

Camel in Sudan: future prospects

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Abstract

According to FAO statistics, camel population in Sudan ranks the second in the world after Somalia with 4.5 millions heads. This population is quite important while the camel production appears, at least officially, very low. With a meat production of 49,880 tons and a milk production of 120,000 tons, camel production is far away from the potential. Even if these data did not cover the entire reality, it is obvious that camel production in Sudan is insufficiently valorized. Meat from young camels has been reported to be comparable in taste and texture to beef. In spite of the increase in local camel meat consumption to 63,000 tons in 2009, yet camel meat is common in some parts of the country and milk consumption under *gariss* form is popular in rural areas where camel is generally reared.

Camel diseases are the major constraints of production such as trypanosomiasis and mastitis. The research has to push in that way in order to innovate camel meat and milk sector. The modernization of meat and milk processing could be the motor for the improvement of camel production. Both in terms of research and of development, the identification of the main constraints for the camel sector is the way to propose a fruitful strategy.

Key words: camel population, gariss processing, meat consumption,

Introduction

The camel is one of the main herbivorous reared in the Sahelian countries as Sudan. Its place among the livestock is marginal at the world level (less than 1% of the domestic herbivorous biomass), but in the Sahelian band (from Mauritania to Ethiopia) and especially in Sudan, countries having a large part of arid lands, the place of camel is quite more important. The camel farming is mainly traditional based on the mobility of the herd, the use of natural resources and a low investment in infrastructures, veterinary control and other services. However, the intensification of the camel farming could represent a way for modernizing the camel production at the benefit of the local producers and of the consumers of camel products as it is observed especially in Gulf countries. Sudan is submitted to all African countries to different trends as urbanization, high growth demography and climatic changes. These trends have strong effect on camel farming. The present paper proposes a review on camel population and production in Sudan, the place of this population compared to the neighboring countries and other “camel countries”, and will suggest some ways about the future of this population both in term of production and valorization.

The camel population in Sudan

According to FAO statistics, with a camel population of 4.5 millions heads, Sudan is the second country in the world after Somalia (fig. 1). However nowadays, if we consider the current political situation in this last country, shared into 3 entities (Puntland, Somaliland, Somalia), the camel population in Sudan (18% of the whole population in the world) is probably the most important.

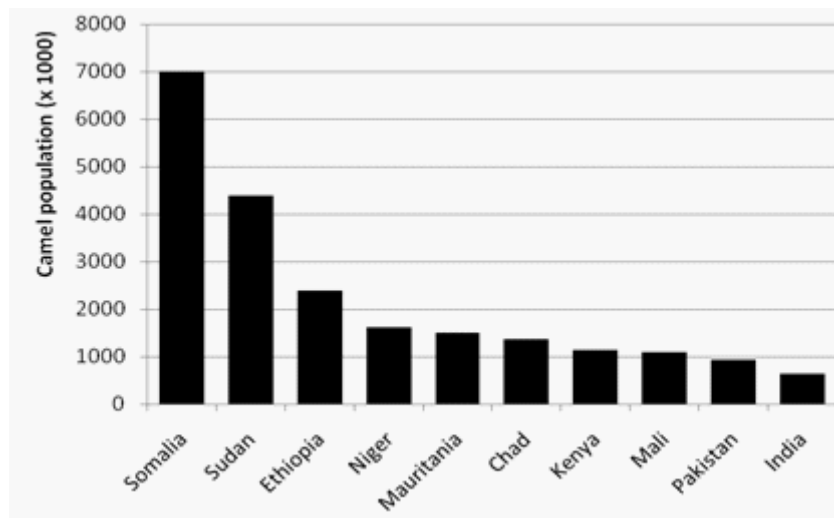


Figure 1: The ten first countries in the world according to their camel population.

Regarding the trend since 1961 (date of the first FAO statistics), the camel population in Sudan is growing regularly with a yearly growth of 2.55%. The camel population growth in Sudan is higher than the world growth (2% per year on average). However this growth was not regular. Three periods were observed: from 1961 to 1978 with medium growth (1.3%), from 1979 to 2000 with a low growth (0.95) and a rapid growth from 2001 (5.14% per year). These differences could be attributed to the impact of drought during the years 80 and 90, but also probably to a better census of the livestock after the year 2000 (figure 2).

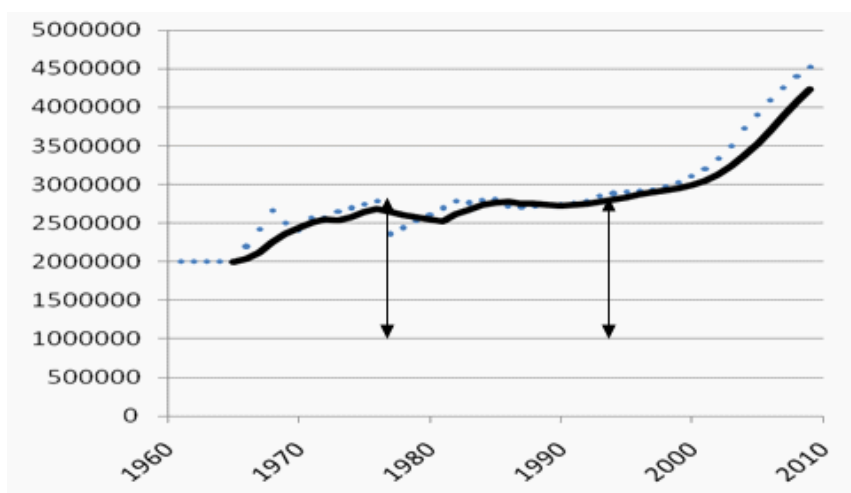


Figure 2: Camel population growth in Sudan from 1961 to 2009 (source FAOstat).

According to the current population trend, a non-linear regression model was used to foresee the future population. The growth model could be summarized as:

$$\text{Camel population} = 3425926055.14 - 3485545.49 * \text{year} + 887.14 * \text{year}^2 \quad \epsilon = 245,000$$

The number of camel in Sudan is expected to be more than 5.4 millions in 2025 according to this model or more than 8 millions heads according to the current growth since the year 2000 (figure 3).

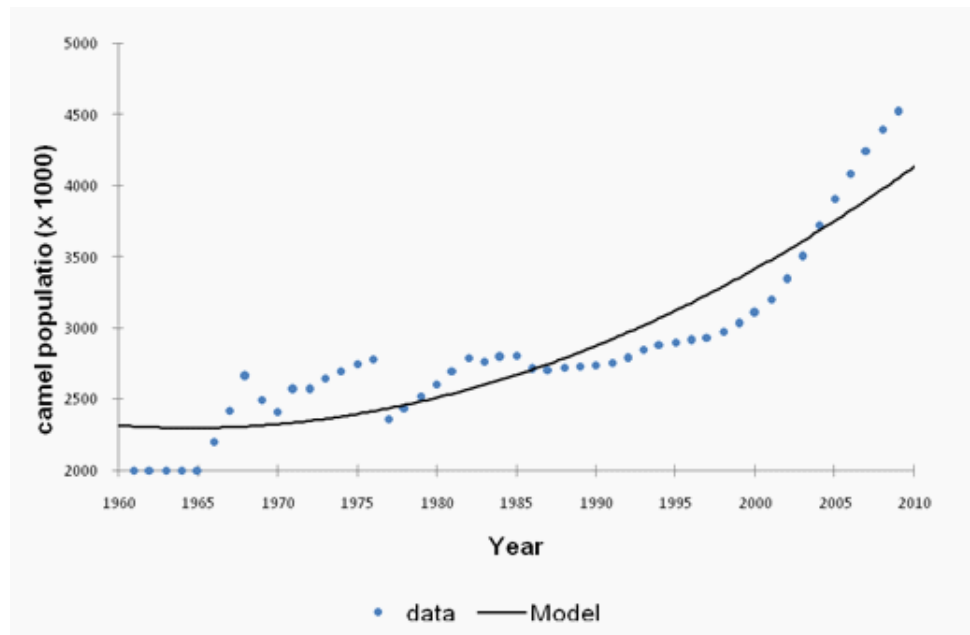


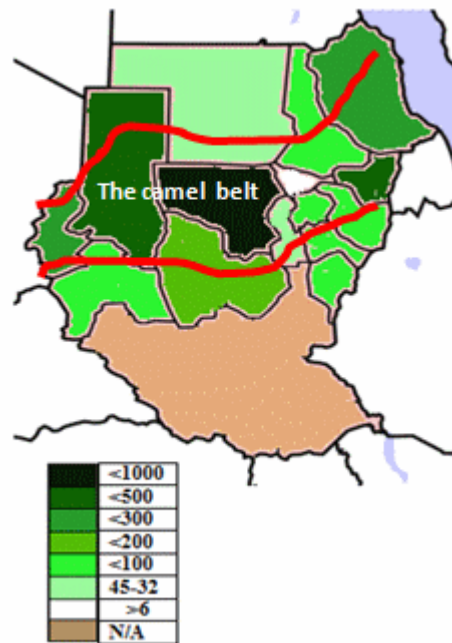
Figure 3: Camel population trend in Sudan since year 1961.

Distribution

It is known that camel is the animal adapted to the arid lands in the old world, in Africa and in Asia. The north of Sudan is widely included in arid areas of African continent and the camel population is concentrated between approximately isohyets 100 and 300 mm (map 1), constituting the “camel belt”. This area includes the states of North and South-Darfur, North and South-Kordofan, Khartoum, Gezira, Kassala, Red Sea, River-Nile, Northern Sudan, White Nile, Blue Nile and Sennar State. North Kordofan state only has the highest camel population with more than one million heads, representing approximately 5% of the whole world camel population. However, this population is moving and a slight expansion of the camel belt to the South is observed since one decennial as in other countries of Sahel region (Faye 2009).

The distribution according to the other herbivorous species is also an important indicator of the place of camel into the livestock economy. In 2008, the camel population represented 10.3% of the total DHB (domestic herbivorous biomass) to be compared to the 4.8% at the world level (for only the countries with native camels). This indicator is however higher than in Sudan in 13 countries where the desert takes a more important place. Indeed, the small

ruminant population in Sudan is also important all over the country and cattle are well present in the south. So, this indicator will increase yet with the separation of Southern Sudan where the camel farming is marginal. Indeed, more than 98% of the camel population will stay in North Sudan while the total herbivorous biomass will decrease significantly.



Map 1. Camel distribution in Sudan according to the states mainly included between the isohyets 100 and 300 mm.

The camel milk production

The milk production is one of the main objectives of the camel producers. The camel milk in Sudan is consumed fresh or fermented (*gariss*) mainly processed under traditional manner. The FAO statistics give 3 types of data: the number of lactating camels, the yearly milk yield per lactating female and consequently the total amount of milk produced. The proportion of lactating animals accordingly is increasing regularly (figure 4) probably linked to the increasing interest for milk both for the producers and the consumers, but with a value between 1 and 1.80%, it is highly under-estimated.

Indeed, different surveys have shown that the proportion of adult female in Sudan is approximately 50 %, i.e. a proportion of lactating camels between 20 and 25%. In the same time, it was not reported change in milk productivity (2500 kg on average) which is lower than the world mean data (2800 kg/ animal). So, the whole milk production is probably higher than the official statistics.

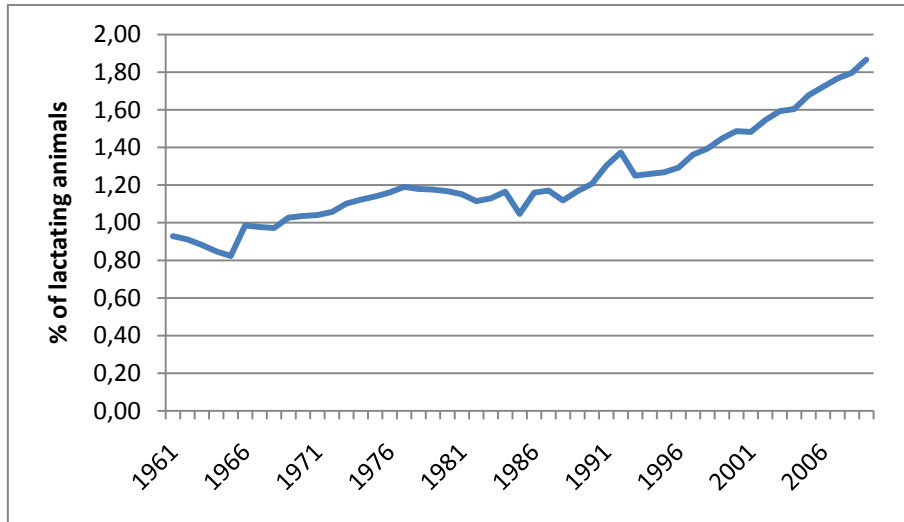


Figure 4: Percentage of lactating camels in Sudan (source: FAOstat)

We can expect to consider that the estimated production is 2-3 times the production according to the official FAO statistics and this production is regularly increasing especially since the year 2000 (figure 5) reaching 1,162,420 tons of milk in 2009 according to FAO but 2,284,913 tons estimated.

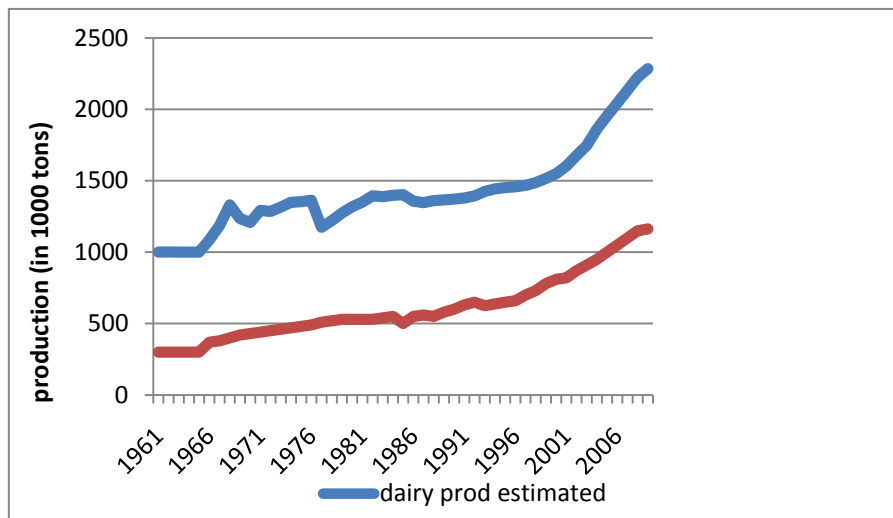


Figure 5: Change in dairy production (1961-2009) according to FAO statistics and estimation on the base of 20% lactating camels in the herd

According to the scientific literature, the milk productivity of camels in Sudan is low: between 820 and 2400 litres/ lactation for 12-18 months lactation (Faye 2004). These observations are not in accordance with the official statistics. It is known that the farming management has a high impact on the expected productivity. With intensive management (better health care, adding concentrates in the diet, vitamin and mineral supplementation), the total milk production per lactation was 2633 litres in semi-intensive system vs 1204 litres only in traditional system (Bakheit et al 2008) i.e. on average 6.9 vs 3.1 liters per day.

Compared to the world camel milk production, the growth in Sudan appeared higher since the year 1996 (figure 6).

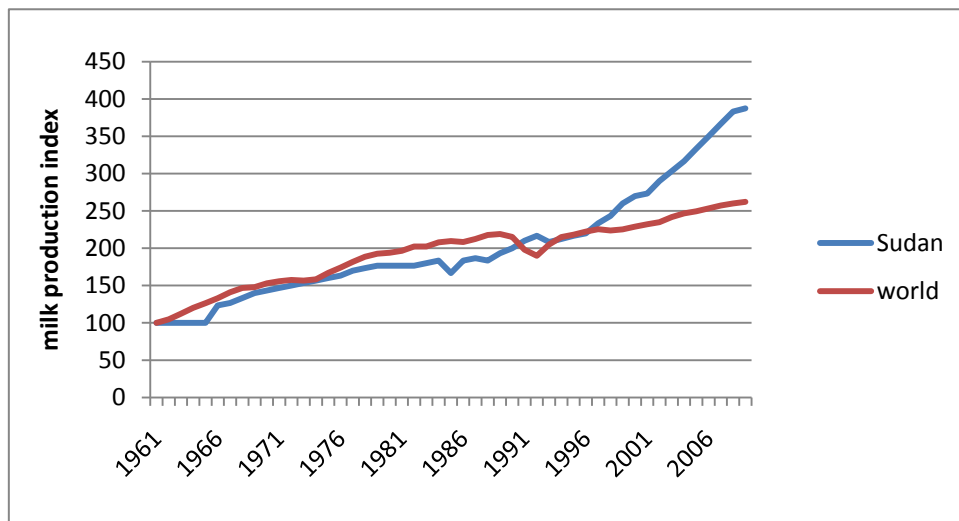
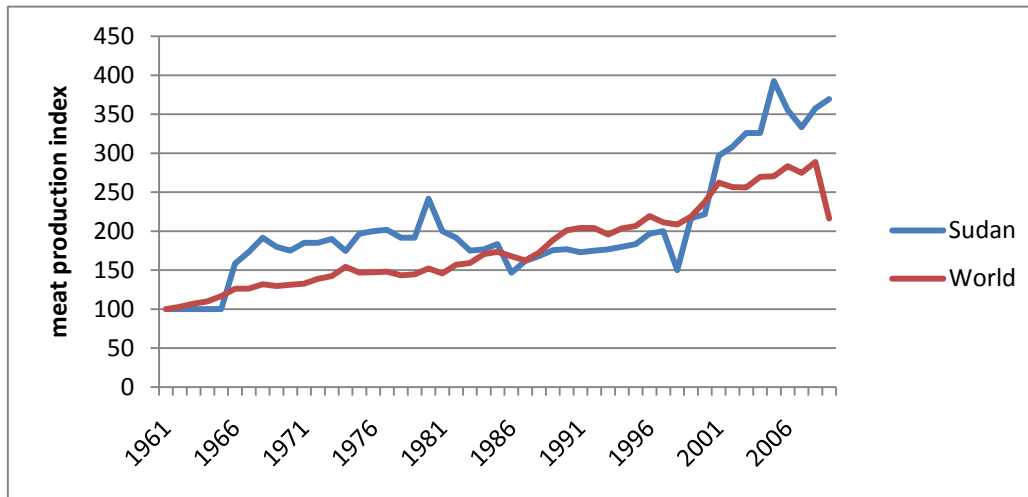


Figure 6: Change in camel milk production in Sudan and in the world (index 100 in 1961)

However this increase is more linked to the higher percentage of lactating camel rather to the improvement of the camel productivity. In general, the camel milk is weakly integrated in market and limited to local ones with a low valorization into cities, contrary to some other Sahelian countries as Mauritania, Niger or even Chad and Kenya. The milk management is mainly assumed under traditional way, with sometimes very debatable techniques for hygiene (like the *surar* technique for discarding the young calf to milking).

Camel meat production

The camel meat production is a traditional speculation of the camel farming systems in Sudan. The slaughtering rate 1961-2009 in this country increased from 3 to 5%. The camel breeds in Sudan have heavy conformation with heavy carcass. However, the mean carcass weight did not change (225 kg) between 1961 and 2009, underlining that the meat productivity did not increase contrary at the world level where the mean carcass weight increased from 183 to 203 kg at the same time. Consequently the increase in camel meat production in Sudan is linked only to the increasing of camel population and of the slaughtering rate. Compared to the world statistics, the meat production growth is more important in Sudan, especially since the years 2000 (figure 7). The production in 2009 (50,000 tons) was four fold the production reported in 1961 (12,000 tons).



However, based on the mean herd composition reported above (50% of breeding female), it is expected to get 25% of pregnant camels every year, i.e., 20% new calves (5% abortion and stillbirth), then after 10% mortality, 18% living calves after weaning including 9% males among them at least 7% could be slaughtered. So the potential of meat production could be higher than the official statistics. In that case, the camel meat production could reach 70,000 tons in 2009.

Contrary to the milk sector, the camel meat production in Sudan is highly integrated into the regional market. Important flows of live camel export are reported to Egypt, Libya and gulf countries. Some camels coming from Chad are also re-exported, notably to Egypt. Officially, the total number of camels exported yearly varied from 80,000 to 150,000 heads but the number change strongly from year to year (table 1). However, most of the camel exportation is depending of informal market and there is an important gap between official and non-official statistics (Alary and Faye 2011).

Table 1: Number of camel exported from Sudan since 2005 (Source: Ministry of Animal resources, Sudan)

Year	2005	2006	2007	2008	2009
Nb of Camel	131156	116184	85862	140757	154477

The slaughtering conditions, the meat processing, the hygiene conditions all along the channel have to be improved in order to modernize the production of camel meat. Fattening feedlot could be implemented also for improving the meat productivity rather to increase the offer by increasing the off take in the herds.

Camel products consumption

In spite of the increasing production, the consumption of camel milk and meat/ habitant did not increase significantly: from 23 to 28 litres/hab/yr for milk and 1 to 1.2 kg/hab/yr for meat between 1961 and 2009 (figure 8). However, these values don't take in account the self-consumption which could be important (especially for milk) in nomad population.

The milk consumption is mainly achieved under fermented form as said above (Dirar 1993). There is a high variability in *gariss* (pure fermented camel milk) or *kashieb* (boiled and skimmed sour milk) preparation: use of different types of spice, duration of fermentation process). Sometimes, dry camel milk is used after acid clotting. The *rob* is also fermented milk used in traditional meals: this product is heated with *okra* powder for preparing porridge. But, there are no new products proposed to urbanized people as yoghurt, pasteurized milk, aromatized milk or even cheese.

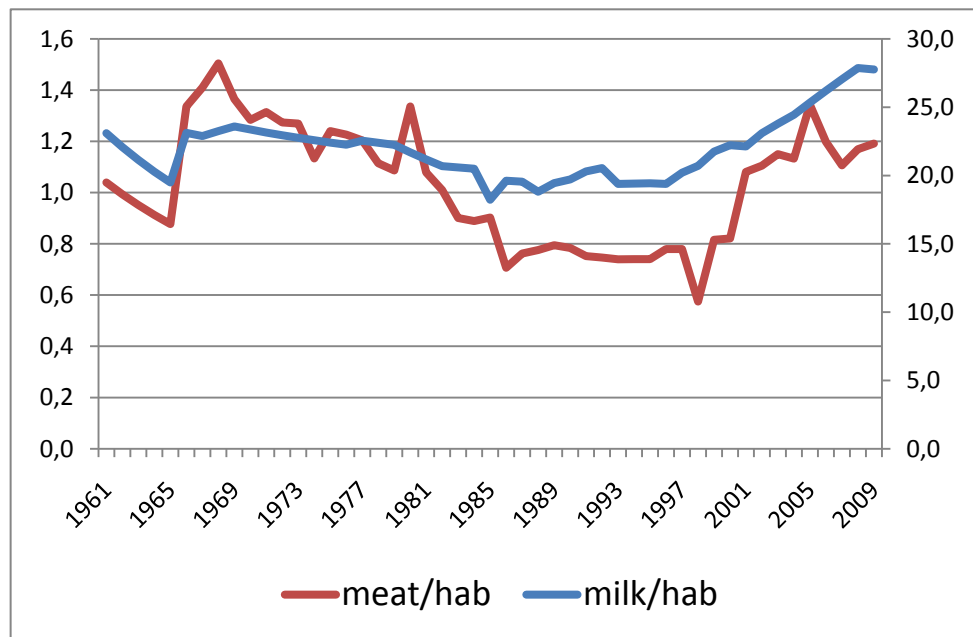


Figure 8: Changes in camel milk and meat consumption *per capita* in Sudan between 1961 and 2009

Accordingly, camel meat is rarely processed and the local consumption is low in spite of the stakes of this meat (low cholesterol, good level of protein, fat under 5%). The development of the camel milk is linked to the development of camel meat and a high correlation between meat and milk production and consumption can be observed.

Other uses

The use of camel for riding and racing is also common in Sudan. The Sudanese breeds are appreciated by the racing lover from Gulf countries. For riding the traditional saddle is placed on the hump contrary to nomads from Niger as Tuareg having a saddle in front of the hump and to Bedouins having a saddle behind the hump. For wedding, a special palanquin is implemented on the camel. The use of camel for agricultural work is also common: for water extraction, sesame oil-press or packing.

The camel diseases

Three main features could be mentioned for camel diseases in Sudan:

- The common camel diseases (surra, mange, GI parasitism, skin diseases) are still widely frequent but could be managed by proper treatment and

prevention, the main aspect being the access to veterinary medicine market with proper molecules.

- The multifactorial diseases (calf diarrhea, respiratory diseases, reproduction diseases, infertility) are not properly studied because yet mainly based on the research of pathogenic agents (Ali et al 2005; Yagoub 2005) and not necessary on risk factors, especially those linked to the farm management that could be achieved through ecopathological survey (Faye et al 1997).
- Recent outbreak with high mortality rate was observed in Sudan and attributed to emerging diseases (like PPR). These new diseases, mainly viral origin have to be controlled with caution and there is a strong necessity to achieve epidemiological surveys and to have clear diagnosis (Khalafalla et al 2010).

The camel research in Sudan

The camel research in Sudan exists for long time and is recognized at international level. This research is mainly achieved in universities and an important part of the work could be consider as academic and insufficiently linked to the camel development. In spite of the existence of some camel research Institute in different states of the country, there is a lack of a National Camel Institute with a national mission. Different strategic plan for camel research and development was proposed in the past, but there is a lack of operational structures to support these plans. However, there is a good level of publications in camel. In spite of the high variability in the quality of the published paper, the total number of scientific publications by Sudanese scientists is quite honorable. During the time 1999-2010, Sudan appears among the high “producers” in publications focused on camel after India, Egypt, Saudi Arabia, Iran and Emirates (figure 9). Among the Sahelian countries, Sudan has the most active camel scientist community. Elsewhere, the scientific production is increasing every year and is quite underestimated as many camel scientists from Sudan are “exported” to other countries as Saudi Arabia, Emirates or Oman. They contribute often strongly to the publications affected to these countries.

Recently, the camel scientists and people working in camel development have created the Sudan Camel Association (SUCA) with the objective to coordinate and encourage camel researchers, to conduct studies and research on different aspects of scientific, cultural and socio-economic points linked to camel development, and finally to contribute to the improvement of camel productivity in Sudan.

The camel research in Sudan includes many fields, but at international level some aspects are mostly considered: camel diseases with a focus on virology, mineral metabolism, biochemistry, reproduction disorders, milk quality. Other topics are emerging or need to be developed, as pasture management by camel herds (face to climatic changes), the knowledge of the local and export commodity channel (for milk and meat), camel meat and milk processing, camel farming systems in Sudan and analysis of the farmers’ practices, emerging diseases, camel genotyping.

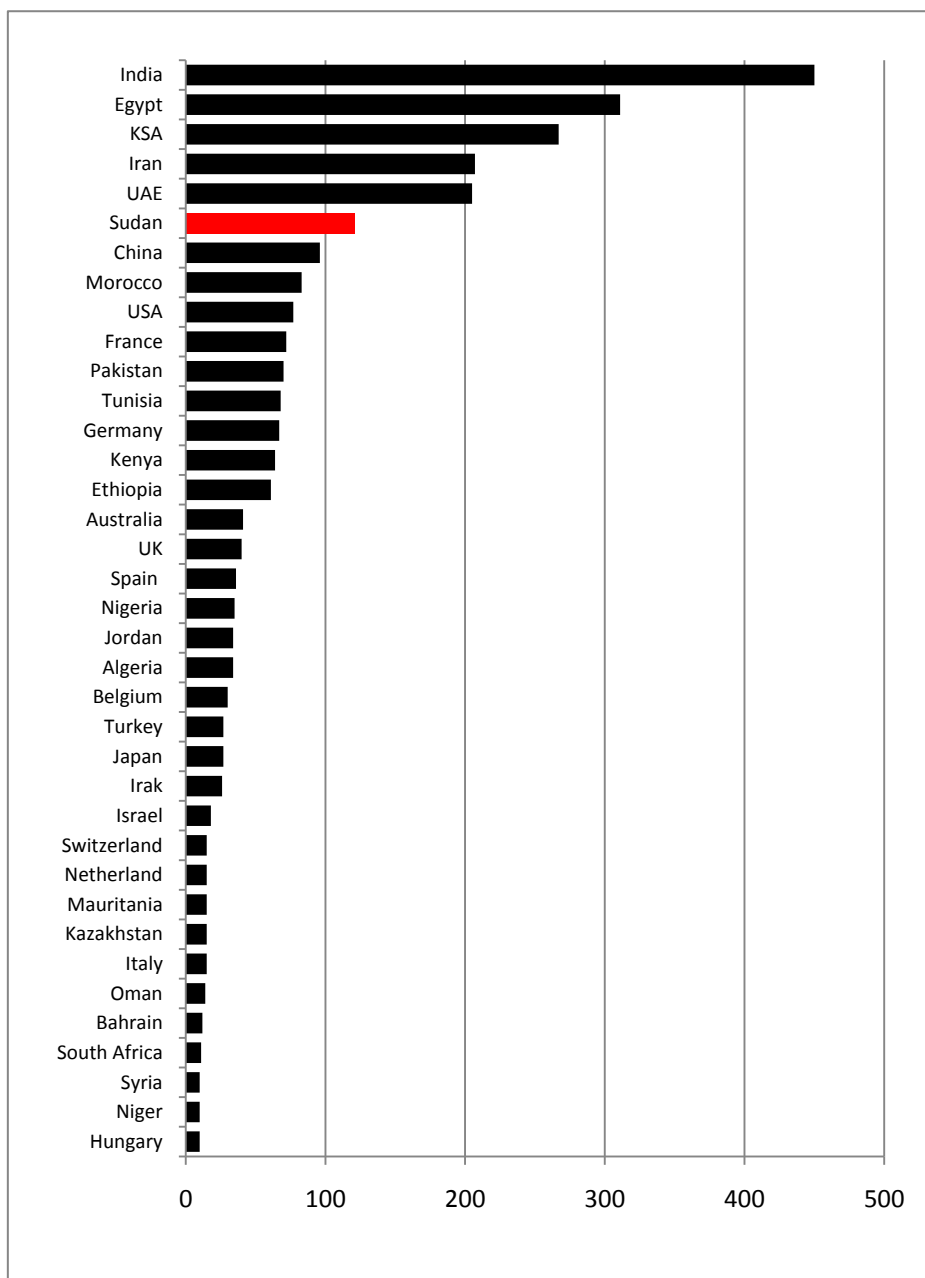


Figure 9: Classification of the countries according to the number of publications in camel reported in international database

Conclusion

The camel sector in Sudan has a high potential and it will increase in the future because:

- The separation of the South Sudan which will reinforce the place of camel in the livestock economy.
- The climatic changes with the risk of desertification process.

The research sector has also a good potential but the risk of brain drain is important. The definition of a clear strategy at national level would be useful for supporting convenient actions both for a better knowledge of the camel sector and for a balanced development of this

important sector of Sudanese agriculture. The modernization of the camel production and processing for a better correspondence with the urban demand could be a way for the development of the camel sector in Sudan.

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