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INTRODUCTION TO CAMEL ORIGIN, HISTORY, RAISING, CHARACTERISCTICS, AND WOOL, HAIR AND SKIN, A REVIEW

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Abstract:-
In this review, we discussed about camel origin, history, population, characteristics, raising and wool, hair and skin from camel. The camelides belong to order Artiodactyla (even-toed ungulates) and sub-order Tylopoda. The family Camelidae is divided into 3 genera, The old world camels (genus Camelus, one-humped camel, Camelus dromedarius and The Bactrian or two-humped camel, Camelus bactrianus) and the new world camels (genus Lama with the species L. glama, L. guanicoe, L. pacos and genus Vicugna with the species V. vicugna). The Camelini had reached Eurasia via the Bering Isthmus about 5-3 million years ago, whereas Lamini dispersed to South America via Panam's Isthmus about 3 million years ago. Scientists have been reconstructed an evolutionary life tree of the camelidae based on its genome sequences analysis. The camel can tolerate severe condition more than other animals and will continue to produce during severe drought in comparison to others. Breeding, feeding, housing, disease control and care all affect the growth and production of camels. In all the arguments against camel raising, the most important fact has been overlooked by the planners and the owners of the camels. The wool and hair of the old world camels is of lesser quality and value than that of the new-world camels. The Bactrian gives more wool than the dromedary and its wool is also of a higher quality. The wool is used for making padded cloth, quilts and mattresses, the hair used for making rope, clothes, tents, carpets, robes, saddlegirths and blankets.

Keyword: - *Camel, history, drought, raising, wool.*

1. TAXONOMY AND HISTORY

Many people believed the myth that camels originated from a rabbit because a camel has grooved upper lip like of rabbits. The camelides belong to order Artiodactyla (even-toed ungulates), sub-order Tylopoda, that represents with the suborders Suiformes (pig-like), Camelids as ruminating animals classified in proximity to ruminants but are not part of the suborder Ruminantia. differences such as foot anatomy, stomach system and the absence of horns confirm this fact (Schwartz and Dioli, 1992; Fowler, 1998; Werney, 2003). The Tylopoda and Ruminantia groups divided in early revelatory history die to camels have so many differences from ruminant animals. Many researchers indicated that the origin of camels can be traced to the Protylopus were rabbit-sized with four-toed feet and low-crowned teeth animal that occupied the North American continent during the Eo-cene period or 45-50 million years ago (indra et al, 1998). Genealogy of the dromedary camel showed in table 1. (Wilson, 1984).

Table 1. Genealogy of the dromedary camel

Order	*Artiodactyl*a (even-toed ungulates)
Suborder	*Tylopoda* (pad-footed animals)
Family	*Camelidae*
Subfamily	*Camelinae*
Genus	*Camelus*
Species	*Camelus dromedaries*

The family Camelidae is divided into 3 genera: The old world camels (genus Camelus) and the new world camels (genus Lama with the species L. glama, L. guanicoe, L. pacos and genus Vicugna with the species V. Vicugna) (Wilson and Reeder, 2005) (Fig 1). The new-world Camelidae are smaller versions of the camels and live in the heights of the mountains in South America. In the older literatureonly two genera (Camelus and Lama) have been described. Two domesticated species of old world camels exist, the dromedary or one-humped camel (Camelus dromedarius)and The Bactrian or two-humped camel(Camelus bactrianus).The dromedary camel is the most important livestock animal in the semi-arid areas of Northern and Eastern Africa as well as in the Arabian Peninsula and Iran. The one-humped camel was domesticated about 3000 B.C.E. in southern Arabiamainly for its meat and milk (Epstein, 1971). The name of the dromedary derived from the Greek, “dromeus” which means runner or droma-running (Jassim and Naji, 2002). The one-humped camel was probably domesticated in the region of today’s Yemen and Oman about 3.000 to 4.000 years ago (Fowler, 1998). It is a multipurpose animal and used for milk, meat, hides and transport (Burgemeister, 1974).

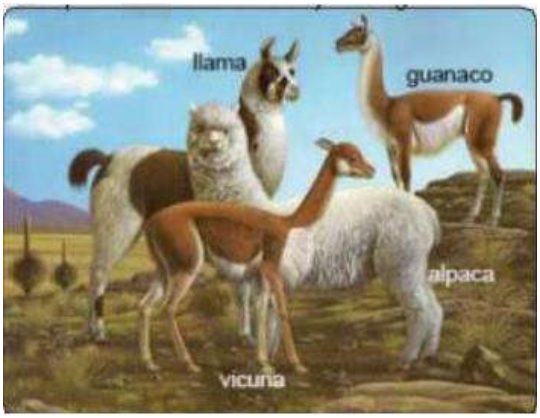

Fig 1. New World Camelids which habitat in South America in there in front of picture is small brown is vicuna, middle one is alpaca, behind of alpaca standing heighier one is llama and the guanaco stands on the stone place.

The Bactrian or two-humped camel (*Camelus bactrianus)* exist in the cold deserts and dry steppes of Asia. The name of Bactrian camel comed from the area of Bactriana in Asia that was the old name of Iran (Bakhtar or Bactar). The two-humped camel, the Bactrian, was domesticated on the border of Iran and Turkmenistan and spread to an area bordered by the Crimea, southern Siberia, Mongolia and China. These animals are stockier than the dromedary and covered by a thicker wool. Also in the desert Gobi there is still a population of wild Bactrian camels classified as *Camelus ferus* (Rao et al., 1970; Fowler, 1998). The wild Arabian camel became extinct (Lensch, 1999).

In 1848, US scientist Joseph Leidy was explored the *Poebrotherium* which is one of ancestor of camels inhabited the open-woodland areas of North Dakota about 37-24 million years ago. They were lightly built and were goat-sized, about 3 feet long. Their head, with a distinctive narrow snout, and long neck looked similar to a modern-day llama. From 24 to 5 million years ago, camels increased in size with lengthening necks and limbs, also developing and efficient pacing gait

for traveling through expanding steppe and grassland habitat of the time. The modern camel's tribes *Camelini* and *Lamini* diverged one another by about 17 million years ago. The *Camelini* had reached Eurasia via the Bering Isthmus about 5-3 million years ago, whereas *Lamini* dispersed to South America via Panam's Isthmus about 3 million years ago (Abdulaziz et al, 2010) *Paracamelus*, the likely ancestor of Camelus, is known from the fossil records of Asia, Europe and Africa about 7.5-6.5 million years ago. In there are some of hypothesis that Camelus originated from African continent related these fossil evidents. But most of fossil records were found from North America. In the Yukon of Canada, rare fossil remains of a giant camels such as proximal phalanx, ankle elements, partial long bones and teeth collected from Plio-Pleistocene (3.5 million years ago) deposits of the Old crow Basin at 67th parallel north which are considered Paracamelus in the North (Rybczynski et al, 2013). But a research team led by the Canadian Museum of Nature has identified the first evidence for an extinct giant camel in Canada's High Arctic in 2010 (Rybczynski et al, 2013). The discovery is based on Ellesmere Island at 97th parallel north or 1200 kilometers away from the Yukon early camel fossil remains place and its represents the most northerly record for early camels. They identified using collagen fingerprinting of the fossil limb bone compared with a database of genus-specific collagen peptide markers from 37 modern mammal species as well as that of a fossil camel found in Yukon. The collagen profile of the High Arctic camel most closely matched those of modern dromedary camels as well as the Yukon giant camel, which is thought to be Paracamelus-ancestor of modern camels. The collagen information, combined the anatomical data they to conclude that the Ellesmere camel and the giant Yukon camel are near relatives and is likely the same lineage as Paracamelus which lived 3.5 million years ago.

The relative size of the Ellesmere camel tibia is in length about 30 per cent larger than that of modern camels. From the size of the tibia, the Ellesmere camel was comparable in body size to other giant camels such as the Asian Paracamelus gigas and the Yukon giant camel. By the palaeo-environmental reconstruction of upper portions of the Ellesmere camel fossil site was determined in the High Arctic at a time when global temperature were 20 to 30 °C warmer than today and the area supported a larch dominated forest habitat. Based on the High Arctic camel fossil record the researchers concluded that camels originated in North America and dispersed to Eurasia via Bering Isthmus a land bridge linking Alaska and Siberia. The Paracamelus lineage were living in the North American Arctic for less than 7 million years ago the populations may have dispersed across the Bering Strait in cold winter via Arctic sea ice (Rybczynski et al, 2013).
Scientists have been reconstructed an evolutionary life tree of the camelidae based on its genome sequences analysis. The complete mitochondrial genome sequence of wild Bactrian camels said that the divergence time for Camelini and Lamini was estimated to be 25 million years. In tribe Camelini, Bactrian camel and dromedary speciation may have begun 8 million years ago, in tribe Lamini, at first appears alpaca 10.4 million years ago, then vicuna speciation have begun 6.4 million years ago and at later time llama and guanaco have diverged 1.4 million years ago. In this study they concluded that the extant wild Bactrian camel and domestic Bactrian camel have separate maternal origins and that the two subspecies diverged some 0.7 million years ago (Burger et al, 2012; Jirimutu et al, 2009; Cui et al, 2007).
Recent results of camel's genetic analyses haven't shown the domestic Bactrian camel originated from extant two humped wild camel. Furthermore, comparative mitochondrial DNA analyses conducted in bone samples of *C.bactrians* from late Bronze and early Iron Age sites of Siberia and modern domestic Bactrian camels as well as wild camels. The comparative DNA analyses showed that are inconsistent with an ancestry of the wild Bactrian camel to both the pre-historic and the modern domestic camels whereas the extant wild two humped camel is not the progenitor of the domestic Bactrian camels.
A Dromedary and Bactrian camels were domesticated in Near East for use as a draft and saddle animals, food source as milk, meat and even may be textile source about 2500-3000 years ago. Although many claim there is a consensus within archaeological circles, in reality, scholars debate exactly when the camel was first domesticated in the Near-East for any purpose. In many Bible sources mentioned camels being used as beasts of burden animals in early 3rd millennium and late of 2nd millennium BC. Some researcher notes that not found any evident of domestication camels up to 1000 years of BC. In 1845, British archaeologists were discovered "The Black Obelisk of Shalmanester III"-black limestone monument in northern Iraq at Kalhu capital of ancient Assyrian. The monument is decorated with domestic Bactrian camels. The obelisk was erected in 825 BC for achievements of King Shalmaneser III (reigned 858-824 BC).This archaeological finding is one of ancient evidences for Bactrian camel domesticated in Near East. Assyrian kings often collected exotic animals as an expression of their power (Kennedy, 2010).
Near East, Arabian regions and Iran empire regions were main localities for domestication of animals and crops. May be the Bactrian camels domesticated in this region after then imported to near areas. Also, in the Syrian cylinder seal dated 1800 BC. Ancient historical findings and remains also document that over 1000 years before century Bactrian camels were reared in western China; in 840s BC Bactrian camels were used by people in Turkmenistan (Indra et al, 1998). Ancient Romans used to call two humped camels as Bactrian camels. Bacteri was a middle Asian country within Macedonia in 4th millennium BC. Hunnu people who lived in the territory of Mongolia used to have feasts by having camel racing. Historic manuscripts reveal that camel caravans used to head China from Hunnu Empire, and also they mention that 700 carriages and 1000 camels were captured (Indra et al, 1998; Luvsan, 1975). Ancient petroglyphs of camels from 2-3 thousand years before century are found in many places in Mongolia, including various drawings of camels such as grazing camels, riding, and leading by people and trotting camels that is shown its was one of motherland of wild and domestic Bactrian camels (Luvsan, 1975; Sanjmyatav, 1995).

2. Camel population in the world

According to FAO (1979) there were approximately 17 million camels in the world of which 12 million were in Africa and 4.9 million in Asia. Approximately 94% of the estimated world's camel population were thought to be one-humped or dromedary camels. The twohumped Bactrian camel comprises 6% and is primarily in Asia. Seventy percent of the

world's camels are located in the tropics, a majority of them in Sub-Sahara Africa. Five adjoining countries-Somalia, Ethiopia, Kenya, Sudan, and Dijibouti-contain 84% of African camels and 60% of the world's camels (Morton, 1980).
In 2001, the total camel population was 19 million of which 17 million were dromedaries (*C. dromedarius*) and 2 million were Bactrian camels (*C. bactrianus*) (Farah, 2004).
According to FAO statistics (Global Livestock Production and Health Atlas - GLIPHA, 2006) the world population of camels is about 20 million animals, 15 million camels live in Africa and 5 million in Asia (GLIPHA, 2006). In most countries, the camel population is increasing after a period of decreasing number due to the introduction of modern ransport facilities (Farah, 2004). The camel population is thought to be increasing slightly in Iran (Glipha, 2006). The population of camels in some countries in Africa and Asia is given in Tables 2 and 3 (GLIPHA, 2006).

Table 2. Development of the dromedary population in some countries in Africa

Africa			Count (n)
	1995	1999	2003
Algeria	126,350	220,000	245,000
Bukina faso	13,300	14,473	15,600
Chad	613,450	715,000	730,000
Djibouti	64,010	67,790	69,000
Egypt	131,000	134,000	120,000
Eritrea	71,000	75,000	75,000
Ethiopia	340,000	527,340	326,500
Kenya	787,700	811,500	830,000
Libya	101,000	42,000	47,000
Mali	292,000	466,900	470,000
Mauritania	1,113,000	1,206,000	1,292,000
Morocco	37,000	36,000	36,000
Niger	380,000	404,000	420,000
Nigeria	14,881	18,000	18,000
Senegal	5,000	4,000	4,000
Somalia	6,100,000	6,925,500	7,000,000
Sudan	2,903,000	3,031,000	3,200,000
Tunisia	231,000	231,000	231,000

Table 3. Development of the dromedary population in some countries in Asia

Asia			Count (n)
	1995	1999	2003
Afghanistan	201.000	290.384	175.000
Bahrein	900	915	92
India	1.030.000	820.000	900.000
Iran	**143.000**	**143.000**	**146.000**
Iraq	5.400	8.500	7.600
Jordan	18.000	18.000	18.000
Kuwait	3.400	3.600	9.000
Lebanon	490	450	440
Oman	94.400	117.000	124.700
Pakistan	1.1000.000	800.000	800.000
Qatar	8.483	50.305	1.000
Saudi Arabia	421.700	255.475	260.000
Syria	6.711	13.330	13.500
Turkey	2.000	1.400	900
UAE	158.264	207.446	250.000
Yemen	231.000	246.000	264.000

3. Camel Characteristics

Camels are well adapted to dehydration for relatively long period in harsh conditions of the desert where water is scarce. The camel's water resilience included following features as heat store in the body during daytime, desaturation of exhaled air in their nose, high economy water metabolism, high tolerances to dehydration, water store in their body parts and huge amount water intake in short time period after dehydration. In 1919, some of camel researchers observed wide range of diurnal body temperature in camels in Algeria and they conclude that the camel was erroneously associated with poor thermo-regulation capacity. About 40 years after Schmidt- Nielson and their team again in Algeria observed an increase in the body temperature of camels during daytime of about two degrees Celsius when watering daily and up to six degrees Celsius when water deprived in the hot summer. Camels realized the huge amounts of fluctuation their body temperature in relation to their heat balance and water economy (Schmidt-Nielsen et al, 1981). The camels can store heat in their body gained from 35-40 degrees hot desert environment and that produced from its metabolism in order to conserving water from expensive evaporation of heat losses due to increase their body temperature up to 41°C during daytime. This heat is then lost passively during the cooling night by conduction, con- vention and radiation at no cost to its body water as result of this process decreased their body temperature up to 34 °C.

Other animals excluded the camels dissipate their additional heat during the hot summer achieved through the water expensive evaporative cooling either from the respiratory tract by panting or through sweating evaporation from skin by sweating. The camel's higher body temperature also tends to decrease heat gain from the warmer environment which reduces the overall heat load on the animal. Moreover, in water deprived camels have increased their body temperature more than normal hydrated camels for example, in normal watering camel can stored 9.5 kilocalorie heat per kg their body weight but in dehydrated camel can be stored 23.6 kilocalorie heat the same body weight. Its meaning the camels are burning inside of their body during hot summer days (Farid and Mohamed, 1989). In medical practise, greatly increase body temperature named a hyperthermia and decreasing body temperature from normal value meaning hypothermia. But the camels have the disorder situations in their normal desert lifestyle.

Early, camel researchers mentioned a camel hasn't any sweat glands because can't sweat in order to thermo-regulation. But last year's study showed that a camel has sweat glands in their all skin areas excluded the lips, external nares and perianal region. A light and electron microscope study was made on the sweat glands of the dromedary camel. The secretory tubule was made up of columnar, cuboidal or sometimes flat epithelium in there was no evidence that the glands was of the classical apocrine type (Tana and Abdalla, 1980). Mongolian camel researcher doctor Luvsan mentioned that in Bactrian camel the hair follicles, sweat and sebaceous glands of skin are not formed during their ontogeny, but total area of camel's hide increases, therefore, number of follicles per unit area of hide decreases (Luvsan, 1986).For example, in young camel (up to 4 years old) has 0.88-2.1 pieces of sweat and sebaceous glands per one millimeter area of hide but in adult camel has 0.68-1.48 pieces of the glands per one millimeter area of skin. In Bactrian camels have little number of sweat glands per one millimeter of skin area than other domestic animals. Although, the camels well adapted in hot desert environment still needs to dissipate some heat in order to maintain their thermo-regulation. The camels have two ways such as panting and sweating. During the heat of vaporization of one gram water at 33°C or 541 calories and by sweating at 580 calories per a gram water in camels ((Farid and Mohamed, 1989). Camels are sweating to thermo-regulation but they can produce three times less amount of sweat than cattle in same condition. Camel's sweat is alkalinity with high in potassium.

The wild camel as well as domesticated Bactrian camel can drink salt water and frequently use salty bush for their foods in Gobi desert regions. The domesticated camels not always drink salty water but sometimes, especially in summer they can use salty, rainy pond water in desert salt marsh that is shown domesticated camels can drink the salty water in their water needs. Another interesting issue is the camel urine has higher concentration than ocean water but the concentration of camel urine less than the desert rat urine ((Abdulaziz et al, 2010)
; Abdu Adem et al, 2013). Some scientists are conducted research on higher concentration of camel urine and the camel kidney is characterized by a long loop of Henle, and well developed medulla of their kidney that helps to reabsorption primary urine water. Recent year's camel genome investigations are unraveling the mysteries of super reabsorption of camel urine from the kidneys and their remarkable salt tolerance. In humans the gene CYP2J controls hypertension (increasing blood pressure disease) that ways suppressing it leads to high blood pressure. In Bactrian camels have 11 copies of CY- P2J and 2 copies of CYP2E genes, more than in cattle (four and one), horses and humans (one and one). These two genes can help to transform arachidonic acid into 19(S)-HETE which have been demonstrated to be a potent vasodilator of renal preglomerular vessels that stimulate water reabsorption. The camels produce more 19(S)-HETE potentially useful for survival in the desert. In addition, the activity of CYP2J gene is regulated by high-salt diet and its suppression can lead to high blood pressure. Camels are known to be able take in a large amount of salt apparently without developing hypertension because they have 11 copies of CYP2J genes (Jirimutu et al, 2012). According to research reports the basal plasma glucose levels in domestic ruminants (2.5-3.5 mmol/l) are lower than in monogastric animals (3.5- 5.0 mmol/l) but not in camels. Basal plasma glucose levels in dromedary camel 6-8 mmol/l, in Bactrian camel 4.9-5.2 mmol/l are significantly higher than monogastrics(6-9-37-41-60). The physiological experiments had shown that the level of blood glucose in camels may be caused by their strong capacity for insulin resistance. The Bactrian camel genome analysis shows that a large number of rapidly evolving genes in camels are involved in type II diabetes mellitus and the insulin signaling pathways. The two critical genes such as PI3K and AKT involved in this process have undergone rapid divergence in camels, which may change their responsiveness to insulin. The Silk Road is a historical network of interlinking trade routes across the Afro-Eurasian landmass that connected East, South, and Western Asia with the Mediterranean and European world, as well as parts of North and East Africa. The Silk Road gets its name from the lucrative Chinese silk trade but though silk was certainly the major trade item from China, many other goods were traded, and various technologies, religions and philosophies, as well as also traveled along the Silk Routes. These roads were largely traveled by one method: camel caravan. Camel caravans were groups of people and camels who traveled in convoys over long distances. Camels were well-suited to the task, which adapted hot and cold deserts. Mongolian Bactrian camel has a capacity to lift 160-240 kg on its back, 300-400 kg on carriage, and they can travel with this amounts of luggage 30-35 km per day that means with 4-5 km/ hour in speed (Aurzana, 1954).

Camel racing competitions are very popular in Arabian Countries because there enhance racing camel breeds. In dromedary camel has in average 40 km/hour speed but Bactrian camel racing speed has 27.2km/hour (Biichee, 1998). Camels with thin body builds, short body, long legs and light bone tend to be faster. Hence, from the above statements it is abvious that the camel use for various purposes in different countries.

4. Raising and Feeding

Animal husbandry covers a variety of subjects which have direct or indirect impact on the final product. Breeding, feeding, housing, disease control and care all affect the growth and production of animals. Husbandry has been based on superstition and practices handed down by father to son over the ages. Customs regarding the ownership of camels; who

is allowed to graze them; and even watering have been ingrained in the culture of the various nomadic people (Gast, et al., 1969; Hartley, 1979; Mares, 1954).
Camels are mated for the first time at the age of 3 - 4 years. (Rao et al., 1970; Farah, 2004). The sexual cycle of dromedary camels begins at 24 months (Puschmann, 1989), camels are seasonal polyoestrous animals and the ovulation of the female dromedary is induced by copulation or the presence of a male (Wilson, 1984). The mean gestation period is between 315 - 360 days (Puschmann, 1989) up to 370 -375 days (Rao et al., 1970; Fazil and Hofman, 1981; Arthur, 1992). Knoess et al (1986), working with camels under intensive management, concluded that calving intervals of 18 mo are possible.

There are different breeds used for different purposes like riding, burden, meat or milk production (Burgemeister, 1974). Dromedary camels are bred on a large scale in most countries of the Arabian Peninsula as camel racing has a high socio-economic importance in the Arabian even African countries where a new industry developed. For example approximately 200.000 racing camels are existing in the UAE. An average racing camel can participate in races until the age of 6 years and more (Snow, 1992; Haydn-Evans and Werney, 1995). The Bactrian camel is also used for providing milk, meat, hides and wool as well as being a mean of transport (Chapman, 1985). Camels are disease-tolerant, droughttolerant, easily domesticated, and efficient converters of feed and water to meat and milk. Therefore, the use of the dromedary camel as a source of food and revenue should permit the pastoralist and rancher in arid areas to reduce their total dependence on higher risk livestock enterprises.

The one-humped Bedouin camel, either alone or together with sheep and goat husbandry, offers one possibility to combat malnutrition in perennial drought areas. The members of the Camelidae are to be found in various areas of the world. The value of the smaller members of the family and the two-humped Bactrian camel is to be found in wool, hides and transport. Milk does not play a significant role in the economic importance of these animals. Nevertheless, the Bactrian camel is of importance in parts of Russia, where they are kept fairly intensively and are even machine milked (Kuchabaev, et al., 1972). The Arabian camel was domesticated because of its potential value as a source of milk (Epstein, 1971). What makes the camel so special in the deserts and semi-deserts is its ability to survive the severe drought conditions by many, and varied, physiological mechanisms. Although other ruminants have large quantities of water in their digestive tracts, as is needed for normal digestive processes, their water turnover is far greater than that of the camel (Macfarlane, 1964; Macfarlane and Howard, 1970). This low water turnover enables the camel to graze relatively far from water sources and to replenish losses in a very short time (Yagil, et al., 1974). Although water is an essential part of an animal's diet, the camel can survive long periods without drinking, and then replenish the loss in a very short time (Schmidt-Nielsen, 1964; Yagil, et al., 1974). Nevertheless, water needs are dictated nor only by the climate, but also by feed (Gautier-Pilters, 1979). Whereas lambs and calves must have drinking water, even during the period before weaning (Stephenson, et al., 1980), the young camels can subsist on their mothers milk alone (Yagil and Etzion, 1980a, b). Therefore, water resources when limited, can be utilized far better by camels than by other animals. In hot and dry areas buildings do not have to be necessarilly solid brick, but should have suitable roofing, enclosed by a solid fence to prevent animals being stolen or breaking out a water and feed trough and an area for milking, examination and treatment.

The mechanisms that enable the camel to go long periods without water are those which allow for a low rate of water loss and a high tolerance to dehydration (Gauthier-Pilters, 1979). Even though body weight losses of 40 percent can be found, camels only stop eating after more than a third of the body weight is lost. The rapid replenishment of losses (Yagil, et al., 1974) and the fact that the camels do not muddy water supplies mean a far more efficient utilization of water (Dahl and Hjort, 1979). The same mechanisms allow the dehydrated, lactating camel to produce diluted milk (Yagil and Etzion, 1980). However, water supplies must be readily available as a herd of camels will drink large amounts in a very short time, so that slowly drawing buckets of water from a well will not suffice.
There is a direct relationship between the cultural habits of man and camel holding (Mares, 1954). The nomadic life is a consequence of the need to search for grazing. With the decline in this way of life the social structure of the nomadic community is changing. In traditional camel raising the entire community is together during the cool season, but much time is spent with the camels in aiding mating and calving (Dahl and Hjort, 1979). This is the time when meat and milk are plentiful and access to water and pastures for the animals is easy. During the hot season the families disperse according to their tasks with the various groups of camels. Almost every able-bodied person, from seven years old to the aged, is needed in the search for pasture (Torry, 1973). The pastoral societies thus feel deprived of society's benefits and experience a much lower standard of living (Squires, 1978).
The maintenance of the fragile ecological balance in the desert requires extreme mobility and endurance of the men and the herds". These words of Hilde Gauthier Pilters (1979) sum up the difficulties of camel raising under present conditions. The search for food, the attractions offered by encroaching urbanization, and a more sedentary life are causing people to abandon camel holding and turn to easier ways of living (Cole, 1975) that is, until times of drought, when the so-called easier living and rapid turnover of crops and other food animals, die leaving thousands starving. In 1973, during the worst drought for over fifty years, camels suffered the least. An FAO census (1977) taken in Niger, showed a 100 percent loss for cattle, 50 percent loss for sheep and goats and only 20 percent loss for camels.
In all the arguments against camel raising, the most important fact has been overlooked by the planners, and even by the owners of the camels themselves, in times of severe drought the camel can be the only animal that will digest the remaining flora, and on it can produce milk and meat for human nutrition (Sweet, 1965). There is much truth in the quotation from the Koran that "the camel was given to man as a gift from God".

In severe drought sheep, cattle and goats die, while the camel remains relatively unaffected (Seaman, Holt and Rivers, 1978). It often is the only provider of food (Sweet, 1965). The inability to recognize the value of this animal to date is due to a number of factors. The notion that camel raising is a primitive occupation and not socially acceptable is the main reason for the decline in camel raising (Knoess, 1979). Quick-return crops or grazing, quickreproducing sheep and goats appears to be a better value than maintaining camels for long periods (Dahl and Hjort, 1976). Grazing land is becoming scarce and is of poor quality for efficient production (personal communication). Camel raising is on the decline because it is considered a high-risk proposition (Dahl and Hjort, 1979) as well as uneconomical. In addition, the importance of the camel as a riding animal or a beast of burden is declining from year to year, as nomads turn to mechanized transport. Three alternatives for housing and feeding camels can therefore be considered: (1) The ageold method of wandering great distances looking for feed. But the camels' way of feeding is entirely different from that of sheep and goats, which graze intensively, and cattle, which move slowly and demand large amounts of fluid. Camels never overgraze (Gauthier-Pilters, 1979); they are constantly on the move and take only small portions of each plant. In contrast, sheep and goats graze down to the roots, and goats often climb into trees to obtain feed. In the summer of 1973 in the interior part of middle Mauritania not a single blade of grass was left because of the grazing sheep and goats. (Gauthier-Pilters, 1979). Even in extremely poor vegetation areas the camels did not consume all the feed. Mixed ranching or breeding in the traditional camel areas is virtually impossible because the vegetation is not only dispersed and irregular, but is often unpalatable to other animals. These areas are not suitable for agriculture.

Wandering with camels can be made more profitable by introducing plants into the grazing areas. This can be done by keeping sheep or goats with the camels in order to increase production. The camel, however, shows preference for some plants. In western Sahara in a pasture of forty plants the camel's diet consisted of Diplotaxis pitardiana (Gauthier-Pilters, 1979) forming one third of total feed intake. In western Erg, Cornulaca monocantha made up 65 percent of feed intake, although seven other fodder plants were available. One of the plants readily eaten by the camel is Anabasis arterioidea, which is a hardy, dry plant that supposedly wears down the teeth. Another plant that is preferred in Aristida purgens. This plant is a hardy grower, but dries up quickly in the spring. It covers vast dune areas in Mauritania and western Algeria. For up to five months of the year it is the only fodder available. The dry stalks, leaves and flowers are all nutritious and more succulent pastures are ignored in favor of these plants. Aristida plumosa and Panicum turgidum are also favourites of the camel. Even spiny plants are liked and do not hamper the camel from eating them. When introducing plants into the camel's grazing areas, vegetation which is drought resistant and requires minimal water must be chosen. When referring to the radius of grazing for various animals (Schmidt-Nielsen, 1965, it appears that the camels has, by far, the greatest grazing radius. This can also be used in planning a better exploitation of the water resources and introduction of plants.

In the meantime, the camel will continue to produce during severe drought. This will make a high-risk economical venture a venture of survival. The four conditions that must be met before pastoral industry in least developed area can be undertaken, are (Squires, 1976):

1- Availability of free land, producing suitable forage
2- Demand for animal products
3- Low labour requirement
4- Suitable animals for breeding and herd improvement

The limited availability of free land is slowly becoming a pressing problem with increasing urbanization. Nevertheless, there are still enough arid and semi-arid areas which are fairly barren, but can be readily grazed by camels. They are often the only animals that can survive in those areas. But the land is not sufficient, and there must be suitable forage (Squires, 1976; 1978, 1979). Here the introduction of hardy forage plants will greatly increase the grazing capabilities, which not only will increase the production of the animals, but will allow more animals to graze intensively in a defined area which will alleviate the squabbles between home-steaders and nomads. It is also possible to go over, partially or wholly, to stall keeping. Forage can be grown as shrubs (Forti, 1971), as fields that can be harvested, even mechanically (Pasternak, 1981) or close to the encroaching townships using municipal rubbish dumps, (Forti, et al., 1971). The hardy plants are readily eaten by the camel as they are mainly salty plants with a high protein content. Trials on the introduction of various species of Atriplex, Acacia and Cassia have been a great success in semi-arid zones, and the improved grazing land with increased carrying capacity has given good results.

The second condition for pastoral industry, the demand for animal products, needs no further comment. The alleviation of malnutrition is the quest of the coming years. Even today there is a big market for camel meat in various parts of the world, where drought is of limited importance. Exporting meat, of the young males that are not used for breeding, would provide a good income for camel breeders. If relatively bare areas can be covered with fodder not only camels, but sheep and goats can be kept at the same time, which will greatly increase the production of animal protein and provide a fall-back to the slower-producing camels in times of drought. The extremely rapid development of Atriplex, combined with its density and height, present grazing sheep and goats with problems, but camels grazing at the same time open up paths between the bushes. The camels graze at different levels than the sheep or goats thus forming a perfect symbiosis in grazing. Land use can thus be more productive than agriculture based on cultivated crops, as this can lead to soil erosion (Knoess, 1979). The third condition for pastoral industry, a low requirement of labour, is especially applicable in the case of the grazing camel. Herding is not labour intensive, even though during the mating and calving periods more help is

needed. Stall-raising would increase the labour, because of the need to bring food to the animals, but the introduction of mechanization would elevate the level of farming and greatly reduce the labour requirements. Families would not have to be separated, and so the community as a whole would enjoy the benefits of social services, without breaking their link with tradition.
The most important condition for pastoral industry is choosing the breeding stock. This is of vital importance and will probably need a lot of persuasion and education before suitable progress can be achieved. Building up a suitable herd is not an easy matter. It is easier to choose a good male than to choose good females and cull the bad ones.

At the moment the main reason against raising camels is the long periods without production, six years to wait for sexual maturity and then a long calving interval of two years (Dahl and Hjort, 1979), however the calving interval can be shortened to 18 months (Knoess, 1976). With good management this interval could be reduced to a year, or 15 months. If the calves are separated from their mothers within the breeding season, a month or so after birth, the female camel will quickly come on heat. This would then allow for breeding in the same season as calving. Although climate as well as feeding have considerable effects on the fertility of the animals, improved nutrition would increase the health and so the fertility of the animals. The combination of balanced nutrition and education in the selection of both males and females will shorten the period before maturity and improve the birth weight and calving intervals. Disease control will also lessen abortions and perinatal deaths. It is quite clear that the increase in milk and meat production will be determined by all of the above factors. Selection, on its own, will not have a great effect on undernourished animals. Well-fed animals will show no improvement if ill or worm infested. The goal of a healthy, well-fed and high-producing animal can be achieved even in a drought area with good planning, control, education and aid. Increasing camel production will not take place rapidly, nor will it be easy to convinve populations that have not previously owned camels or have left camel raising for easier and “more modern” businesses. Camel raising in feed-lots need not to be left to people who have previously managed camels, but it can be a self-sufficient industry close to an urban centre, utilizing unskilled man-power which is creating a labour problem in the towns. In conclusion no more appropiate words can be used to sum up the situation described in the foregoing than those written by Knoess in 1977: Countries in the arid zones of the world should reconsider the role of the camel and camel breeding, if they are to capaitalize on the unique potential of these animals to produce protein and other animal products at relatively low cost from desert and steppe lands and from farm wastes. There is often little or no cooperation between the animal scientist and the botanist in trying to achieve the common goal of improving fodder that would improve animal husbandry and provide food for people. Modern technology and changing society can aid camel raising as a source of food in those parts of the world where water and fodder are scarce. Hence, camel raising must not be abandoned; it is often the only way to utilize vast desert areas (GauthierPilters, 1979). Although considered a highrisk animal, because of its slow reproduction rate (Dahl and Hjort, 1979), the camel is often the only defence against starvation during the perennial periods of drought.

The method, which has not yet been the subject of research, is raising and breeding the animals in a stall system. The other two methods are cheaper and easier so far as housing is concerned. In the stall system, simple, mobile fencing can be erected that would restrain the animals in the evening (Evans and Powys, 1979). A shaded area is all that is necessary in the enclosed space. This method of holding camels will enable the population to enjoy the benefits of sedentary life such as education and health services, but especially it will allow for greater improvement of the growth and production of camels. Therefore, stallfeeding, introduction of plants, selection of breeding stock and education and training will give the best opportunity for improving the production of camels. The intensive holding of camels will also decrease the risk run in herding of camels escaping in order to return to the area where they were born, even if this occurs years later and hundreds of kilometres away (Denis, 1970). Another benefit of stall holding is that disease prevention and control can easily be carried out and this will also greatly improve productivity. Internal and external diseases cause a high mortality rate among young camels, and are the cause of abortions and reduced milk and meat production (Evans and Powys, 1979; Mustafa, 1978; Richard, 1979). Feed would be better utilized by healthy and parasite-free animals. The diseases or health hazards of camels are Camel pox (Viral diseases), Rinderpest, Foot-and-mouth disease, (Evans and Powys, 1979), Bacterial diseases (Anthrax, salmonellosis, Brucellosis, Corynebacteriosis, Pulmonary-affection-complex, Rickettsiosis) and Parasitic diseases such as Trypanosomiasis, Helminthiasis hydatidosis, Myiasis, Mange and Ticks.
The main actions to prevent these ailments are Systemic treatment against trypanosomiasis, Anthelminthic treatment, Vaccination against pyogenic diseases, Vaccination against camel pox and Vaccination against anthrax.
The main reason for the decline in camel pastoralism - the long period of time needed to build the herd and the slow improvement of the herd can be countered. Either controlled grazing or stall-feeding makes it possible to improve holding, feeding, selection and the control of parasites and diseases. All these factors will increase the value of the camel and reverse the trend of giving up camel herding in favour of growing cash crops or sheep raising. Sheep, goat and even cattle rearing can be undertaken in conjunction with camel raising. This will offer the benefits of quick-growing and rapidly reproducing animals that are very susceptible to drought and relatively slower developing animals that can continue producing food for man even under severe dry conditions.
Camelidae living in the high-altitude regions of Peru, Bolivia and Argentine have wool of excellent quality (Bustinza, 1979). The wool of the vicugna is especially highly prized. This wild species, living in the high Andes, has very short wool, 2 to 3 cm long with an average yield of only 150 gr per animal. The fine internal fibres are brown-yellow, and the coarser external fibers are brick red giving an overall red appearance. The vicugna also has a large hank of fibres growing on the chest which are longer and stronger than the fibres on the rest of the body. These chestfibres are light-yellow to white in colour. The ponchos and shawls made from vicugna wool are highly prized and very costly.

The guanaco is found in the valleys of Patagonia. The body is covered with two types of wool; very fine internal fibres which are light brown, and coarser and longer external fibres which are red-brown in colour. The head is covered with short black hair. The young have an especially fine pelt.
The llama also lives in the heights of the Andes. These animals give about 2 kg of wool per animal per year. The fibre is long and coarse. It has a variety of colours, black, brown and white, often all appearing on one animal. The wool is used for making string bags or sacks, blankets and clothing.
The alpaca is an animal of great economic importance. The wool is an important item of this animal. There are two types of alpacas, the Huacaya and the Suri which are easily differentiated by their wool. The wool fibres of the Huacaya are rough with a well-defined crimp. This wool is very similar to sheep wool and is easy to dye. The wool grows perpendicular to the body and forms compact staples. The wool of the Suri, on the other hand, is completely different and is of coarser quality. The fibres are shiny and smooth and have no crimp formation. The wool is not easily dyed. The wool grows parallel to the body, forming lank, round staples that fall from the body leaving a line down the middle of the back.

Much research has been done concerning the fibres of the various animals. This has been well presented by Bustinza (1979). The fibres are affected by age and sex as well as by nutrition and diseases. The production of wool and hair of adult animals ranges between 1 kg (ElAmin, 1979) and to 5 kg (Keikin, 1976). The wool and hair of the old world camels is of lesser quality and value than that of the new-world camels. The Bactrian gives more wool than the dromedary and its wool is also of a higher quality (Dong Wei, 1979). Wool is shed at the end of winter, and if not gathered, the animal rubs itself against trees and bushes until the wool is discarded. In China about 1 500 tons of wool are collected per year. This wool is used for making padded cloth, quilts and mattresses. In addition to the wool, there is long hair that can also be sheared. This is used for making rope. The hair from the dromedary is used for making clothes, tents, carpets (Cloudley-Thompson, 1969), robes, saddle-girths and blankets (El-Amin, 1979).

The Bactrian camel can produce fibers with fine soft down to survive at Central Asian cold desert condition. Bactrian camels are molting 1-1.5 months of summer from May to July during this time in the camel skin remains long hairs that are framework of a camel wool. Camel fine wool grows from July to December by an average of 2.12cm a month.

Average wool yield of Bactrian camels are 2.6-8.3 kg depending on age and gender. In the whole camel wool occupied 21.6-35.5% of coarse wool and 70% of fine wool. Bactrian camel coarse and fine wool contains relatively different amounts of fine down with 14.4-23.6 microns or cashmere. For example, the coarse wool contains 66.5-84.7% and fine wool contains 86.0-94.4% of fine soft downs (Luvsan,1989). Young and female camel hairs have fine soft down that is similar quality to goat cashmere. According to grading of animal fiber are fibers with 14-20 micron as cashmere, 21-23 with microns as cashgora and fibers with more 23 mi- crons as mohair. Mongolian goat fibers included in fine cashmere grade, now one kg raw cashmere sold at $40-45 in domestic market. But same amount camel wool market price was only $3-4 in domestic fiber market. This bigger price difference related to less development of the camel wool process capacities. In online shops of high design clothing found images of pure camel wool luxury men coat made by Italian producers may you thought that is made by Arabian camel wool but it is not true, these luxury men's coat made by Mongolian Bactrian camel wool. Because, secrets of the luxury products to being in integrated with central Asian camel's cashmere, Italian camel silk producing technologies using mountain's pure water combining Spain's thorny plant's head and Italian style superior design of clothes (Luvsan,1989).

Camel hides are used for making shoes and sandals. The hide of the dromedary is not good quality, and is mainly used for making whips and saddles (El-Amin, 1979). Hide is used to make a gourdlike container for water and milk. The skin of the vicugna is highly prized and can bring in US$ 1 000 per skin (Bustinza, 1979). The guanaco has a skin of good quality and, among other things, is used for making bed covers, coats and mantels. Llama hide is used for making shoes, sandals and bags.

The meat, skins and furs of the new-world camels are thus far more important for man than the milk and haulage ability of the old-world camels. Nevertheless, the food producing characteristics of the desert-living camel, in respect of both milk and meat, are complemented by accompanying yields of wool, hides, skins and bones, which all help to provide man with clothing, shelter and other useful products. When breeding for the ideal milk producer, the meat, as provided by the calves, and the wool can supplement local industry. As with beef, the most economical age for slaughter, and the age of the animal having the best-tasting meat must be determined. This will quickly reverse the misconceptions regarding camel meat which are mainly due to the slaughter of aged animals that have outgrown their usefulness.

5. Conclusion

The price of camels is comparable to that of cows (Evans and Powys, 1979), although scarcity of camels is raising this price. The direct upkeep of camels is far less than cattle, as they subsist on inferior quality fodder. However when conditions are acceptable cattle are preferred because of camels' slower maturing rate. There is no question that in areas where both feed and water are readily available cattle are more profitable, but no comparative study has been done on production of cattle when feed quality or water quantity is low. When drought exists cattle are soon annihilated (Rice, et al., 1957). Sheep and goats are also far more susceptible to drought than camels (FAO, 1977). The holding of camels, in addition to cattle, sheep and goats will, therefore, increase the utilization of plants grown on meager water resources, while in times of drought, when other animals must be slaughtered, the camel will continue to provide milk and meat for man. This will prevent the high rate of human mortality associated with the loss of livestock (Seaman, et al., 1978).

Traditional camel raising has no future. Camel husbandry must be revolutionized, and camel raising must be shown to be not only socially acceptable, but economically viable. Like the old cultural values, the traditional role of the camel is disappearing, so new and improved methods of camel raising must be initiated that will enable man to utilize the natural ability of the camel to produce milk, meat, fiber, hides, skins and energy in areas where other animals cannot produce, or produce only with difficulty. Milk and meat yields can also be increased by better husbandry. Planned breeding programmes, increasing the amount of feed, better utilization of feed and a good health programme are as important as understanding the physiology of reproduction, gastro-enterology and endocrinology.

6. References

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