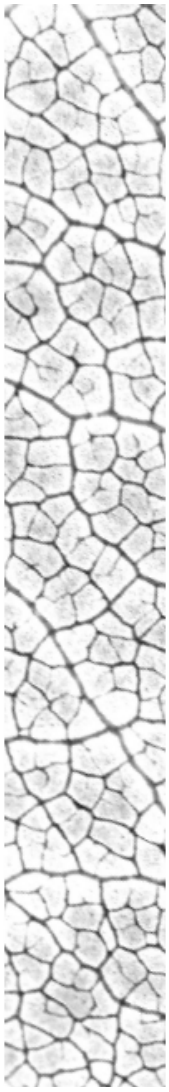

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A biological analysis of endocrine-disturbing chemicals in camel meat sector in Kazakhstan

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Abstract
Endocrine disrupting chemicals (EDCs) consist of a diverse group of industrial chemicals and pharmacological agents. The use of instrumental analyses as the first screening tool might not be cost-effective to identify the existence of enormous numbers of chemical contaminants in environments. Also, knowledge of the concentration of individual residues is difficult to use to evaluate biological impacts of contaminants to wildlife and humans. The primary objective of present paper is a biological analysis of camel meat status in Kazakhstan. After a post-independence decline linked to the restructuration of collective structures in agriculture and food sector, the camel sector increased regularly. The camel population increased annually by 0.5% on average since the independence, while camel meat production increased by 1.2%. The slaughtering rate appeared still high, but stable for 10 years. Camel meat represented 1% only of the total red meat consumed in the country but this proportion is increasing. Despite this growing interest for camel meat, the sector is not organized in Kazakhstan. Despite recent initiatives in big towns the breeding is still traditional, and the consumption is essentially rural. Moreover, there are very few processing and no standard regarding this meat. The perspectives of development require however, the establishment of formal rules.

Keywords: biological review, camel, meat sector, processed meat, meat product

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INTRODUCTION

The priorities for development of sectors to achieve a leading position in the world food market through production of competitive food were listed in the document named "Strategy. Kazakhstan-2050". Livestock sector was one of the items to be supported in relationships with the agro-food industry. Indeed, the food industry development in Kazakhstan is particularly important with the accession to the Customs Union and the accession to the WTO in 2015, as well as due to the growth of the country's population, the intensive growth of food consumption and changes in the structure of consumption in the direction of higher quality and variety of products.

The meat is particularly important in the country because Kazakh people are traditionally big meat eaters. With a meat consumption varying between 60 and 80 kg/hab/year, Kazakhstan is one of the highest per capita consumption of the world and on average up to twice the mean world per capita consumption (50-60 kg in 2017 according to the website food-exebitions.com). The main origin of the red meat consumed in Kazakhstan are in the order beef (60% of the red meat), sheep (21%), horse (15%), goat (3%) and camel (1%). Many experts are predicting a shortage of beef meat in the country from 2020, the demand increasing by 1.8% every year. In such context, even if camel meat is a marginal production, it could contribute more significantly to the meat supply of the Kazakh population.

The present paper is focused on camel meat market in the country, on its importance and potential.

CAMEL DEMOGRAPHY IN KAZAKHSTAN

Kazakhstan is knowing positive camel population growth since the independence. This growth is + 0.5% on average for the last 23 years just behind Azerbaijan and Turkmenistan (1.3% each) while all other countries in Central Asia has a negative growth. However, the decline was important in the few years following the independence due to the restructuration of the agricultural sector in general (**Fig. 1**).

In Kazakhstan, the camel population is concentrated in the southern and Western part of the country, the highest density being around the Caspian Sea (**Fig. 2**). Those areas are corresponding to the more desertic or

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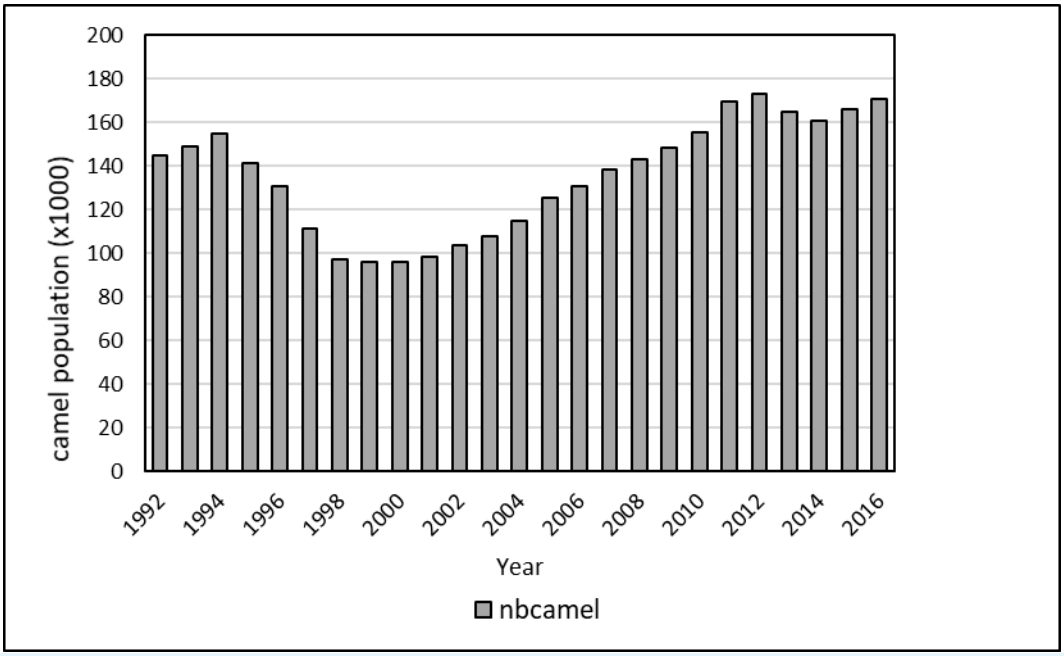

Fig. 1. Change in camel population in Kazakhstan since the independence (source: FAOstat 2017)

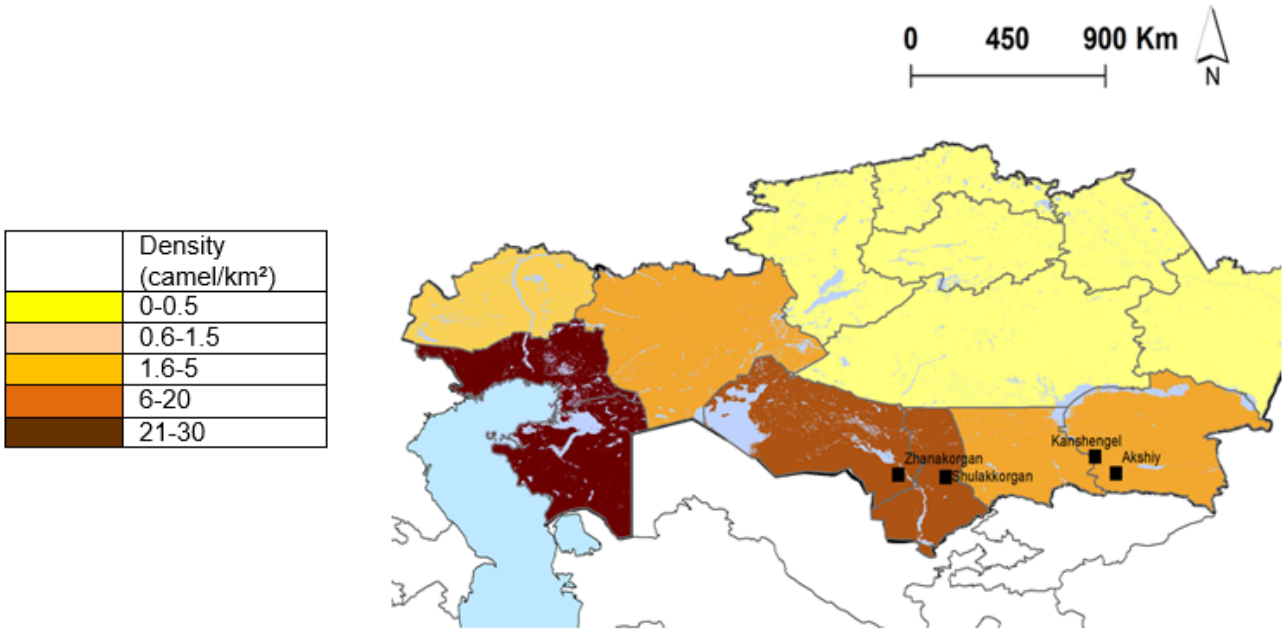

Fig. 2. Camel density in the different regions of Kazakhstan (from statistics at the Ministry of Economy 2015)

semi-desertic places. The camel farming is thus strongly linked to the steppic areas. The particularity of Kazakhstan is the cohabitation between Bactrian and dromedary camels and the presence of hybrids. Except some introduction of dromedary Arvana from Turkmenistan, there is no known importation of Bactrian camel from other countries rearing Bactrian camels. Consequently, the national biodiversity is clearly respected.

Camels in traditional times played an important role in the life of nomads in different ways as working animals (pack, harness, riding). In the areas of camel breeding, camels were able to replace horses (transport), cows (milk) and sheep (wool). Nomadic people used camels to transport entire household goods and even portable yurt (dwelling of nomads). Later, with the development of motor vehicles, the value of camels as draft animals, began to decrease, and they came to be regarded primarily as a productive animal, a good source of meat, milk, wool and skin (Nurtazi 2017).

Regarding the last data in 2018, the camel population in the country was exactly 191100 heads in

Table 1. Regional distribution of camel herd from February to September 2018 (source: National statistics)

Regions	for February, 1st	for April, 1st	for July, 1st	for September, 1st
Republic of Kazakhstan	**191.1**	**209.8**	**219.3**	**209.8**
The Akmolinsky	0.1	0.1	0.1	0.1
The Aktyubinsk	16.8	16.5	18.3	17.4
The Almaty	7.2	7.6	8.5	8.2
The Atyrausky	30.1	31.5	33.6	33.3
West Kazakhstan	2.5	2.6	2.6	2.6
The Zhambylsky	6.0	6.3	6.8	6.8
The Karaganda	1.4	1.5	1.6	1.4
The Kostanajsky	0.2	0.2	0.2	0.2
The Kyzylordinsky	41.9	44.3	47.3	47.3
The Mangistausky	58.4	70.9	70.0	64.1
The Pavlodar	0.1	0.1	0.1	0.1
North Kazakhstan	0.0	0.0	0.0	0.0
The Turkestansky	25.7	27.6	29.4	27.5
East Kazakhstan	0.6	0.6	0.7	0.7
The city of Astana	-	-	-	-
The city of Almaty	0.0	0.0	0.0	0.0
The city of Shymkent	-	-	-	0.0

Table 2. Regional distribution of the camel population in Kazakhstan and relative importance of camel in the herbivorous population (source: Kazakhstan statistics Committee 2018 www.wikipedia.org)

Region	Camel heads (x1000)	Human population	Hab./camel
The Akmolinsky	0.1	145 531	1455.3
The Aktyubinsk	17.4	417 471	24.0
The Almaty	8.2	1 787 964	218.0
The Atyrausky	33.3	236 414	7.1
West Kazakhstan	2.6	300 128	115.4
The Zhambylsky	6.8	357 577	52.6
The Karaganda	1.4	501 129	357.9
The Kostanajsky	0.2	239 414	1197.1
The Kyzylordinsky	47.3	267 750	5.7
The Mangistausky	64.1	81 453	1.3
The Pavlodar	0.1	344 720	3447.2
North Kazakhstan	0.0	216 865	-
The Turkestansky	27.5	161 039	5.9
East Kazakhstan	0.7	328 294	469.0
The city of Astana	-	1 020 722	-
The city of Almaty	0.0	1 787 964	-
The city of Shymkent	0.0	912 300	-

February, 209800 in April, 219300 in July and 209800 in September (Kazakhstan Statistics Committee 2018). The distribution of this population is variable with the most important herd in the western part (Mangistausky oblast') while the lowest population is in the city of Shymkent (**Table 1**).

The ratio number of habitants/number of camels expressed also the relative importance and concentration of camel stock in the different regions. Therefore, the highest concentrations were still observed in the southern part of the country with 1.3 hab/camel in Mangistausky, 5.7 in Kyzylordinsky, 5.9 in Turkestansky and 7.1 in Atyrausky (**Table 2**).

By taking in account the weight of the animals providing red meat, we can calculate the Domestic Herbivorous Biomass (DHB) and assess the contribution of camel. This percentage of camel biomass reported to the total DHB increased from 1.32 to 2.40% from 1992 to 2017 showing an increasing contribution of camel stock to the total livestock. However, this proportion is stable since the year 1998 (**Fig. 3**).

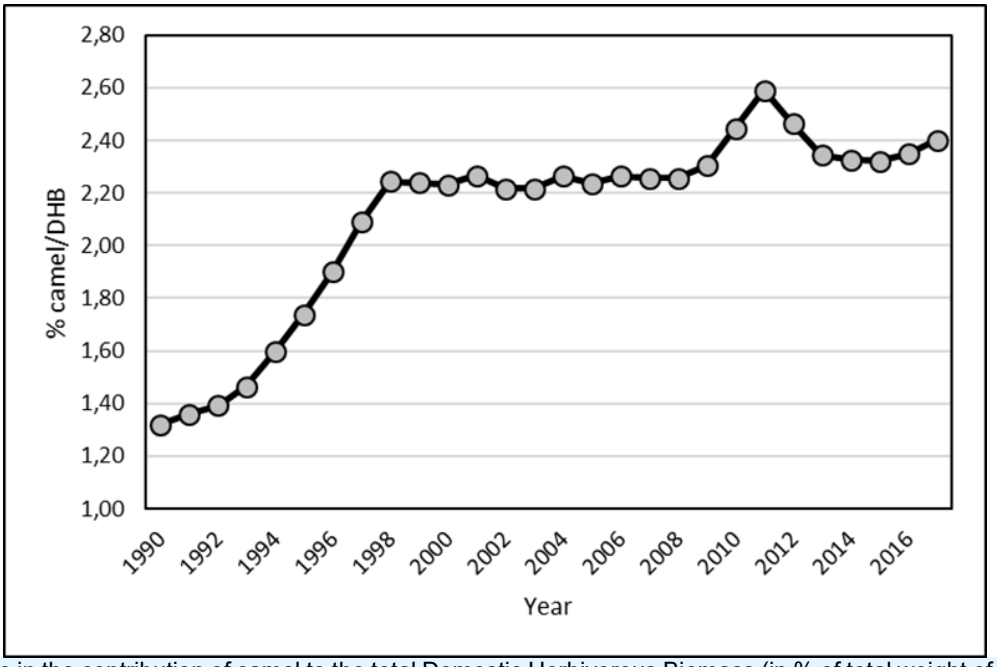

Fig. 3. Change in the contribution of camel to the total Domestic Herbivorous Biomass (in % of total weight of camel, cattle, horse, sheep and goat)

GROWTH PERFORMANCES OF CAMEL IN KAZAKHSTAN

Camels are one of the largest farm animals. The female adult weight, reached at 6-7 years old, is around 600-700 kg for Arvana dromedary and up to 700-800 kg for Bactrian. The weight of large male Bactrians and dromedaries reaches 900-1000 kg (elite male Bactrians can weight up to 1250 kg, while Bactrian and dromedary hybrid (Nar) can weight up to 1350kg). Carcass weight of 30-month old camelcan reach 200-250 kg (adult animals up to 350-400 kg), which is more than 50% of weight. Specially fattened animals can produce 60% of dressing percentage (Nurtazi 2017).

The Arvana is a typically milk-yielding, pack-carrying and smooth-riding breed of camels (Meredov 1984). Few data are available regarding Arvana breed. In one experiment on young Arvaan camel weaned at 9 months, the mean weight was 232-273 kg at 12 months, 297-332 kg at 18 months and 418-491 kg at 24 months according to the type of diet given to the animals (Saparov and Annageldiyev 2005). Such growth corresponded to a daily weight gain of 500g in 1-2ycamel grazing in natural pasture and 600g in camel receiving feed supplement.

SLAUGHTERING RATE IN CAMEL POPULATION

Recent data regarding camel meat from FAO database are available since 2006 (FAOstat 2018). On average 20% of the camel population is slaughtered every year which appeared very high, the world percentage being on average 7% (Faye and Bonnet 2012). However, the slaughtering rate knew a very high variability. A peak of slaughtering (up to 30%) occurred between 1996 and 2000, following the restructuration of livestock farming systems and leading to a dramatic decrease of the camel population (**Fig. 4**). Nowadays, a decrease of the camel slaughtering rate is observed leading to the increasing the livestock number.

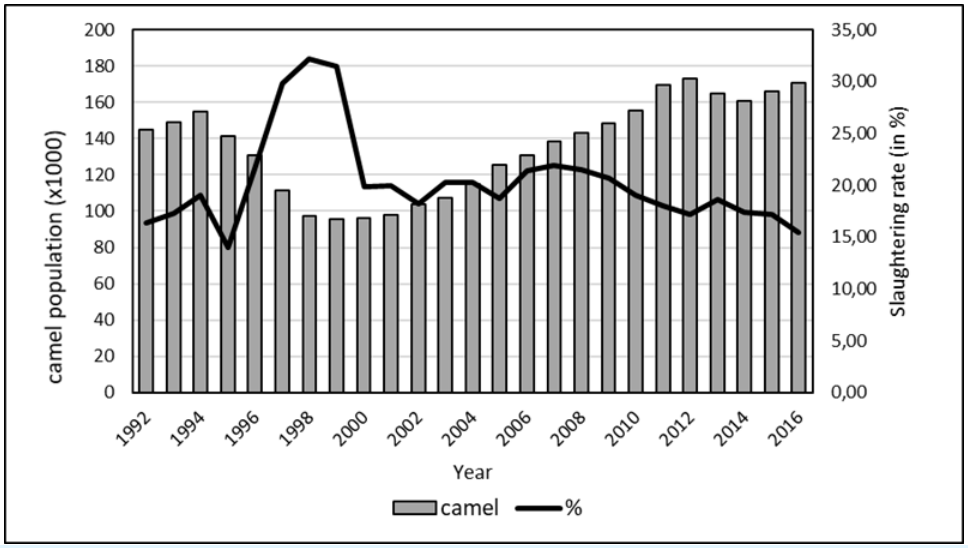

Fig. 4. The population of camels in Kazakhstan and slaughtering rate in Kazakhstan (source: FAOstat 2018)

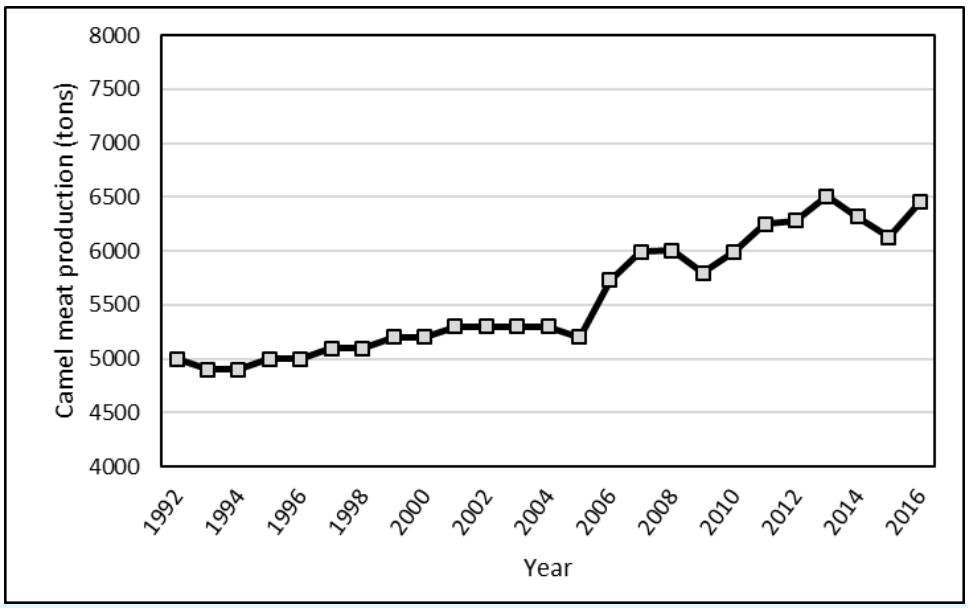

Fig. 5. Changes in camel meat production since the independence of Kazakhstan (source FAOstat 2018)

CAMEL MEAT PRODUCTION

With an average weight of carcass at 245 kg, the total quantity of camel meat available on the national market is officially 6451 tons only i.e. 1% of total red meat produced in the country. The camel meat production is increasing regularly since the independence starting from 5000 tons (**Fig. 5**). It is corresponding to annual growth of 1.16% which is higher than the population growth (0.7%).

The percentage of camel meat among red meat was changed from less than 0.6% just after independence to 0.9% nowadays (**Fig. 6**). A peak up to 1.2% occurred in 2001 and this percentage overpassed 1% during the years 1999-2005 corresponding roughly with the years knowing an increase of slaughtering rate (**Fig. 4**). The percentage of camel meat is stable for the last 10 years because the growth of camel meat production is similar to that of the other meat.

However, by considering the relative growth (index 100 in 1992), the camel meat increase appeared higher than cattle and sheep meat, but lower than horse and mainly goat meat (**Fig. 7**). On average, since the independence, camel meat production grew by 29%, while cattle meat decreased by 28% and sheep met by 37%. Only horse (+94%) and goat meat (+158%) increased more than camel meat production.

CAMEL MEAT MARKET

The difference between the prices of the different meat being not so important than for milk, the camel meat value is in the same proportion (1%) of the total red meat value. Contrary to milk, the camel meat sector is

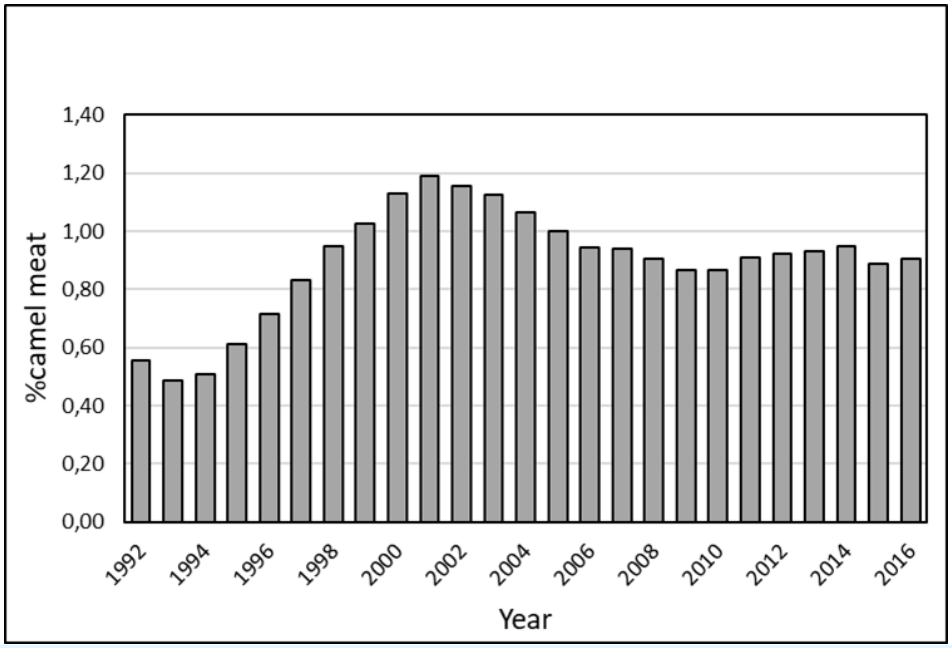

Fig. 6. The percentage of camel meat among all red meat consumed in Kazakhstan from 1992 to 2016 (source FAOstat 2018)

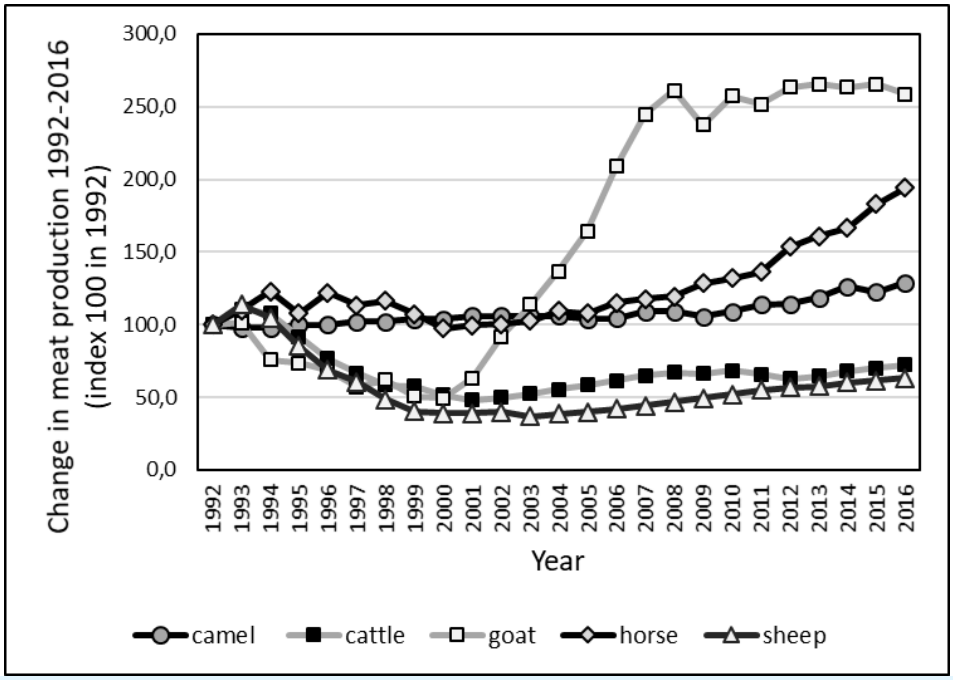

Fig. 7. Relative changes in red meat production for 1992-2016 un Kazakhstan (index 100 in 1992)

not really organized in a commodity channel and there is no meat processing (dry meat, sausages, modern packaging for supermarket, etc.) as it is developed in North Africa and Arabian Peninsula (according www.healthyfoods.com).

Among 173 meat processing enterprises in the Republic of Kazakhstan, none are working on camel meat. Yet, few initiatives are growing, and industrial processing of camel meat and meat products could be expected in a short time. For example, in the Mangystau region, in the village of Shetpe in 2017, was opened a workshop on the basis of an agricultural cooperative for the production of traditional canned camel meat in a tin can. Moreover, in 2019, in the Almaty city and on the basis of a modern workshop, the enterprise “Kun Nury” Ltd will launch production of canned camel meat in retort bags and lamister boats. It is planned to export products outside the Republic of Kazakhstan.

For the moment, camel meat is consumed only in traditional way (no standard cutting, boiled meat, rural

consumption). For example, no camel meat is available is the bazar of big town as Almaty or Astana. However, specialized shops are starting to be implemented as for example, “Sydyk” in Almaty are selling fresh camel meat and camel meat products from Daulet-Biket farm.

CONCLUSION

Perspective 1: Increasing part of red meat due to camel: studies have shown that camel meat has many benefits as a producer of meat. It has a low-fat content with high nutritional value and has the ability to combat hyper-acidity, high blood pressure, pneumonia and respiratory diseases. Camels and meat products have as meat quality characteristics of the meat and muscle structure.

Perspective 2: improvement of slaughtering conditions: to develop and provide for abattoirs and for the meat sector as a whole the necessary hygiene and environmental legislative frameworks. These need to be supplemented by regulatory systems (“directives”) to be issued by governments and designed to implement and strictly enforce the laws. Slaughter lines could be more cost efficient if most or all individual parts needed could be fabricated locally or within the region. Importing slaughterhouse equipment from developed countries causes costs to surge. It would be desirable if more technical companies in the sub-region would include abattoir equipment in their manufacturing programs.

Perspective 3: Processing camel meat (canned camel meat, *kazy*, camel-burger and sausages), camel meat is one of the most promising unconventional resources of high-quality domestic raw materials for meat-processing enterprises.

Perspective 4: Camel meat standard: develop the national standard for camel meat for further processing. The abattoir sector has been neglected compared to other sectors of national and regional livestock development. Consequently, governments should, on the basis of effective hygiene laws and regulations, encourage and facilitate the construction of good standard abattoirs by the private or public sector. One principle of modern meat hygiene is the sharing of responsibilities for consumer protection between the meat business operator and the government official health and hygiene control entities. Meat business operators must be prepared to accept the primary responsibility for the hygienic quality and safety of meat and meat products.

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