ISSN 0189-0514
J. Anim. Prod. Res. (2018) 30(1):01-11

National Animal Production Research Institute
Ahmadu Bello University
P.M.B 1096, Shika-Zaria,
Kaduna State, Nigeria.
Email:japr@napri.gov.ng Url:journals.napri.gov.ng

REVIEWING THE ISSUES ABOUT CATTLE HIDES CONSUMPTION IN NIGERIA: AN ADVOCACY AGAINST EATING POMO

***Udoh, U. H., Inyang, U. A. and Akpan, P. J.**
Department of Animal Science, University of Uyo, Nigeria
**Corresponding author's email: utibudy4good@yahoo.com*

ABSTRACT

The recent trend in the country; the rising consumption of "pomo" (cattle or goat hides) means a slow death to the Nigerian leather industry. Every day, concerns are being raised as to whether one should eat "pomo" or not. These concerns range from the safety of "pomo" consumption, its nutritional benefits and effects on the leather industry. These concerns are envisaged mostly by the leather producers of the country who decry the deplorable state of the industry due to argument that when you eat "pomo" you eat your shoes. This review brings to limelight reasons people consume "pomo"; the various concerns surrounding its consumption and ways of mitigating these concerns.

Keywords: hides ,pomo, leather, cattle, tanning, Nigeria

INTRODUCTION

"Takalamin Kano, naman Lagos" is a popular saying by the Hausas in the Northern part of Nigeria and translates to "a shoe in Kano is meat in Lagos". This statement is a clear indication of the competition that exists between the consumers of food grade cattle hides and the leather industry for cattle hides. This competition is fierce in Nigeria as a lot of people across different societal class levels have successfully incorporated food grade cattle hides into their daily food recipe (Kalu *et al.*, 2014). This is evident in the common practice of serving 'pomo' as a delicacy in social gatherings especially in the southern part of Nigeria (Funke, 2013).

In the northern part of the country, cattle hides is mostly processed into leather for use in the production of shoes and various clothing accessories like bags, clothes, and purse (Umar *et al.*, 2015; $GEMS_1$, 2012a; and Chemonics, 2002). The processing of cattle hides into leather is done in both industrial and traditional ways with different levels of technicality (Umar *et al.*, 2015; Kalu *et al.*, 2014; $GEMS_1$, 2012a; and Chemonics, 2002). Whether processed into leather or food, cattle hides is a product of cattle and its availability is largely influenced by the livestock industry (Mohammad *et al.*, 2002).

Objectives of this Study

The objectives of this study are to:

1. Review the various uses of cattle hides.
2. Investigate the prevalent issues surrounding cattle hides consumption in Nigeria.
3. Consider possible remedies to the issues.

LITERATURE REVIEW

The Nigerian livestock industry

The Nigerian livestock industry is composed mainly of cattle, sheep, goats, pigs, and poultry (Premium Times, 2016; and Chemonics, 2002). The Minister of Agriculture and Rural Development, Mr Audu Ogbeh,, stated at a news conference in Abuja that the livestock sector is predominantly at a subsistence level of production, with over 90% of cattle being

produced in the pastoralist system of production (Premium Times, 2016). He made this comment while giving out the country's livestock census according to the 2011 National Agricultural Sample survey. The census disclosed that the country has an estimate of 19.5 million cattle, 72.5 million goats, 41.3 million sheep, 7.1 million pigs, 28,000 camels, 974,499 donkeys, 145 million chickens, 11.6 million ducks, and 1.2 million turkeys (Premium Times, 2016) (see table 1).

Table 1: Nigerian Livestock Population Statistics

Animal Species	Population (million)
Cattle	19.500
Goat	72.500
Sheep	41.300
Pig	7.100
Camel	0.028
Donkey	0.974
Chicken	145.000
Duck	11.600
Turkey	1.200

Source: Premium Times (2016)

Cattle, sheep and goats are said to be the most consumed of the livestock sector and constitute the traditional sources of hides and skins in the country (Chemonics, 2002). The dominant breeds of cattle , sheep and goats were reported by Uzochukwu (2006) as: "great humpless, small humpless, West African dwarf cattle, short horned red zebu, short horned zebu, Adamawa zebu, and long horned zebu for cattle; Balami, Uda, Yankasa, West African dwarf sheep for sheep; and Red Sokoto, Gahel goat, and dwarf goats for goats".

Hides and Skins

Hides or skin, according to Wikipedia (2016), "is an animal skin treated for human use". Hides and skins are said to be by-products of the meat packing industry and are obtained by stripping off the skin of a slaughtered carcass ($GEMS_1$, 2012a). Hides are thicker and are obtained from bovine animals like cattle and camel while skins are thinner and are derived from ovine and related animals like goats and sheep ($GEMS_1$, 2012a and Chemonics, 2002). "Depending on the health, age, weight and nutritional status of the animal, hides and skins can account for as high as 15% and as low as 7% of the dress out weight of the animal (a typical dressing percentage of a well-managed farm animal is 60 - 65%)" (Chemonics, 2002).

Table 2: Cattle Slaughter Statistics in Nigeria

Year	Cattle Slaughtered
1985	2,106,140
1986	1,415,859
1987	1,160,577
1988	1,041,475
1989	1,404,060
1990	1,471,540
1991	776,246
1992	1,192,642
1993	1,347,964
1994	1,220,670
1995	983,446
2012	7,000,000

Source: Chemonics (2002), $GEMS_1$ (2012a)

Being a by-product of the meat packing industry, hides and skins production depend entirely on consumer demand for meat; and the livestock sector for livestock production (Foraminifera Market Research Report,2016; Chemonics, 2002; Mohammad *et al.*, 2002; and UNIDO, 2002). Annual statistics of the Federal office of statistics, cited by Chemonics (2002) (see table 2) showed a decline in the number of cattle slaughtered annually from 1985-1995. The cattle figures dropped significantly from 2,106,140 in 1985 to 983,446 in 1995. This automatically translates to a great reduction in the number of hides recovered annually within that period. However, $GEMS_1$ (2012a) pecked the annual number of cattle slaughtered at nearly seven million.

Technically, cow refers to mature female cattle. In Nigeria, it is very common to hear people refer to cattle of any sex and age as "cow". Hence, hides from cattle is popularly referred to as "cowskin" (Funke, 2013); its importance in both the food and leather industries cannot be overemphasized.

Uses of Cattle Hides

Cattle hides is widely used across the world in various forms. Its use can be categorised into three *viz*.:

- For food
- For leather production
- For the production of collagen/gelatine

(Umar *et al.*, 2015; $GEMS_1$, 2012a; Mohammad *et al.*, 2002)

Cattle Hides as Food

Cattle hides is widely consumed as food in Nigeria (Umar *et al.*, 2015; $GEMS_1$, 2012a; and Chemonics, 2002). Before consumption, it is processed into an edible form similar to beef which serves as replacement for meat in meals. In Nigeria, cattle hide is mostly consumed in the southern part (with respect to the northern and southern parts of the country) where it is referred to by various names such as 'pomo', ponmo', 'kpomo', 'kanda', and 'raincoat'. Cattle hides is also eaten as food in Ghana, there it is called 'Welle'. In Jamaica, it is used in the preparation of stews and soups (Funke, 2013).

The processing of cattle hides to food (pomo) is very important to ensure its palatability. This is done to get rid of the hairs on the hides and make it tender for chewing (Funke, 2013). This can be achieved in different ways. The two most commonly used methods are: boiling and singeing (burning/roasting) (Kalu *et al.*, 2014; and Akwetey *et al.*, 2013).

In boiling method, the hides is placed inside hot water to ease hair removal, afterwards, the hairs are shaved off the hides using a sharp cutting edge like razor blade or knife. The shaved hides is then boiled for several hours for tenderization (fermentation).

In the singeing method, the hairs on the hide are gotten rid of over an intense flame produced by burning old tyres and/or wood. The burnt hide is then boiled, washed and allowed to soak in water for further tenderization.

The product of the two processing methods described above is an edible hides, "pomo". The differences in the end product derived from the two methods are the colour, and the chemical composition (Funke, 2013 and Atwetey *et al.*, 2013). Funke (2013) noted the difference in colour due to the processing methods employed. She reported that the outcome of the burning method is the brown/burnt coloured "pomo" while that of the boiling method is the white type "pomo". Akwetey *et al.* (2013) reported in the Journal of Animal Science Advances Periodicals of Global Researchers Journals the chemical composition of cattle hides using different processing methods. The report showed that "pomo" processed by fermentation has a higher metal composition than that processed by singeing.

Cattle Hides for Leather

Cattle hidess is a raw material for the leather industry (Umar *et al.*, 2015; Mwinyinkione and

Williams, 2013; $GEMS_1$, 2012a; Chemonics, 2002; and Mohammad *et al.*, 2002). According to Wikipedia, "leather is a durable and flexible material created by tanning animal raw hides and skin, often cattle hides". Umar *et al.* (2015) deciphered the leather value chain into three different processing stages.

The first is the raw material recovery stage. This has to do with the harvesting (recovery) of raw hides from slaughtered carcasses through the process of flaying (skin removal). In this stage, flay damage (holes and knife damages that occurs during skin removal) is incurred when not done carefully ($GEMS_1$, 2012a).

The second stage is leather tanning and finishing. Tanning is the process of treating skins and hides of animals to produce leather, which is a more durable. Tanning converts the protein of raw hide (by changing the protein structure) into a stable material, making the leather soft and pliable for use. Tanning halts the decaying process and transforms the hide into leather. After tanning, the hide is called finished leather and can be used to craft various leather goods.

Types of Tanning

There are basically two types of tanning. They are:

- Chrome tanning (industrial processing); and
- Vegetable tanning (traditional processing).

The chrome tanning is an industrial processing method which involves soaking of the raw hide in metal chromium (chromic acid) solution. Dyeing could also be done simultaneously. This method is cheaper and faster and leathers derived endure heat to a considerable level. The disadvantage of this tanning method is its adverse effect on the environment. The chemicals used for chrome tanning pollute the environment. Also, leathers that are chrome tanned cannot be used by people that are sensitive to chrome tanning chemicals.

Vegetable tanning method is employed mostly by the traditional tanneries. This method uses natural materials and products like bark of trees. Raw animal hides are soaked for a very long time in vegetable liquors. This type of tanning method produces quite thick leather that is environmentally friendly. However, it is time consuming and leathers produced does not stand up to heat and may shrink or crack if overheated. The leathers produced are also not uniform in appearance and are not available in a variety of colours.

The third stage is the production of leather products. After tanning, the cattle hide is called leather and "may be exported as crust or finished leather for which additional cosmetic processes are added. Finished leathers are exported or sold locally for the production of FLGs (Finished Leather Goods *e.g.* footwear, fashion accessories, upholstery, dresses, and other items)" ($GEMS_1$, 2012a).

The Nigerian Leather Industry

Leather production in Nigeria began in the Northern part of the country by the peasant traditional tanning industries (Umar *et al.*, 2015). These industries transform locally available raw hides and skins using traditional tanning methods into leather and subsequently leather materials for local and home consumption till in the year 1949, when John Holt established a tannery with modern tanning technology in Kano state (Umar *et al.*, 2015 and $GEMS_1$, 2012a). Umar *et al*. (2015) also reported Kano, Sokoto, Katsina, Jigawa, Borno, Kaduna, Adamawa, Yobe, and Bauchi as the main centres of hide and skin production in Nigeria. $GEMS_1$ (2012a) ranked Kano as the centre of the Nigerian leather industry.

The Nigerian leather industry, both modern and traditional, processes hides and skins from cattle, sheep and goats, the local sources of their raw materials (Umar *et al.*, 2015). The materials of these local sources are recovered at abattoirs which were reported by $GEMS_1$ (2012a); Chemonics (2002); and Mohammad *et al.* (2002)

as mostly unofficial and local, and sometimes cause difficulty in the efficient harvest of hides and skins. The recovered hides and skins are sent to the tanneries for processing into leather. Three types of materials are produced from the tannery, they are: the wet blue skin (also called chrome tanned: banned as an export good in Nigeria in the year 1999); crust leather; and finished leather. The crust and finished leathers are sold out, sometimes exported to other countries, for further processing into leather and leather products ($GEMS_1$, 2012a and 2012b). Chemonics (2002) reported that "three major products are obtainable from these by products (raw hides/skins): dried or wet salted raw hides/skins, wet blue and tanned leathers". It is reported that most tanneries in Nigeria are located in the northern part of the country with Kano having the highest number of tanneries, however, only a few commercial tanneries are in operation today (Chemonics, 2002).

The finished leathers are used by the Finished Leather Goods (FLGs) production industries as inputs in the production of finished leather products. These industries are situated in Kano, Onitsha, Aba, Lagos Kaduna and Sokoto ($GEMS_1$, 2012a). These industries get their inputs (leather) from the local industrial tanneries, traditional tanneries and also make use of imported leathers which are mostly synthetic (Umar *et al.*, 2015; GEMS, 2012; and Chemonics, 2002). Below is a map of Nigeria showing hides and skins activity areas.

: Map of Nigeria showing Hides and Skins Activity Areas

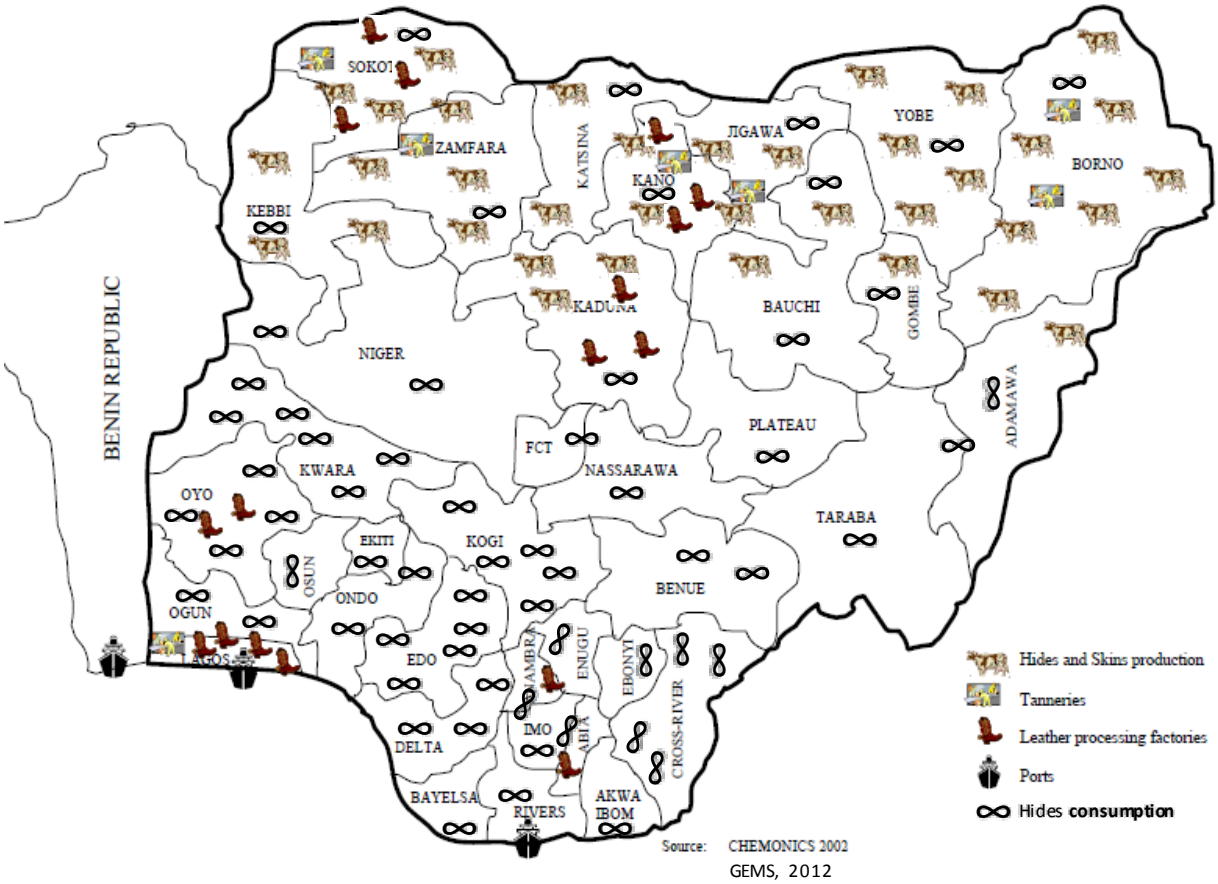


Figure 1: Map of Nigeria showing hides and skins activity areas

Cattle Hides for Collagen/Gelatin Production

Cattle hides is basically made up of collagen (Funke, 2013), "a hard, insoluble and fibrous protein that makes up to one third ($^1/_3$) of the protein in the (human) body (Medical News Today, 2015). The word "collagen" is derived from the Greek word "kolla" meaning "glue" and is commonly found in the skin, connective tissues, and bones (Medical News Today, 2015 and Funke, 2013).

In the pharmaceutical, cosmetics and food companies, collagen is extracted from cattle hide and other animal skins and by-products (bones and connective tissues) for the manufacture of various drugs, cosmetics, food and home products (Medical News Today, 2015 and Funke, 2013). This is due to the many benefits collagen is believed to have.

Importance of Collagen

According to a report by the Medical News Today (2015), collagen has the following benefits to the (human) body: "

a. Collagen gives the skin its strength, structure and elasticity
b. Collagen plays a role in the replacement of dead skin cells
c. Collagen promotes youthful skin, healthier hair and stronger nails"

The report also stated that collagen production declines with age (from 40 years of age and worsen at 60 years) and is reduced by exposure to ultraviolet light hence its wide usage in the pharmaceutical and cosmetic industries. Funke (2013) reported the use of gelatin (a substance derived from collagen) in the pharmaceutical and cosmetic industries. She stated that "… gelatin is used in pharmaceutical companies to make casing for medicine and added to medicine as a gelling agent. It is also added to beauty creams/products in the cosmetic industries".

A report by Sunday Sun mentioned the usefulness of collagen in the food industry, it says "it (cattle hide) is best used as (an) emulsifier in food product development".

Funke (2013) also added that "collagen is……used in various forms in the food industry to make food items such as jelly, gello, gelatin sheets, fruit or wine gums, gummy bears, jelly babies, ice-cream (and) also added in ready-made and other processed food in which it acts as a gelling agent".

Issues about Cattle Hides Consumption

"Pomo" consumption in Nigerian, though prevalent, has a lot of issues/controversies surrounding it. One of these issues is its safety for consumption.

Safety of "Pomo" Consumption to Human Health

A lot of concerns are over the air as regards the safety of "pomo" consumption to human health. Some of these concerns aroused as a result of the way "pomo" is being handled from recovery to processing and also the processing method used. Other health concerns are prompted by the health status of the animals prior to slaughter.

Majority of cattle production and slaughter occur in the Northern parts (see figure 1.0) of Nigeria as these areas have a denser cattle population compared to the southern parts. With the high rate of consumption of hides in the South, most of the recovered hides are transported from the North to areas of consumption (in the South). During this process, the hides are exposed to a lot of contaminants like dust and microbes which could be very fatal to human health if consumed without proper processing. Also, cattle hides that are recovered and processed in the southern abattoirs are so done hurriedly to meet demand. Kalu *et al.* (2014) noted the hastiness at which hides are processed which might make them unfit for consumption. They observed that "due to the health related problems associated with eating red meat, cattle hides' also known as ponmo or kanda, have become a substitute for red meat in Nigeria which in turn have resulted in the increase demand for this product. To meet this demand, abattoir workers

do not take time in processing these hides appropriately". Concerns are also being raised as regards the transfer of diseases and parasites from cattle hide to humans via the food chain. This concern was opined by Dr Isuwa Adamu, Director General, Nigerian Institute of Leather Science and Technology (NILEST), Zaria in an interview with NAN (Nigerian News Agency) cited by The Nigerian Eye (Oct. 8, 2014). He stated that "pomo" is dangerous to human health as some of the hides are harvested from sick animal carcasses with skin disease and sometimes the withdrawal period of chemicals used in treating these diseased animals are not observed before slaughter leaving consumers vulnerable to such chemicals. It is believed that if the withdrawal period of a particular drug is not observed, especially antibiotics, it will exert a residual effect in the body of the consumer of such animal product; as a result, the consumer may develop resistance to such drugs. Another issue relating to human health is that of toxic chemical in "pomo" due to processing. Kalu *et al* (2014) noted that due to the high demand of "pomo", wood are fuelled with substances like tyres, plastics and polystyrene materials to hasten the process of singeing. They discovered that these materials deposit some toxic metals to the hide being processed which then becomes a source of potential health hazard.

Nutritional Value

Arguments are also everywhere as to whether 'pomo' should be consumed due to its nutritional value. Mrs Funmi Oladun-moye, a food technologist at the Federal Institute of industrial Research Oshodi (FIIRO) reported that "pomo" should not be an alternative for meat as it is deficient in essential nutrients needed by the body but should rather be used as a food additive (emulsifier) (Sunday Sun, 2015). A report on the nutritional value of a 40g piece of "pomo" was given at the third Joint Annual Meeting of Animal Science Association of Nigeria and the Nigerian Institute of Animal Science, held at the University of Ibadan in 2014. There, the nutritional value of a 40g piece of "pomo" was reported to be 150g calorie, 4g total fat, and 1g saturated fat (Ahmed, 2015) (see table 3). It was also reported that, although "pomo" contains collagen (a protein), it should not be a replacement for meat as the collagen is not a complete protein (*i.e.* does not contain all the essential amino acids) (Ahmed, 2015).

Table 3: Nutritional Composition of a 40g piece of "Pomo"

Nutrient	Amount
Calorie (kcal)	150
Total fat (mg)	4
Saturated fat (mg)	1
Poly-saturated fat (mg)	0
Mono-saturated fat (mg)	0
Trans fat (mg)	0
Cholesterol (mg)	0
Sodium (mg)	0
Potassium (mg)	0
Total cholesterol (mg)l	0
Dietary fibre (mg)	0
Sugars (mg)	0
Vitamin A (mg)	0
Vitamin C (mg)	0
Calcium (mg)	0
Iron (mg)	0

Source: Ahmed, 2015

"Pomo" consumption in Nigeria is reported to be beyond eating as a source of nutrient, it gives the "common man" the "psychological feeling that his meal is not naked" (Paradigm, 2014).

Scarcity of Raw Materials for the Leather Industry

"Pomo" and leather are derived from the same raw material: cattle hides. The extent of its consumption in Nigeria has gained the recognition of international news agencies like

BBC (British Broadcasting Cooperation) which captioned in its news post of 14th November, 2000: **"Nigeria Eats it's Shoe Leather".** The post claimed that Nigerians prefer sending their recovered hides to the market as "pomo" rather than to the leather industries as raw materials. Dr Samuel Achi, Provost of the Federal College of Chemical and Leather Technology, Zaria, lamented on the effect of "pomo" consumption to the leather industry, he said in an interview with BBC (2000) "these pomo eaters, they have decided to walk on bare feet because they have decided to eat their own shoes in their pots". The speculation surrounding this issue is ascribed to the price offered by "pomo" processors for these hides. $GEMS_1$ (2012a) gave a situation report on the price of cattle hides used for "pomo" processing, it reported that "given the high price that hides fetch in the food market (which can be as much as five times the price paid by tanneries) there is little incentive for producers to sell their hides to the leather industry". Uka *et al*. (2001) reported the estimated consumption of hides and skins by humans to be at least sixty per cent of recovered once. Chemonics (2002) also reported a similar situation regarding hides and skins recovery activities at Jos abattoir, it reported that humans consume 96.29% of recovered hides and 32.26% of recovered skins, with a sum total of 64.13% of recovered hides and skins being consumed (see table 4). Given the above statement, it is obvious that the workers at the abattoirs prefer selling their hides to the "pomo" sellers than to the local tanneries because of the cash returns involved. Cattle hides, it is said, if not consumed but sent to the leather industry for processing has the potential to yield millions of dollars in revenue annually (BBC, 2000).

Table 4: Hides and Skins Recovery at the Jos Abattoir, January 1999 – February 2000

HIDES PRODUCTION			**SKIN PRODUCTION**			**SUMMARY OF PRODUCTION**		
Total no. of hides produced	Hides for human consumption	Hides for processing	Total no. of skins produced	Skins for consumption	Skins for processing	Total no. of hides and skins produced	Hides and skins for consumption	Hides and skins for processing
64,033	61,655 **96.29%**	2,378 **3.71%**	73,764	26,748 **32.26%**	47,016 **63.74%**	137,777	88,354 **64.13%**	49,423 **35.87%**

Source: Chemonics (2002)

Possible Remedies to the Issues

The impeding issues surrounding cattle hide consumption in Nigeria could be mitigated with the following remedies:

- Since "pomo" is believed to be consumed for reasons other than its nutritive value, its consumption should be supplemented with other protein sources like fish and legumes to balance the amino acids required by the body.
- The processes involved in the conversion of raw hides to "pomo", from the recovery to the final processing stages should be done under strict supervision of qualified health personnel to reduce the risk of foodborne diseases.

- Safer methods of processing hides into "pomo" should be developed and adopted to reduce the rate of contamination.
- The livestock industry should improve its livestock production to provide safe and adequate meat at affordable prices to the populace. This will encourage withdrawal from "pomo" eating.
- Research should be carried out to assess the impact of breeds and nutrition on the quality of hides and skins
- More research should focus on provision of adequate and good quality hides from cattle through breeding programmes.
- Programmes amongst pastoral communities to improve livestock feeds and pasture quality should be promoted. Also, awareness on the values and benefits of hides should be campaigned for.
- Activities at the abattoirs should be monitored and inspected and standards created for the swift and efficient recovery of good quality hides after slaughter.
- The leather industry should explore possible alternative sources of raw materials other than animals. It could look into the production of high quality synthetic leather.
- Slaughter facilities should be upgraded to provide quality hides for leather.

Sources: Umar *et al.* (2015); Kalu *et al.* (2014); Funke (2013); Mwinyinkione and Williams, 2013; Abubakar (2012); $GEMS_1$ (2012b); Samuel (2007); Mohammad *et al.* (2002); UNIDO (2002); and Uka *et al.* (2001).

CONCLUSION

Cattle hides utilization is widespread in Nigeria in various forms and products. Its utilization in the pharmaceutical, food, leather and cosmetic industries is indispensable.

Urgent attention should be paid to the concerns surrounding cattle hides consumption by increasing cattle production in the country so that there would be sufficient and affordable hides to meet the various uses.

REFERENCES

Abubakar, S.J. (2012). Export Performance of SMEs in the Nigerian Leather Industry and the Mediating Effect of Perception of Export Difficulty. *International Journal of Academic Research in Business and Social Sciences,* 2:1-14

Ahmed, O. (2015). Questions on Cow Skin's (Ponmo) Nutritional value answered. Foods Nigeria. posted to http://www.foodsng.com

BBC News (14th November, 2000). Nigeria eats its shoe leather. http://www.bbc.co.uk/ retrieved on 12/10/2016

Chemonics International Incorporated (2002). Subsector assessment of the Nigerian hides and skins industry. Prepared for the United States Agency for International Development (USAID)/Nigeria. Pp. 955-3300

Cletos, M., Michael, C., Voster, M., Kennedy, D., Munyaradzi, C.M. and Jan, G.R. (2007). Potential for value-addition of Nguni Cattle products in the communal areas of South Africa: A Review. *African Journal of Agricultural Research*, 2 (10):488-495

Foraminifera Market Research (2016). Trading on raw hides and skins in Nigeria: The opportunity. *http://www.foramfera.com/trading-on-raw-hides-and-skins-in-nigeria-the-opportunity/*

Funke, K. (2013). Cow Skin (Pomo) - To eat or not to eat. Funke Koleosho's food blog. Posted to *http://funke-koleosho.blogspot.com.ng/* retrieved on 12/10/2016

GEMS$_1$ (The Growth and Employment in States) (2012a). Midi-Brief: Transforming the Nigerian leather industry. Pp. 1-8

GEMS$_2$ (2012b). Output Fact Sheet: Finished Leather. Pp. 1-2

Kalu, E., Nwanta, J.A. and Anaga, A.O. (2014). Determination of the presence and concentration of heavy metal in Cattle hides singed in Nsukka abattoir. *Journal of Veterinary Medicine and Animal Health,* 7(1):9-17

Medical News Today (2015). Health Benefits of Collagen. *http://www.medicalnewstoday.com/articles/262881* retrieved on 12/10/2016

Mohammad, A.J., Kiruthu, S., Berhanu G. and Simeon, E. (2002). Essential actions to meet quality requirements of hides, skins and semi-processed leather from Africa. A Report prepared for the common fund for commodities Amsterdam, The Netherlands. Pp. 1-62

Mwinyikione, M. and William, Q. (2013). Review of the challenges towards value addition of the leather sector in Africa. *Global Advanced Research Journal of Management and Business Studies,* 2(11): 518-528

Nii, O.T. and Odiase, S.A. (2002). Impact of the structural adjustment program on the agricultural sector and economy of Nigeria. *Journal of African Finance and Economic Development,* 5(2):1-29

Ojeka, G.O., Effiong, C.E. and Eko, E.O. (2016). Constraints to agricultural development in Nigeria. *International Journal of Development and Economic Sustainability,* 4 (2):19-33

Premium Times (2nd June, 2016) Nigeria releases census of goats, sheep, pigs, and other livestock in country. *http://www.premiumtimesng.com/* retrieved on 12/10/2016

Samuel, K. (2007). Present and future role of Africa in the world leather and derived products industry and trade. prepared for UNIDO at the sixteenth session of the leather and leather products industry panel, Gramado, Brazil. Pp. 1-31

Sugar Daily (3rd June, 2016). Nigeria releases its livestock's census. *http://www.sugardaily.ng/* retrieved on 12/10/2016

The News (13th August, 2014). The news challenges facing Nigeria's leather industry. *http://thenewsnigeria.com.ng/* retrieved on 12/10/2016

The Nigerian Eye (8th October, 2014). Stop eating pomo, it is dangerous to your health. *http://www.nigerianeye.com/2014/10/stop-eating-pomo-it-is-dangerous-to.html*

The Paradigm (13th March, 2014). Proposed pomo ban: consumers, sellers berate FG. *http://www.theparadigm.com* retrieved on 12/10/2016

Uka, E., Enwere, D. and Mike, D. (2001). Technology capability in the Nigerian leather industry: a firm-level case study. *The African Technology Policy Studies Network, Nairobi,* pp. 1-46

Umar, S., Aminu, A. and Suhasini, K. (2015). Leather value chain study in Katsina state, Nigeria: Cost and Return Analysis. *Research Journal of Agriculture and Forestry Sciences,* 3(11):10-20

United Nations Industrial Development Organization (UNIDO) (2002). A Blueprint for the African leather industry: A development, investment and trade guide for the leather industry in Africa. Pp. 1-105

Usman, H. and Nasiru, M. (2005). Commodity chain analysis of cattle marketing in Nigeria: A case study of K.R.I.P area Kano state. A report submitted to ADENI Project/NAERLS Zaria. Pp. 1-5

Uzochukwu, A. (2016). Export constraints of the Kano leather industry: A study of industrial clusters in Nigeria. Pp. 1-19

Wikipedia (2016). Collagen. Retrieved from *https://en.wikipedia.org/wiki/Hide_%28skin%29* on 14/10/2016

Wikipedia (2016). Hide (Skin). *https://en.wikipedia.org/wiki/Hide_%28skin%29* on 14/10/2