children do milk the cattle. The milk products frequently produced in LGAs of Niger State was nono and wara was mostly produced in Kwara State (Table 4). Notably, the males of age 19-30 milk the cow (85%, 83.4%, and 93.3% in Kwara State). However, in Mokwa 50% of both male and female milk their cow themselves. The results of additive used showed that *Calotropia procera* was the additive mostly used across the LGAs (91.7% Bida and Illorin South, 100% Moro and Illorin West). Higher number of respondents from Kwara State makes use of plastic utensils while in Mokwa and Lavun 75% make use of calabash. The presence of high microbial load in milk and milk products has been linked with the use of calabash, dirty hands, additive (Addo *et al.*, 2011). 100% of respondents make use of bare hand in milking the cow milk in Mokwa, Lavun, Illorin East, Illorin South and Moro. Notably, 1-2 persons in Bida, Ifelodun and Illorin West make use of machine. It was also observed that the nomads do not take their bath or wash their hands before milking the cows according to them this will make the cow to think they were calves and not refuse milking. The use of bare hands mostly by the nomads may be because there was no source of light in the area as the use of machine in milking cow requires electricity, technical skills and capital investment (Millogo *et al.*, 2008).

Table 3: INFORMATION ON CATTLE AND CATTLE FEEDS FROM LOCAL DAIRY FARMERS n=600

Variables	NIGER STATE LOCAL GOVT AREA										KWARA STATE LOCAL GOVT AREA									
	Agaie		Mokwa		Bida		Lavun		Bosso		Illorin East		Illorin South		Moro		Ifelodun		Illorin West	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Kinds of Animals																				
Cattles only (pasteuralist)	28	(46.7)	10	(16.7)	54	(90)	35	(58.3)	32	(53.3)	21	(35)	45	(75)	47	(78.3)	31	(51.7)	30	(50)
Cattles and other animals (agropasteuralist)	32	(53.3)	50	(83.3)	6	(10)	25	(41.7)	28	(46.7)	39	(65)	15	(25)	13	(21.7)	29	(48.3)	30	(50)
Kinds of feeds given to cattles																				
Fodder crop	8	(13.3)	0	(0)	0	(0)	0	(0)	0	(0)	11	(18.3)	17	(28.3)	20	(30)	12	(20)	11	(18.3)
Grasses	30	(50)	10	(16.7)	56	(93.3)	40	(66.7)	48	(80)	45	(75)	30	(50)	25	(41.7)	36	(60)	27	(45)
Cereal straw	12	(20)	30	(50)	2	(3.3)	10	(16.7)	8	(13.3)	4	(6.7)	11	(18.3)	5	(8.3)	10	(16.7)	13	(21.7)
Commercial feed	0	(0)	0	(0)	0	(0)	5	(8.3)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	3	(5)
Cereal by product	10	(16.7)	20	(33.3)	2	(3.3)	5	(8.3)	4	(6.7)	0	(0)	3	(5)	10	(16.7)	2	(3.3)	6	(10)
Operate field grazing only																				
Yes	58	(96.7)	50	(83.3)	48	(80)	30	(50)	40	(70)	45	(75)	56	(93.3)	46	(76.7)	36	(60)	27	(45)
No	2	(3.3)	10	(16.7)	12	(20)	30	(50)	20	(30)	15	(25)	4	(6.7)	14	(23.3)	24	(40)	33	(55)
Practices																				
Open field grazing	40	(66.7)	60	(100)	42	(70)	40	(70)	52	(90)	50	(83.3)	60	(100)	46	(76.7)	58	(96.7)	49	(81.7)
Grazing in door at night	16	(26.7)	0	(0)	18	(30)	10	(16.7)	0	(0)	10	(16.7)	0	(0)	11	(18.3)	0	(0)	8	(13.3)
Field supplemented with commercial feeds	4	(6.7)	0	(0)	0	(0)	15	(30)	0	(0)	0	(0)	2	(3.3)	3	(5)	2	(3.3)	3	(5)
Zero grazing	0	(0)	0	(0)	0	(0)	0	(0)	8	(10)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Storage of feed																				
Raised place and dry	34	(56.7)	30	(50)	36	(60)	10	(16.7)	0	(0)	16	(26.7)	10	(16.7)	5	(8.3)	5	(8.3)	3	(5)
Raised place and humid	4	(6.7)	10	(16.7)	12	(20)	30	(50)	24	(40)	10	(16.7)	25	(41.7)	20	(30)	30	(50)	10	(16.7)
On floor and dry	12	(20)	10	(16.7)	12	(20)	10	(16.6)	36	(60)	23	(38.3)	10	(16.7)	24	(40)	10	(16.7)	33	(55)
On floor and humid	10	(16.7)	10	(16.6)	0	(0)	10	(16.7)	0	(0)	11	(18.3)	15	(30)	15	(25)	15	(25)	14	(23.3)

Sampling size for each Local Govt is 60, values in brackets are percentages

Table 4: INFORMATION ON MILK PRODUCTION

n=600

Variables	NIGER STATE LOCAL GOVT AREA										KWARA STATE LOCAL GOVT AREA									
	Agaie		Mokwa		Bida		Lavun		Bosso		Illorin East		Illorin South		Moro		Ifelodun		Illorin West	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Attributes of good milk																				
White colour smelly	22	(36.7)	0	(0)	0	(0)	5	(8.3)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
White colour not smelly	32	(53.3)	40	(66.7)	0	(0)	50	(83.4)	4	(6.7)	48	(80)	45	(75)	40	(66.7)	23	(38.3)	60	(100)
Yellow colour smelly	0	(0)	0	(0)	55	(91.7)	0	(0)	56	(93.3)	0	(0)	0	(0)	0	(0)	2	(3.3)	0	(0)
Yellow not smelly	6	(10)	20	(33.3)	5	(8.3)	5	(8.3)	0	(0)	12	(20)	15	(25)	20	(33.3)	35	(58.3)	0	(0)
Who milks the cows																				
Male	30	(50)	30	(50)	12	(20)	40	(66.7)	32	(53.3)	34	(56.7)	51	(85)	50	(83.4)	50	(93.3)	49	(81.7)
Female	16	(26.7)	30	(50)	42	(70)	15	(25)	8	(13.3)	20	(33.3)	9	(15)	10	(16.7)	10	(16.7)	5	(8.3)
Children	14	(23.3)	0	(0)	6	(10)	5	(8.3)	20	(33.3)	6	(10)	0	(0)	0	(0)	0	(0)	6	(10)
Age of those that milk the cows																				
Below 18	18	(30)	0	(0)	12	(20)	10	(16.7)	28	(46.7)	11	(18.3)	6	(10)	7	(11.7)	4	(6.7)	7	(11.7)
19-30	32	(53)	30	(50)	38	(60)	25	(41.7)	24	(40)	30	(50)	36	(60)	40	(66.7)	49	(81.7)	50	(83.3)
31-40	8	(13.3)	30	(50)	0	(0)	20	(33.3)	8	(13.3)	10	(16.7)	14	(23.3)	13	(21.7)	6	(10)	2	(3.3)
41 Above	2	(3.3)	0	(0)	0	(0)	5	(8.3)	0	(0)	9	(15)	4	(6.7)	0	(0)	0	(0)	1	(1.7)
Milk products frequently produced																				
Nono	26	(43.3)	20	(33.3)	24	(40)	40	(66.7)	16	(26.7)	20	(33.3)	18	(30)	12	(20)	13	(21.7)	13	(21.7)
Kindirmo	16	(26.6)	20	(33.3)	18	(30)	15	(25)	28	(46.7)	8	(13.3)	12	(20)	8	(13.3)	7	(11.7)	5	(8.3)
Manshanu	10	(16.6)	10	(16.7)	6	(10)	5	(8.3)	16	(26.6)	2	(3.3)	12	(20)	5	(8.3)	0	(0)	2	(3.3)
Wara	8	(13.3)	10	(16.7)	12	(20)	0	(0)	0	(0)	30	(50)	18	(30)	35	(58.3)	40	(66.7)	40	(66.7)
Do you process the milk yourself																				
Yes	38	(63.3)	50	(83.3)	42	(70)	50	(83.3)	48	(80)	47	(78.3)	50	(83.3)	43	(71.7)	46	(76.6)	49	(81.7)
No	12	(20)	0	(0)	12	(20)	10	(16.7)	8	(13.3)	4	(6.7)	1	(1.7)	7	(11.7)	4	(6.7)	8	(13.3)
At times	10	(16.7)	10	(16.7)	6	(10)	0	(0)	4	(6.7)	9	(15)	9	(15)	10	(16.7)	10	(16.7)	3	(5)

Sampling size for each Local Govt is 60, values in brackets are percentages

TABLE 5: MILK PRODUCTION CONT'D

n=600

Variables	NIGER STATE LOCAL GOVT AREA										KWARA STATE LOCAL GOVT AREA									
	Agaie		Mokwa		Bida		Lavun		Bosso		Illorin East		Illorin South		Moro		Ifelodun		Illorin West	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Who process the milk																				
Male	3	(5)	10	(16.7)	0	(0)	0	(0)	4	(6.7)	5	(8.3)	0	(0)	0	(0)	0	(0)	60	(100)
Female	47	(78.3)	50	(83.3)	45	(75)	45	(75)	48	(80)	50	(83.4)	50	(83.3)	57	(95)	51	(85)	0	(0)
Children	10	(1.7)	10	(16.7)	15	(25)	15	(25)	8	(13.3)	5	(8.3)	10	(16.7)	3	(5)	9	(15)	0	(0)
Age of milk producers																				
<18	18	(30)	30	(50)	0	(0)	0	(0)	16	(26.7)	25	(41.7)	35	(58.3)	19	(31.7)	37	(61.7)	35	(58.3)
19-30	32	(53.3)	20	(33.3)	35	(58.3)	35	(58.3)	24	(40)	26	(43.3)	20	(33.3)	40	(66.7)	20	(33.3)	15	(25)
31-50	8	(13.3)	10	(16.6)	20	(33.3)	20	(33.3)	16	(26.7)	7	(11.7)	5	(8.3)	1	(1.7)	3	(5)	7	(11.7)
50 above	2	(3.3)	0	(0)	5	(8.3)	5	(8.3)	4	(6.6)	2	(3.3)	0	(0)	0	(0)	0	(0)	3	(5)
Additives used																				
Banbu	10	(16.7)	10	(16.7)	0	(0)	0	(0)	0	(0)	10	(16.7)	0	(0)	0	(0)	0	(0)	0	(0)
<i>Calotropia procera</i>	40	(66.7)	30	(50)	55	(91.7)	10	(16.7)	10	(16.7)	42	(70)	55	(91.7)	60	(100)	49	(81.7)	60	(100)
Pawpaw leaves	10	(16.6)	20	(33.3)	10	(1.7)	50	(83.3)	50	(83.3)	8	(13.3)	5	(8.3)	0	(0)	11	(18.3)	0	(0)
No additives	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)

Sampling size for each Local Govt is 60, values in brackets are percentages

TABLE 6: MILK PRODUCTION CONT'D

n=600

Variables	NIGER STATE LOCAL GOVT AREA										KWARA STATE LOCAL GOVT AREA									
	Agaie		Mokwa		Bida		Lavun		Bosso		Illorin East		Illorin South		Moro		Ifelodun		Illorin West	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Utensils used in production																				
Calabash+ calabash spoon	26	(43.3)	45	(75)	6	(10)	45	(75)	4	(6.7)	27	(45)	16	(26.7)	10	(16.7)	7	(11.7)	5	(8.3)
Plastic rubber +plastic spoon	23	(38.3)	10	(16.7)	54	(90)	15	(25)	56	(93.3)	24	(40)	44	(73.3)	45	(75)	50	(83.3)	55	(91.7)
Earthen pot	11	(18.3)	5	(8.3)	0	(0)	0	(0)	0	(0)	9	(15)	0	(0)	5	(8.3)	3	(5)	0	(0)
What is used in milking cows																				
Bare hand	60	(100)	60	(100)	58	(96.6)	60	(100)	60	(100)	60	(100)	60	(100)	60	(100)	58	(96.7)	56	(93.4)
Machine	0	(0)	0	(0)	2	(3.3)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(1.7)	2	(3.3)
Both	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(1.6)	2	(3.3)
Containers used in milking the milk																				
Plastic bucket	12	(20)	30	(50)	1	(1.6)	5	(8.3)	4	(6.6)	20	(33.3)	45	(75)	50	(83.3)	51	(85)	46	(76.7)
Mental bucket	4	(6)	0	(0)	0	(0)	0	(0)	0	(0)	20	(33.3)	4	(6.6)	0	(0)	9	(15)	14	(23.3)
Calabash	40	(66.6)	30	(50)	59	(98.3)	55	(91.6)	56	(93.3)	20	(33.3)	11	(18.3)	10	(16.7)	0	(0)	0	(0)
Washing of hand in milk production																				
Before	18	(30)	10	(16.7)	36	(60)	25	(41.6)	40	(66.6)	37	(61.7)	15	(25)	32	(53.3)	30	(50)	20	(33.3)
After	42	(70)	40	(66.7)	24	(40)	35	(58.3)	16	(26.7)	10	(16.7)	39	(65)	18	(30)	15	(25)	15	(25)
At times	0	(0)	10	(16.6)	0	(0)	0	(0)	4	(6.7)	13	(21.7)	16	(26.7)	10	(16.7)	15	(25)	25	(25)
Bathing in milk production																				
Before	10	(16.6)	0	(0)	6	(10)	15	(25)	48	(80)	20	(33.3)	17	(28.3)	10	(16.7)	31	(51.7)	30	(50)
After	50	(83.3)	50	(83.3)	48	(80)	45	(75)	8	(13.3)	38	(63.3)	39	(65)	30	(50)	20	(33.3)	6	(10)
At times	0	(0)	10	(16.7)	6	(10)	0	(0)	4	(6.7)	2	(3.3)	14	(23.3)	20	(33.3)	9	(15)	24	(40)
Source of water																				
Well	6	(10)	0	(0)	0	(0)	15	(25)	0	(0)	39	(65)	40	(66.6)	30	(50)	25	(41.7)	10	(16.7)
River	52	(86.6)	30	(50)	54	(90)	45	(75)	56	(93.3)	18	(30)	0	(0)	10	(16.7)	0	(0)	4	(6.7)
Rain water	2	(3.3)	20	(33.3)	6	(10)	0	(0)	4	(6.7)	0	(0)	10	(16.7)	5	(8.3)	20	(33.3)	10	(16.7)
Tape water	0	(0)	10	(16.7)	0	(0)	0	(0)	0	(0)	3	(5)	10	(16.7)	15	(25)	15	(25)	36	(60)

Sampling size for each Local Govt is 60, values in brackets are percentages

TABLE 7: MILK PRODUCTION CONT'D

n=600

Variables	NIGER STATE LOCAL GOVT AREA					KWARA STATE LOCAL GOVT AREA				
	Agai	Mokwa	Bida	Lavun	Bosso	Illorin East	Illorin South	Moro	Ifelodun	Illorin West
Do sanitary inspector visit farmers										
Yes	12 (53.3)	0 (0)	0 (0)	15 (25)	12 (20)	0 (0)	4 (6.7)	0 (0)	4 (6.7)	5 (8.3)
No	46 (43.3)	50 (83.3)	60 (100)	45 (75)	0 (0)	60 (100)	54 (90)	60 (100)	52 (86.7)	50 (83.4)
At times	2 (3.3)	10 (16.7)	0 (0)	0 (0)	48 (80)	0 (0)	2 (3.3)	0 (0)	4 (6.7)	5 (8.3)
If YES how often										
Never	38 (63.3)	0 (0)	60 (100)	45 (75)	52 (86.7)	60 (100)	50 (83.3)	60 (100)	52 (86.7)	50 (83.4)
Weekly	6 (10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Monthly	4 (6.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Yearly	4 (6.7)	0 (0)	0 (0)	15 (25)	8 (13.3)	0 (0)	8 (13.4)	0 (0)	4 (6.7)	10 (16.7)
2-3 times a year	2 (3.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (3.3)	0 (0)	4 (6.7)	0 (0)
4-5 times a year	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Sampling size for each Local Govt is 60, values in brackets are percentages

3.4 Transportation and Marketing of Milk and Milk Products

As revealed in this present study, the use of animal as a means of transportation of milk product to the market was observed among respondent in Agaie LGA (6%). Table 8 shows that the females were the highest marketers of milk products however, in Agaie LGA 2 males were recorded to sell fresh milk.

Knowledge and practices of aflatoxin in milk production is shown in Table 9. Majority of the milk producers said cattle can get disease from what they eat and also acknowledged that they have seen mould growing on their cattle feeds. However, quite a high percentage (66.7, 58.3, 58.3, 58.3, 60, 58.3, 68.3 and 50 %) of Local farmers from Agaie, Mokwa, Luvuvu, Illorin East, Illorin West, Illorin South Moro and Ifelodun LGAs said they allow their cattle to graze on them except when the cattle become sick.

Concerning storage of cattle feeds 83.3% and 50% of farmers from Mokwa and Ifelodun did not know if proper drying of animal feeds could prevent moulds growth. The materials used for selling milk products mostly were calabash, plastics, polyethylene bags. Bottles were used in Agaie and Bida LGAs (8% and 26.7% respectively). Unused products were either resold or eaten by family members.

3.5 Knowledge and Practices about Aflatoxin in Milk

As shown in Table 9, knowledge and practices of aflatoxin in milk, 70% of the respondent in Bida agreed that cattle can get diseases from what they eat while 58.3% and 50% of respondent in Luvuvu and Illorin South said they do not know. 66.7% Said they have seen mould in their cow feeds and 58.3% allow the cows to graze on it. A similar trend occurred in illorin South. 100% and 68.3 % of Agaie and Luvuvu practice zero grazing whereas other LGAs such as Mokwa and Illorin East operates open field grazing. 83.3% of respondent in Mokwa and Ifelodun do not know if proper drying of animal feeds prevents mould. Mould has been said to produce mycotoxins such as aflatoxin in cattle feeds. Animals fed aflatoxin B₁ and B₂ contaminated feeds are usually excreted in their milk and urine. Aflatoxin M₁ and M₂ has been implicated in liver cancer in human and also affect the milk quality as well as the cattle (Xiong *et al.*, 2013). Okeke *et al.* (2012) in their findings in Bida reported 100% of aflatoxin level high than the limited level.

TABLE 8: TRANSPORTATION OF MILK AND MILK PRODUCTION CONTD

n=300

Variables	NIGER STATE LOCAL GOVT AREA										KWARA STATE LOCAL GOVT AREA									
	Agaie		Mokwa		Bida		Lavun		Bosso		Illorin East		Illorin South		Moro		Ifelodun		Illorin West	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Means of transportation of milk products																				
Car	18	(30)	10	(16.7)	18	(30)	5	(8.3)	4	(6.0)	20	(33.3)	18	(30)	9	(15)	8	(13.3)	34	(56.6)
Motor cycle	14	(23.3)	10	(16.6)	6	(10)	20	(33.3)	24	(40)	10	(16.7)	30	(50)	11	(18.3)	12	(20)	13	(21.7)
Animals	4	(6)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Trekking	24	(40)	40	(66.7)	36	(60)	35	(58.4)	32	(53.3)	30	(50)	12	(20)	40	(66.7)	40	(66.7)	13	(21.7)
Materials used for selling products																				
Bottles	4	(6)	0	(0)	16	(26.7)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Polyethene bags	0	(0)	13	(21.7)	24	(40)	5	(8.3)	8	(13.3)	23	(38.3)	20	(33.3)	33	(55)	40	(66.7)	40	(66.7)
Cup to cup	26	(43.3)	7	(11.7)	12	(20)	50	(83.3)	40	(66.7)	10	(16.7)	20	(33.3)	7	(11.6)	8	(13.3)	5	(8.3)
Calabash	10	(16.6)	15	(25)	6	(10)	05	(8.4)	0	(0)	15	(25)	10	(16.7)	10	(16.7)	4	(6)	2	(3.3)
Plastic plate	8	(13.3)	25	(41.6)	2	(3.3)	0	(0)	12	(20)	12	(20)	10	(16.7)	10	(16.7)	8	(13.3)	13	(21.7)
Who does the selling																				
Male	2	(3.3)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Female	44	(73.6)	50	(83.3)	48	(80)	50	(83.3)	44	(93.3)	50	(83.3)	53	(88.3)	60	(100)	45	(75)	55	(91.7)
Children	14	(23.3)	10	(16.7)	12	(20)	10	(16.7)	16	(26.7)	10	(16.7)	7	(11.7)	0	(0)	15	(25)	5	(8.3)
Method of selling																				
Hawked	20	(33.3)	40	(66.7)	20	(83.3)	5	(8.3)	16	(26.7)	15	(25)	17	(28.3)	30	(50)	35	(58.3)	15	(25)
Stationed	10	(16.6)	20	(33.3)	16	(26.6)	0	(0)	24	(40)	30	(50)	12	(20)	8	(13.3)	10	(16.7)	15	(25)
Both	30	(50)	0	(0)	24	(40)	55	(91.7)	20	(33.3)	15	(25)	31	(51.7)	22	(36.7)	15	(25)	30	(50)
What happened to unsold milk products																				
Reused	8	(13.3)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	7	(11.7)	9	(15)	0	(0)	12	(20)
Discarded	2	(3.3)	0	(0)	0	(0)	5	(8.3)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Eating by families and neighbours	20	(33.4)	30	(50)	54	(90)	55	(91.7)	40	(66.7)	30	(50)	40	(66.7)	50	(83.3)	40	(66.7)	20	(33.3)
Resold	30	(50)	30	(30)	6	(10)	0	(0)	20	(33.3)	30	(50)	13	(21.6)	1	(1.7)	20	(33.3)	28	(46.7)

Sampling size for each Local Govt is 60, values in brackets are percentages

TABLE 9: Knowledge and Practices about aflatoxin in milk

n=300

Variables	NIGER STATE LOCAL GOVT AREA										KWARA STATE LOCAL GOVT AREA									
	Agaie		Mokwa		Bida		Lavun		Bosso		Illorin East		Illorin South		Moro		Ifelodun		Illorin West	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Cattles can get disease from what they eat																				
Yes	34	(56.8)	40	(66.7)	42	(70)	25	(41.6)	16	(26.6)	15	(5)	10	(16.7)	50	(83.3)	45	(75)	40	(66.7)
No	20	(33.3)	20	(33.3)	0	(0)	0	(0)	16	(26.6)	20	(33.3)	20	(33.3)	10	(16.7)	2	(3.3)	5	(8.3)
I don't know	6	(10)	0	(0)	18	(30)	35	(58.3)	28	(46.6)	25	(41.7)	30	(50)	0	(0)	13	(21.6)	15	(25)
Have you seen mould growing on cattle feeds																				
Yes	30	(50)	30	(50)	32	(53.3)	25	(41.6)	40	(66.7)	47	(78.3)	36	(60)	20	(33.3)	10	(16.7)	20	(33.3)
No	16	(26.7)	10	(16.7)	10	(16.7)	30	(50)	8	(13.3)	4	(6)	2	(3.3)	12	(20)	30	(50)	20	(33.4)
At Times	14	(23.3)	20	(33.3)	18	(30)	5	(8.3)	12	(20)	9	(15)	24	(40)	28	(46.7)	20	(33.3)	20	(33.3)
What did you do																				
Leave them to eat them , it's not harmful	40	(66.7)	35	(58.3)	5	(8.3)	35	(58.3)	20	(33.3)	35	(58.3)	36	(60)	35	(58.3)	41	(68.3)	30	(50)
Remove them	10	(16.7)	25	(41.7)	50	(83.3)	10	(16.7)	5	(8.3)	6	(10)	12	(20)	7	(11.7)	9	(15)	10	(16.7)
At times	10	(16.6)	0	(0)	5	(8.4)	5	(8.3)	35	(58.3)	19	(31.7)	12	(20)	18	(30)	10	(16.7)	20	(33.3)
Practices																				
Zero grazing	6	(10)	0	(0)	0	(0)	5	(8.3)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Open field grazing	40	(66.6)	60	(100)	52	(86.6)	35	(58.3)	42	(76)	60	(100)	55	(91.7)	42	(70)	48	(80)	50	(83.3)
Grazing indoor at night	8	(13.3)	0	(0)	8	(13.3)	15	(25)	16	(26.7)	0	(0)	0	(0)	4	(6)	12	(20)	10	(16.7)
Field grazing supplemented with commercial feeds	6	(10)	0	(0)	0	(0)	5	(8.3)	2	(3.3)	0	(0)	2	(3.3)	14	(23.3)	0	(0)	0	(0)
Storage Practices																				
Raised place and dry	16	(26.7)	10	(16.7)	4	(6.6)	30	(50)	0	(0)	18	(30)	7	(11.7)	3	(5)	7	(11.6)	12	(20)
Raised place and humid	30	(50)	10	(16.7)	12	(20)	5	(8.3)	10	(16.6)	10	(16.7)	13	(21.7)	30	(50)	25	(41.7)	25	(41.6)
On floor and dry	6	(10)	0	(0)	36	(60)	10	(16.7)	32	(53.3)	10	(16.7)	20	(33.3)	20	(33.3)	18	(30)	13	(21.7)
On floor and humid	8	(13.3)	40	(66.6)	8	(13.3)	15	(25)	18	(30)	12	(20)	20		10	(16.7)	10	(16.7)	10	(16.7)
Proper drying of animal feeds prevent mould																				
Strongly agreed	20	(33.3)	10	(16.7)	6	(10)	10	(16.7)	20	(33.3)	12	(20)	10	(16.7)	11	(18.3)	20	(33.3)	22	(36.7)

Agreed	8 (13.3)	0 (0)	48 (80)	40 (66.7)	32 (53.3)	12 (20)	9 (15)	8 (13.3)	10 (16.7)	15 (25)
Disagreed	12 (20)	0 (0)	0 (0)	5 (8.3)	8 (13.4)	25 (41.7)	21 (35)	20 (33.3)	10 (16.7)	20 (33.3)
I don't know	10 (16.7)	50 (83.3)	6 (10)	5 (8.3)	0 (0)	11 (18.3)	20 (33.3)	21 (35)	30 (50)	3 (5)

Sampling size for each Local Govt is 60, values in brackets are percentages

4.0 Conclusion

The over view appraisal of local production of dairy products in the state under study revealed that the sectors are still undeveloped. Majority of the nomads did not attend Western Education and low literacy level, make it difficult for them to fully appreciate the need to adopt improved milk processing and handling techniques. Hence the Government should ensure continued success of the Nomadic Education Policy. The findings of this study reveal that standard feed concentrate were not given to the cows. And whatever the cow feed on directly reflect in the quality of milk produced. In order to improve the quality of milk products the nomads should be encouraged with credit facilities in order to acquire commercial feed concentrate. Notably the milk producers mostly make use of well and river which could be a source of contamination as well resulting into milk borne diseases and public health implications. More boreholes should be sunk by the Government in the rural areas. Also cow milk products marketers were found to lack relevant technologies to store and process their products hence the respondent either resold or eat up the their unsold milk products reducing profit made by the producers. This also imposed limitations to the viability of the milk produced. The use of bottle in packaging these products in some of the local Government Areas could be welcomed and improved upon. Finally, Nigeria has the potential of being a major milk producer in Africa. It has been suggested that if improved methods of storing, processing, packaging, and transporting are employed, output can be raised substantially for internal use, as well as for export.

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