

PAPER • OPEN ACCESS

Potential of animal leather as a strategic commodity for the livestock industry: A review

To cite this article: M I Said 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **788** 012116

View the [article online](#) for updates and enhancements.

Potential of animal leather as a strategic commodity for the livestock industry: A review

M I Said

Head of laboratory of technology of animal waste processing and by product, Faculty of Animal Science, Hasanuddin University Jl. Perintis Kemerdekaan KM 10 Makassar 90245, Indonesia

Email: irfan.said@unhas.ac.id

Abstract. Indonesia is one of the countries rich in germplasm in the form of livestock. Livestock products can be in the form of meat, milk and eggs as well as by-products such as leather. Animal leathers are one of the by-products of livestock produced from a livestock slaughtering industry. Animal leathers have the potential as raw material for non-oil and gas export products. Until now, livestock by-product in the form of leather has been processed and utilized by many people in Indonesia. Utilization is carried out in the form of food and non-food products. The use of food and non-food products has been developed commercially by the community, both in the form of small, micro, medium and large scale industries. Animal leathers are one of the livestock by products that have the highest economic value compared to the others. This is because animal leather is one of the export products. Until now, the exported animal leathers are still in the form of non-food products, while some derivatives of leather products in the form of food products are still imported. The potential of livestock leathers as one of the strategic commodities of the livestock industry needs to be maximally developed. Improving the quality of animal leathers needs to be done in an effort to increase the source of foreign exchange.

1. Introduction

Livestock is one of the creatures created by Allah SWT, which is intended to meet human food needs. Therefore, it is proper for us to always be grateful for one of the blessings that have been given to us. The human need for food, especially animal food, continues to increase along with the increase in the human population. As an illustration, from a meat-producing livestock, there is 30–35% of the share that can be obtained as the main product (main product), while the remaining 65–70% is in the form of livestock waste products (by-product) which until now has not been utilized maximally. Of these by-products, as much as 6–15% of them come from the skin of livestock [1–3]. Apart from livestock skins, various other potential by-products that are widely researched and developed are the use of urine and hair waste. This type of by product is quite saving in Indonesia. The use of microorganisms has been widely considered to assist the degradation and fermentation processes of these by-products [4,5].

2. Overview of the industrial sector in Indonesia

The decline in financial liquidity experienced by economic actors in developed countries such as the United States, European Union, Japan and various other Asian countries has resulted in a drop in



demand for various export products from Indonesia in foreign markets. In accordance with the law of supply and demand (supply-demand) and a fall in market demand amid an abundance of supply, it will result in a decline in prices for various products in the market.

As an effort to anticipate this and overcome the negative impacts that may arise from the global financial crisis on the national economic industry, the government has taken various necessary strategic steps. The industrial sector is an economic sector that is very important for the life of the Indonesian economy. This is because the industrial sector is able to provide a sizeable contribution to national economic growth. The industrial sector has played a very large role by supporting the domestic market. This is done to meet the needs of the consumer community in the country. In addition, the industrial sector is also a reliable economic sector. This industrial sector tries to maximize the country's foreign exchange due to import activities. This is done by substituting a portion of the imported products [6].

3. Potential of livestock hides

Small and medium industries are the industry groups that are most resilient in facing the Indonesian economic crisis. During the economic crisis in 1998–2001, it has shown the fact that Micro, Small and Medium Enterprises (MSMEs) in general are more able to survive and grow around 11% per year compared to large-scale industries which are only around 6% per year.

Small industries in general started from home industries on a micro scale which later developed. With a small scale of production, it is expected that the level of flexibility of the company will be better which in the end can survive during a crisis when compared to large industries. The role of the non-oil and gas industry in the national gross domestic product in 2014 was 17.87 percent. Approximately 0.27 percent of which comes from the contribution of the growth of the leather industry, leather goods and footwear. In 2014, investment in the national footwear industry from 394 companies has reached IDR. 11.3 trillion by absorbing 643,000 workers [7]. The leather processing industry is one of the strategic industries that has the potential to be developed in Indonesia. The availability of leather raw materials in Indonesia is quite potential. Every leather processing industry certainly requires sufficient raw material for leather so that the industry can continue to run in a sustainable manner. The potential of leather raw materials as input from a leather processing industry is generally predictable. This is done by counting the number of slaughterhouses in an area. Data showing the comparison of large and small livestock populations and the number of slaughtered livestock in Indonesia are briefly presented in figures 1 and 2.

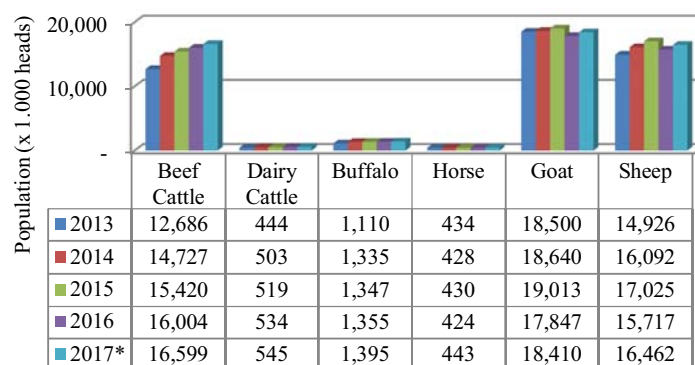


Figure 1. Comparison of large and small livestock populations in Indonesia (2013–2017) [8].

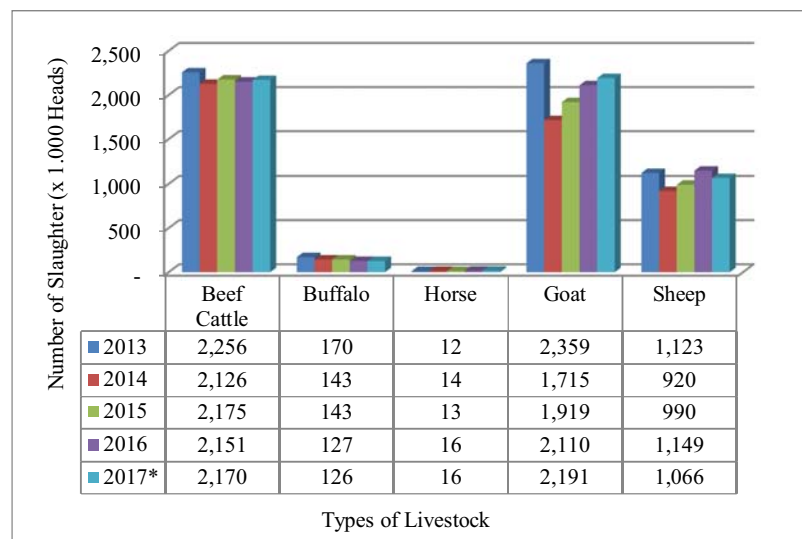


Figure 2. Comparison of slaughter of large and small livestock in Indonesia (2013–2017) [8].

Based on the data (figure 1 and 2), it can be seen that the population of large and small livestock as a source of raw material for leather in Indonesia is still dominated by small livestock such as goats and sheep. Furthermore, among large livestock populations (dairy cattle, buffaloes and horses), beef cattle have the largest population. Based on the data on the average number of slaughterhouses, the number of slaughtered cattle (14.42%) is still higher than other livestock such as buffalo (10.84%), horses (3.29%), goats (11.14%) and sheep (6.54%) [8]. Every slaughtering of livestock (both large and small livestock) will produce by-product (by-product). One of the by-products results is skin. Based on the data (figure 2), it can be seen that in 2017, the number of beef cattle slaughtered reached 2,170,000 heads. In this regard, it can be assumed that there are 2,170,000 pieces of beef cattle available as a source of raw materials. Likewise with buffalo livestock, the potential availability of skins reaches 126,000 pieces, followed by 16,000 pieces of horse skins, 2,191,000 goat skins and 1,066,000 sheep skins.

When calculated as a whole, the potential for raw material for livestock skin can reach 5,569,000 pieces. This data is recorded livestock data. Therefore, the population data will be even greater if it is calculated based on the slaughtered livestock outside the recorded data. The availability of these raw materials is still far from the current industry needs, where the demand for raw leather raw materials for the industry reaches 20 million pieces/year. Based on these data, it means that the difference between demand and supply of leather raw materials is approximately 14.5 million pieces/year. This difference is forced to rely on imported leather raw materials. However, from the magnitude of this difference, only about 1.5 million pieces of imported skins/year can be realized as a result of the quarantine policy [9].

4. Problems of leather industry in Indonesia

The national leather processing industry is one of the potential industries to be developed. This is because the quality of national leather products has been recognized worldwide as a high quality product with a very high demand. However, there are still some fundamental problems in the development of the leather industry in Indonesia, including:

1) The continuity of supply of leather raw materials is still very low, while domestic demand for leather products is very high. This certainly encourages imports of leather raw materials. However, the process of importing leather raw materials encountered obstacles in the quarantine regulations based on Presidential Decree No. 46/1997 dated November 1, 1997 on Leather Raw Material Quarantine.

Due to the very low supply of domestic leather raw materials, it has led to the development of synthetic (imitation) leather production. Synthetic leather is produced from a combination of polymers from petroleum from the Polyvinyl Chloride (PVC) and Polyurethane (PU) groups; 2) The quality of domestic leather raw materials is still low so that it is not in accordance with the expectations of industrial owners. This can cause imported leather raw material to be an option. The low quality of raw materials is caused by high damage, both before the slaughtering process (pre-mortem) and after slaughter (post-mortem). One of the causes of damage to the raw materials of the skin, especially preserved and semi-finished skin, is the attack of microorganisms (bacteria and fungi). The activity of microorganisms causes the skin collagen fibers to become damaged [10]; 3). Quarantine policies related to imports of skin have not gone according to expectations, especially for skin originating from endemic areas of foot and mouth disease (FMD); 4). Waste production has not been managed with a certain standard so it has the potential to damage the environment. Leather processing industrial waste is waste that is not environmentally friendly. This is because most of the production process involves certain chemicals which are classified as B3 waste. Therefore, this process requires special treatment and attention; 5). Limited skilled human resources in the production process and the ability to design a product are still very minimal; 6). The production process of livestock skin derivative products has not been maximally processed.

5. Characteristics of the leather processing industry in Indonesia

The leather processing industry and leather goods, especially garments in Indonesia, actually experienced a triumph between 1986–1996. Exports of leather products (shoes, gloves, and jackets) are growing rapidly which can provide a government contribution of US\$ 2.4 billion [9]. Export data of the leather, leather goods and footwear subsector to the total export of industrial products in the last 5 years presented in table 1.

Table 1. Comparison of the export value of several leather products and leather goods from the total industrial products [9].

Sub Sector	2012	2013	2014	2015	2016	Activities 2016 (%)
1. Sport shoes	2,021,278.0	2,175,230.0	2,229,753.5	2,446,408.0	2,471,077.2	2.25
2. Field Engineering Shoes / Industrial use	866,656.7	911,837.4	1,030,695.6	1,155,642.3	1,214,082.4	1.11
3. Footwear for daily use	632,167.9	767,351.4	842,852.2	901,581.2	950,499.5	0.87
4. Goods made of leather and artificial leather for personal use	209,368.7	225,200.2	232,242.7	237,336.6	277,546.0	0.25
5. Leather	134,991.7	140,995.7	134,216.7	122,722.9	101,287.0	0.09

In existing history, exports of leather and leather products have ranked third in non-oil and gas exports after textile and wood products. The economic crisis that hit Indonesia in 1997, caused almost all industrial sectors to experience a downturn, including the leather and leather products industry [11]. However, in line with the increasing population and the increasing needs and socio-economic structure of the community, the need for leather raw material also increased quite significantly. Leather export activities have gradually increased (table 1).

6. Application of leather products and derivatives

Utilization of livestock skin by-products is not only developed to fulfill non-food needs (fashion), but also to meet food needs. Until now, these activities have been developed by large and small industries in Indonesia. For example, the development of animal hides to produce intermediate products in the form of gelatin/collagen has been developed, both in industrial and research forms. Gelatin is a

hydrocolloid compound obtained from partial hydrolysis of animal protein compounds which have hydrophilic properties. Various physicochemical properties have made gelatin widely applied in various industries such as: the food industry (foam formers, stabilizers, binders and emulsifiers), pharmaceutical and laboratory fields (capsule shells and agar media), cosmetic industry, printing industry, packaging and photography [12,13].

At present, several developed countries (America, Europe and Japan) have been aggressively conducting research related to efforts to find alternative raw materials for gelatin sources [14,15]. This is done for reasons of halalness and safety of the raw materials used. From several scientific journals it has been explained that the source of gelatin raw material, especially those produced in European and American countries, is almost 40–50% of gelatin produced from pork skin and bones. This is reasonable because the raw material for skin and bones from pigs is a waste product/ waste from the slaughterhouse industry which has a very large production but is of no value in the country. In addition, in the past few years, the outbreak of mad cow disease led to the government finally banning the use of raw materials from cattle as a source of gelatin [16–22].

In Indonesia, the use of beef bones and hides as a source of halal gelatin is an effort to find alternative sources of raw material. This effort continues to be developed by many researchers in Indonesia. The use of bovine bone, especially the scapula (os scapula) as a source of gelatin, has been studied in more depth by researchers. Bali cattle hides are a source of raw materials that can be used as a source of gelatin. The use of low quality leather is an attempt to increase the value of a livestock by product. Apart from Bali cattle, goats have also been developed as a source of gelatin. The use of goat skin as a source of gelatin shows quite potential results [23–25]. The search for alternative raw materials through research by exploiting the potential of the region has grown rapidly. Leather by-products obtained from Bali cattle and goats as one of the cattle nufah plasma in Indonesia have a huge potential as a source of gelatin [24,26]. Gelatin extracted from goat skin can be applied as a basic ingredient in making hard capsule shells [27,28].

Another type of food product made from livestock skin is skin crackers. This product is a product that is quite familiar for consumption by the public, especially on the islands of Java and Sumatra (West Sumatra). The skin cracker processing industry as a food diversification product, especially in South Sulawesi, is not yet fully developed. This is because most of the people of South Sulawesi are not familiar with these products [6]. The production of skin crackers in South Sulawesi is only made in semi-finished (dry) form which is then sent to Java to be processed into finished products.

7. Leather goods business potential as a non-oil and gas export commodity

The concept of a processing industry is a strategic industry that should be able to increase the added value and economic value of a product. Leather goods products are one of the products that can be said to have very high economic value. This is because the raw material products obtained naturally from livestock /other animals and generally cannot be synthesized by humans.

The production process also takes a long time (3–4 weeks). For example, one sheet of raw Bali cattle hide (25–30 kg) has a price of around IDR. 300,000–350,000/sheet. With the maximum touch of process technology and an attractive design/model, one piece of leather from Bali cattle with an area of around 28 feet can produce at least 11 pairs of leather shoes (2.5 feet/pair). If the price of one pair of genuine leather shoes has a minimum price of IDR.600,000 (Indonesian standard), then the price of the selling product will reach (11 pairs x IDR.600,000 = IDR.6,600,000). Based on these assumptions, it shows that the value of product sales has jumped in value up to 20 times. The value contained in a leather product can of course be different from one another. This depends on the brand that has been attached to the product and the place where the product is marketed. However, basically the origin of these products still comes from the same livestock.

A question that is quite ironic and at the same time a challenge, why are the prices of leather goods in Indonesia so much cheaper than leather goods abroad? whereas, both come from the same source, which is only a by-product of a livestock. Because of a "prestige", a leather goods will have a very

high "value", which is not only already more expensive than the price of meat from a livestock, it can even be more expensive than the price of the livestock itself [29].

8. Leather industry development strategy in Indonesia

One of the efforts to restore the glory of the strategic industry that has brought Indonesia to become a leather exporting country, of course, requires a number of important steps, including:

1) Quality leather raw materials need to be continuously available to ensure the supply of industrial raw materials. Continuously available raw materials with high quality will produce products with high selling value as well. Leather import procedures need to be regulated so as not to harm the industry; 2) It requires special incentives, policies and regulations from the government related to quarantine procedures, especially for skin originating from certain disease endemic areas. The export and import policy of leather must make regulations so that the supply of raw materials remains continuous so that the industry can continue to produce normally; 3) It needs preventive efforts in treating and utilizing leather processing industrial waste. This is very important because most of the waste generated from a leather processing industry is chemical waste; 4) It is necessary to increase the skills and competencies of employees, craftsmen and designers so that the products produced have high selling value and bargaining power. One of the factors that can reduce the quality of the leather is an incorrect procedure in the process of skinning by the butcher at the slaughterhouse; 5) The production process of products derived from raw materials for livestock skin, especially for food needs, needs to be maximized. This is done to anticipate the production of low quality leather raw materials; 6) Leather products are raw materials for luxury goods that need to be optimized through improved quality and production processes, designs that always follow the latest fashion developments to meet domestic and foreign market demands.

9. Conclusion

In conclusion, I would like to convey some simple thoughts regarding the potential use of livestock waste and by-products. From a livestock, approximately 1/3 of its body is used as a food source in the form of meat, while the remaining 2/3 is non-meat. The economic potential of the non-meat part is what can be maximized if you get a touch of technology. The application of livestock by-product can be used in various industries, both large and small scale industries. Along with the government's efforts to increase the livestock population, of course the potential by-products produced will also increase. Even though cattle skin is only a residual result from a slaughtering process, the "brand" that is carried can exceed the value of a single livestock. The quality of export skins is of course very much influenced by the pattern of raising livestock during their lifetime, quality of feed, management and management of livestock maintenance and handling in slaughterhouses during the process and after slaughter. This of course greatly determines the final quality of the leather raw material.

Acknowledgements

In particular, the authors would like to thank to the Rector of Hasanuddin University who has provided facilities related to the provision of library search facilities.

References

- [1] Said M I 2014 *By Product Ternak, Teknologi dan Aplikasinya* (Bogor: IPB Press)
- [2] Bodirsky B L, Popp A, Lotze-Campen H, Dietrich J P, Rolinski S, Weindl I and Stevanovic M 2014 Reactive nitrogen requirements to feed the world in 2050 and potential to mitigate nitrogen pollution *Nature Communications* **5** 3858
- [3] Soeparno, Rihastuti R A, Indratiningsih and Triatmojo S 2011 *Dasar Teknologi Hasil Ternak* (Yogyakarta: Gadjah Mada University Press)
- [4] Said M I, Asriany A, Sirajuddin S N, Abustam E and Rasyid R 2018 Evaluation of the quality of liquid organic fertilizer from rabbit's urine waste fermented using local microorganisms as decomposers *Iraqi J. Agric. Sci.* **49**(6) 990–1003

- [5] Said M I, Abustam E, Yuliati F N and Mide M Z 2018 Characteristics of feather proteinconcentrates hydrolyzed using *Bacillus subtilis* FNCC 0059 *OnLine J on Biol. Sci.* **18** 138–46
- [6] Said M I 2018 *Histologi dan Ilmu Dasar Pengawetan Kulit Ternak* (Yogyakarta: Penerbit Deepublish)
- [7] Afnan R 2014 *Perbaikan Waktu Pemenuhan Pesanan Melalui Rancang Ulang Tata Letak Fasilitas Lantai Produksi Di UMKM Sepatu Kulit Bandung* (Repository.widyatama.ac.id)
- [8] Ministry of Agriculture 2017 *Livestock and Animal Health Statistics 2017* (Jakarta: Directorate General of Animal Husbandry and Animal Health, Ministry of Agriculture, Republic of Indonesia)
- [9] Ministry of Industry 2016 *Statistic of Industry* (Jakarta: Ministry of Industry)
- [10] Said M I 2000 *Isolasi dan Identifikasi Kapang serta Pengaruhnya terhadap Sifat Fisik dan Struktur Jaringan Kulit Kambing Pickle serta Wet Blue dengan Perlakuan Fungisida selama Penyimpanan* Thesis (Yogyakarta: Program Pascasarjana Universitas Gadjah Mada)
- [11] Untari S, Emiliana, Suliestiyah, Sutyasmi S and Susila J 2007 *Mapping Industri Kreatif Produk Kulit di Pulau Jawa* (Yogyakarta: Badan Penelitian dan Pengembangan Industri Balai Besar Kulit Karet dan Plastik)
- [12] Ramos M, Valdes A, Beltran A and Garrigos M C 2016 Gelatin-based films and coatings for food packaging applications *Coatings.* **6** 41
- [13] Zhang Y, Simpson B K and Dumont M J 2018 Effect of beeswax and carnauba wax addition on properties of gelatin films: a comparative study *Food Bio. Sci.* **26** 88–95
- [14] Lv L C, Huang Q Y, Ding W, Xiao X H, Zhang H Y and Xiong L X 2019 Fish gelatin: the novel potential applications *J. Func. Foods.* **63**
- [15] Ali A M M, Kishimura H and Benjakul S 2018 Physicochemical and molecular properties of gelatin from skin of golden carp (*Probarbus Jullieni*) as influenced by acid pretreatment and prior-ultrasonication *Food Hydrocolloids.* **82** 164–72
- [16] Huang T, Tu Z C, Shangguan X, Wang H, Sha X and Bansal N 2018 Rheological behavior, emulsifying properties and structural characterization of phosphorylated fish gelatin *Food Chem.* **246** 428–36
- [17] Karim A A and Bhat R 2008 Gelatin alternatives for the food industry: recent developments, challenges and prospects *Trends in Food Sci& Tech.* **19** 644–56
- [18] Karim A A and Bhat R 2009 Fish gelatin: properties, challenges, and prospects as an alternative to mammalian gelatins *Food Hydrocolloids.* **23** 563–76
- [19] Bonne K and Verbeke W 2008 Muslim consumer trust in halal meat status and control in Belgium *Meat Science* **79** 113–23
- [20] Hidaka S and Liu S Y 2002 Effect of gelatins on calcium phosphate precipitation: a possible application for distinguishing bovine bone gelatin from porcine skin gelatin *J. Food Composition and Anal.* **16** 477–83
- [21] Nagai T, Suzuki N and Nagashima T 2008 Collagen from common minke whale (*Balaenopteraacutorostrata*) unesu *Food Chem.* **111** 296–301
- [22] Grobber A H, Steele P J, Somerville R A and Taylor D M 2004 Inactivation of the *bovine-spongiform-encephalopathy* (BSE) agent by the acid and alkali processes used in the manufacture of bone gelatin *Biotechnol and App. Biochem* **39** 329–38
- [23] Said M I, Abustam E, Wahab A W, Taba P, Gani A and Wahid A M 2019 Effect of ethanol used in a degreasing process on Bali cattle bones on the physicochemical properties of extracted collagen *Bulg. J. Agric. Sci.* **25** 418–23
- [24] Said M I, Burhan, Tensi and Haerati 2018 Synthesis of collagen from Bali cattle's hide using a combination of acid and alkali on the pre-extracting process *J. Indonesian. Trop. Anim. Agric.* **43** 247–56
- [25] Said M I, Erwanto Y and Abustam E 2016 Properties of edible film produced using combination of collagen extracts of bligon goatskin with glycerol *Amer. J. Anim. Vet. Sci.* **11** 151–9

- [26] Said M I, Triatmojo S, Erwanto Y and Fudholi A 2011 Gelatin properties of goat skin produced by calcium hydroxide as curing material *J. Anim. Sci. and Tech.* **34** 184–9
- [27] Said M I 2011 *Optimasi Proses Produksi Gelatin Kulit Kambing sebagai Bahan Baku Edible Film untuk Bahan Pengemas Obat (Kapsul)* Dissertation (Yogyakarta: Program Studi Ilmu Peternakan Universitas Gadjah Mada)
- [28] Said M I, Triatmojo S, Erwanto Y and Fudholi 2018 Development of prototype of hard capsule shell made from goatskin gelatin using *simplex lattice design* (SLD) as optimization method *Bulletin of Anim. Sci.* **42** 1–7
- [29] Said M I 2020 *Optimalisasi Potensi Kulit Ternak sebagai Sumber Daya Peternakan Menuju Kemandirian Industri Pengolahan Kulit dalam Negeri* Pidato Pengukuhan dan Penerimaan Jabatan Professor dalam Bidang Ilmu Pengolahan Limbah dan Sisa Hasil Ternak (Makassar: Fakultas Peternakan Universitas Hasanuddin Dewan Guru Besar Universitas Hasanuddin)