Due to COVID-19 pandemic, all international projects are temporarily suspended.

TEXAS A&M AGRILIFE RESEARCH | EXTENSION

خروف غنم مشروع

Ghanam Najm Mashrue

Safe, Nutritive and Sustainable Locally Produced Sheep Meat Products

Dan Quadros

PhD, Livestock Production Systems

1. Overview

a. The State of Qatar

The State of Qatar is a country located in Western Asia, occupying the small Qatar Peninsula (4,468 mi², corresponding to 1.7% of the State of Texas) on the northeastern coast of the Arabian Peninsula.

Source: https://d1softball.net/wp-content/uploads/qatar-map-middle-east-physical.jpg and https://www.nationsonline.org/maps/qatar-map.jpg

In early 2017, Qatar's total population was 2.6 million: 313,000 Qatari citizens and 2.3 million expatriates. The country has the highest per capita income in the world.

Qatar is classified by the UN as a country of very high human development and is widely regarded as the most advanced Arab state for human development.

Qatar is a high-income economy, backed by the world's third-largest natural gas reserves and oil reserves.

Source: https://en.wikipedia.org/wiki/Qatar

b. Gulf Cooperation Council (GCC) Crisis

In June 5th of 2017 Bahrain, UAE, Saudi Arabia and Egypt launched a blockade against Qatar. The Saudi-led coalition cited Qatar's alleged support for terrorism as the main reason for their actions, insisting that Qatar has violated a 2014 agreement with the members of the GCC. Qatar denied vehemently the accusations.

Source: https://www.gco.gov.qa/en/focus/gcc-crisis/

The blockading countries released a baseless list of 13 demands to Qatar. Qatar rejected the blockading countries' demands. In January 2018, Qatar seeks international arbitration to end the blockade following a report by the Office of the United Nations High Commissioner for Human Rights (OHCHR).

But, after two years of crisis, nothing has changed and no end in sight.

Qatar remains resilient due to a $340 billion sovereign wealth fund. New alliances were made in order to guarantee food supplies. Also, the country urgently invested in local food production. But Qatar still is very dependable from external imports.

Sources: https://www.gco.gov.qa/en/focus/gcc-crisis/ , https://en.wikipedia.org/wiki/2017%E2%80%932019_Qatar_diplomatic_crisis, https://www.trtworld.com/magazine/qatar-not-only-survived-the-gcc-blockade-but-also-thrived-23082 and https://gulfnews.com/world/gulf/qatar/qatar-crisis-two-years-but-no-end-in-sight-1.64343589

c. Agriculture in Qatar

In general, agriculture in Qatar is inherently limited in scope due to the harsh climate and lack of arable land. In spite of this, small-scale farming, nomadic herding, and fishing were the predominant means of subsistence in the region prior to the 20th century. Although the relative importance of these activities has declined, the government has attempted to encourage agriculture and fishing to provide a degree of self-sufficiency in food.

Date palms were one of the earliest crops to be cultivated in the peninsula. However, as Qatar's geography and climate were unsuitable for large-scale crop cultivation. As the waters surrounding Qatar contain some of the most abundant pearling beds in the world, this was the main source of income for Qatar's inhabitants until the discovery of oil the 20th century. Pearl trading was supplemented in some areas by camel breeding. Fishing also played an important role in the economy. Besides camels the settled villagers have a few horses and cattle, which they keep in their own possession, and some sheep and goats which are tended for them by the Bedouins.

Severe conditions, such as extremely high temperatures and lack of water and fertile soil, hinder increased agricultural production. Orthents, the predominant soil type in the peninsula, accounting for approximately 1,020,000 ha., are unfavorable for crop cultivation because of their extreme shallowness. The limited groundwater that permits agriculture in some areas is being depleted so rapidly that saltwater is encroaching and making the soil inhospitable to all but the most salt-resistant crops. The northern section of Qatar comprises the most significant source of fresh groundwater in the country, mainly due to the more advantageous hydro-geological conditions than those that exist in the southern section of the country. The rate of groundwater extraction in 1966 was 20 million m^3/year. This increased to 120 million m^3/year by 2000. Studies have approximated that aquifer storage will be completely exhausted by 2025.

Of land under cultivation in 1990, about 48 percent was used for vegetables (23,000 tons produced), 33 percent for fruit and date production (8,000 tons), 11 percent for fodder (70,000 tons), and 8 percent for grains (3,000 tons). In 1990 the country had approximately 128,000 head of sheep, 78,000 goats, 24,000 camels, 10,000 cattle, and 1,000 horses.

There are also dairy farms and about 2,000 chickens for poultry. All but 20 percent of local demand for eggs is met domestically.

Consumption of cereals increased by 10.72% CAGR during 2012 to 2015. This growth is met by increased imports of cereals including wheat from Brazil, United States, India and Australia. Increase in consumption is expected to increase in future.

Qatar depends on imports to feed its population despite its efforts to improve food security.
Imported meat accounts for more than 90 percent of domestic consumption in 2017. Australia, one of the world's largest sheep exporters, supplied 93 % of the live sheep that Qatar imports. Australia was the world's 4th largest live sheep exporter in 2016, 31.1% to Qatar. Live sheep from Australia are cheaper than those imported from other countries.
The impact of economic sanctions and resulting blockades towards the movement of goods and services into Qatar since mid-2017 are considered in arriving market numbers and growth rates. Since Saudi Arabia, the United Arab Emirates, Bahrain and Egypt began blockading the country, the government in Doha has been eager to demonstrate that the critical food imports it relies on are continuing as usual, albeit with some detours. A shipment of 32,000 sheep imported from Australia in 2017 June, for example, arrived as expected, though it took 25 days to reach Qatar. For other necessary supplies, Doha has opened new sea routes with Oman as well as two routes to India. Qatar Airways, moreover, has brought in an estimated eight extra cargo shipments of supplies daily, while Turkey and Iran have beefed up their shipments of basic foodstuffs, including dairy and meat.

In July 2017, following the closure of Qatar's only land border with Saudi Arabia, the country announced plans to airlift 4,000 cows in a bid to meet around one-third of its dairy demand. Local company Baladna will be responsible for the dairy production. Later, Baladna announced that it will be importing an additional 10,000 cows so that they can meet Qatar's dairy requirements in full.

Domestic production of meats, dairy products, and crops increased by 400% from June 2017, the onset of Qatar's diplomatic spat. It is expected nearly all (98%) the demand for poultry will being met soon. By 2019, Qatar's vegetable output increased by 20% since mid-2017 to 66,000 tonnes per year. It is expected to further increase by 20,000-40,000 tonnes by 2020. Prior to the embargo, Qatar produced only 20% and 10% of its dairy and poultry needs respectively. By 2019, the country became self-sufficient.

Despite the cultural habits and religious beliefs that makes sheep meat the most preferred in Qatar, the local production is still far away from its demand. Then, the State of Qatar desires to stimulate the local production urgently. Moreover, the World Cup in 2022 is huge event coming, when the country will receive players, sport delegations and journalists from all over the world. Qatar will be in evidence and certainly to search for solutions in the food chain is a priority.

Sources: https://en.wikipedia.org/wiki/Agriculture_in_Qatar, https://www.mla.com.au/globalassets/mla-corporate/prices--markets/documents/trends--analysis/fast-facts--maps/mla_sheep-fast-facts-2018.pdf, https://www.mordorintelligence.com/industry-reports/agriculture-in-qatar-industry, https://worldview.stratfor.com/article/qatar-counts-its-sheep

2. Scope

The objective of the **Najm Sheep Project** is to produce safe, nutritive and sustainable locally produced sheep meat products to meet the demand of Qatar population. In order to achieve that, the State of Qatar and Texas A&M AgriLife will work together with local companies, institutions and producers to elaborate, implement and monitor a highly intensive technically feasible sheep production project, using state-of-art technologies in housing, feeding, breeding and health management, respecting the animal welfare and religious beliefs, while mitigating environmental impacts. The project involves partnerships to slaughter the animals, process the carcasses, pack and distribute the products. An outreach program will be created to link the production and consumer sides. Research trials will be conducted to solve the main constrains of the production system. An international cooperation working group will be created to be responsible for defining guidelines and providing technical assistance to this project.

3. Breeds

The Awassi (a) is the most numerous and widespread breed of sheep in south-west Asia. Then, it must be considered in the project as the base breed. Most of them need to be imported to start the project. According to Hermiz and Alkass (2018), Awassi sheep presents very desirable characteristics such as endurance to nutritional fluctuation, resistance to disease and parasites, and adapted well to different ecological conditions. The economic usefulness of sheep in meat production would be enhanced by increased frequency and rate of reproduction, more efficient growth to heavier market weights and more desirable meat qualities. Growth rate of Awassi lambs particularly under feedlot is extremely good and indicating that this breed is suited for such following system. Somalis (b) also may be imported for breeding purposes. Both will be maternal breeds. To improve the feed efficiency and the quality of the cuts, Dorper (c) and Australian White Sheep (d) sires will be imported to breed the base heard. The idea is to have a new breed composted with Awassi (15%), Somalis (15%), Australian White Sheep (30%) and Dorper (30%) may be considered.

a)

https://awassi.com.au/

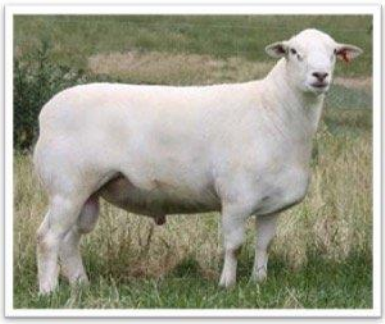
b)

https://www.biolib.cz/en/image/id279683/

c)

https://sites.google.com/site/twinridges/dorper-rams

d)



https://www.highveld.com.au/the-australian-white

Source:

https://www.researchgate.net/publication/331043993_GENETIC_POTENTIAL_OF_AWASSI_SHEEP_FOR_GROWTH_AND_MEAT_PRODUCTION

4. Feeding system

Forage production is extremally limited in Qatar due to climate and soil restrictions. During 5 months of the years, the temperatures are over 105°F (40°C) and just 3in (75mm) of rainfall falls annually. On the top of this, the infertile topsoil is swallow (4 to 12 in, 10 to 30 cm) and underlying rock is highly saline. Then, some alternatives will be considered such as byproducts (e.g. olive-oil extraction mill, sesame meal, date palm leaves), hydroponic forage (barley is subsidized by the local government) and imported pelletized cubes.

Irrigated forage production using wastewater from treatment plants will be included. The partnership with Hassad Foods to provide part of the forage will be considered. The are producing 10 tonnes per acre of Rhodes grass hay, from 10 cuts per year, using wastewater from Doha.

Source: https://dairydeb.wordpress.com/2016/06/22/desert-forage-growing-grass-in-qatar/

To expand the forage production for less favorable areas, other crops can be studied. Spineless cactus holds a promise to be a great source of forage and water in the desert. High productivities and reasonable TDN contents (62%) make it an option to be considered. *Kochia spp.* is plant adapting to extreme environmental factors provide an important part of forage requirements for livestock grazing in arid and semi-arid regions. They provide a high crop production under salinity condition, improve animal performance and decrease feed cost.

Sources: https://www.tandfonline.com/doi/full/10.1080/1828051X.2019.1579680, https://dairydeb.wordpress.com/2016/06/22/desert-forage-growing-grass-in-qatar/, https://www.intechopen.com/books/new-perspectives-in-forage-crops/production-of-spineless-cactus-in-brazilian-semiarid, https://www.researchgate.net/publication/301609550_Kochia_Plant_as_Potential_Forage_for_Ruminants_under_Desert_Conditions

5. Housing and internal environment control systems

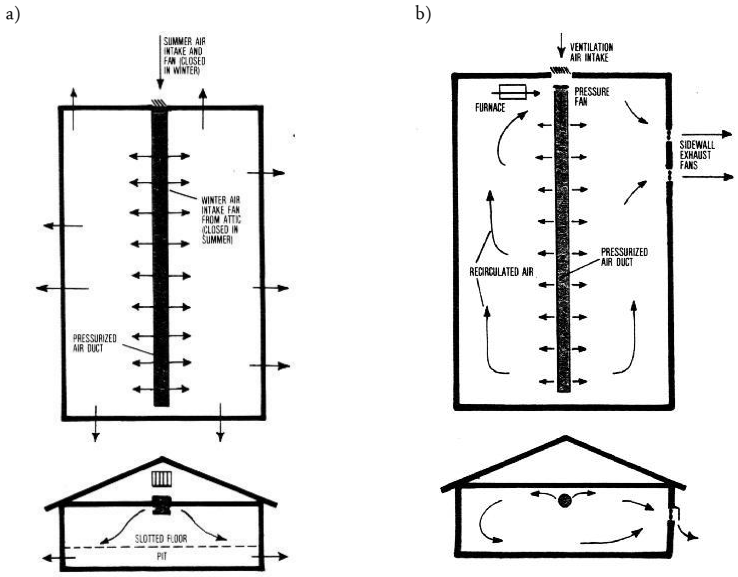
For raising sheep in housing systems, many steps must be followed to guarantee the animal welfare and prevent diseases:

- **a.** Social structure: sheep are social animals that have their own social structure that should be respected to avoid disputes for leadership and make the management easier.
- **b.** Pen design: To meet the social needs of sheep, the walls of pens should be designed to allow sheep to view animal attendants. Pen surfaces should be impervious, easily sanitized and resistant to water and corrosive materials. There should be no sharp edges or protrusions which may cause injury.
    - **i.** height 850mm high for adult sheep
    - **ii.** floor area: Ewes for flushing - 10 to 14 sq. ft/head; Ewes with lambs - 16 to 20 sq. ft/pair; Weaned lambs (market lambs or replacements) - 8 to 10 sq. ft/head; Lambing pens - 16 sq. ft/pen; Rams (180-300 lb.) - 20-30 sq. ft/head
    - **iii.** floor surface/bedding should be non-slip. Ideally surfaces should be abrasive enough to provide even wear on the hooves to minimize the need for hoof trimming while not causing excess wear that may result in discomfort or pain. a slope of 1:15.
    - **iv.** Water: Nipple drinkers will be used to save water and reduce labor.
    - **v.** Feeders: Automatic feeders will be designed to reduce labor and increase the number of meals a day, providing the right diet for each category. Feeder Space - 9 to 20 inches/head depending on size, shorn or unshorn, breed, pregnancy and the number of times fed per day. Creep feeder – 8 to 12 inches/opening/lamb.

- **c.** Indoor environment control: Extremes of temperature, draughts and humidity should be avoided in housing of sheep. Indoor temperature should be maintained between 50-175°F (10-24°C), light, humidity (40-60%). Good ventilation should be provided. Extractor fans should be set to remove 105

ft^3 ($3m^3$) air per kg bodyweight per hour to keep ammonia levels down, Shelter must be provided for sheep from extremes of weather especially when they are freshly shorn or new-born.

For animals in reproduction, the housing system totally automated with thermostats will use pressure ventilation (a) plus water sprinklers and barn curtains. For finishing lambs, the barn will be more sophisticated, totally automated with thermostats, using a combination with pressure and exhaust ventilation (b) plus water sprinklers and barn curtains.



Source: https://www.extension.purdue.edu/extmedia/AE/AE-96.html

Sources: https://ag.umass.edu/crops-dairy-livestock-equine/fact-sheets/housing-working-facilities-for-sheep, https://www.animalethics.org.au/___data/assets/pdf_file/0010/249913/Guide-23-housing-sheep.pdf, https://www.extension.purdue.edu/extmedia/AE/AE-96.html

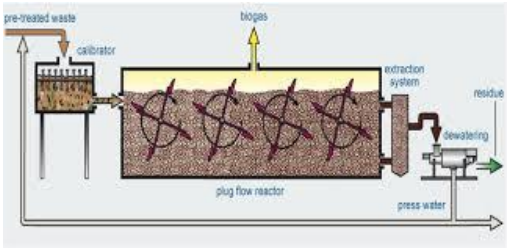
6. Health management

Sheep in desert is relatively less susceptible to the diseases due to less humidity that hampers the pathogen development. Most mortality is due to liverfluke infestation; other major causes are enterotoxaemia, anthrax and foot-and-mouth disease. Sheep-pox also results in serious mortality, although outbreaks occur only every 3 to 4 years. Round gastrointestinal parasites will not be a major menace; however, Coccidiosis can be a very serious threat. Then, preventive procedures, training and period exams will be performed rigorously.

Source: https://pdfs.semanticscholar.org/df7b/dfd534038f2f43f394fd9584653df7d67bbf.pdf

7. Environmental impacts mitigation

The manure will be collected by scraping dry manure daily. To treat the manure and at the same time produce biogas and biofertilizer, an anaerobic digester will be designed and installed. The biogas will be converted into electricity, which contribute to reduce external energy consumption. In addition, solar modules will be installed in the barn roof and external areas to help in the energy balance with renewable energy sources. Normally, the anaerobic digestion uses a large amount of water, that, in the end of the process, is separated the liquid from the solid phase and it is reused in agriculture by the way. But due to the scarcity of this resource, a dry (i.e. high solid) digester using thermophilic fermentation will be installed.



Source: https://umexpert.um.edu.my/file/publication/00013348_134419.pdf

The biofertilizer will contribute to increase the fertility and the soil health. The biofertilizer also can be an additional form of revenue and contribute to organic food production chain.

8. Marketing

The animals to be harvested will be divided into three different classes:

a. Lambs for high standard quality meeting: for restaurants and hotels
b. Weathers: for attending local consumption preferences
c. Adult discarded animals: for processed food

Partnership with slaughter and packing houses will guarantee a safe product for the consumers and the specific cuts for restaurants and hotels. A series of other products will be developed using the non-carcass components, low value carcass parts and the meat from adult animals, using physical, biological and chemical treatments and processes, to produce, for instance, burgers, sausages, canned meat, smoked meat and jerked meat.

9. Conclusion

The **Najm Sheep Project** will be a singular opportunity for Texas A&M AgriLife Research to help the State of Qatar to attend the internal demand for sheep meat, which is highly appreciated, and to get funding to develop this international cooperation project. The professionals of AgriLife Research and Extension, working together with Qatar`s national institutions and companies, can design, install and monitor an innovative and technical feasible project for safe, nutritive and sustainable locally produced sheep meat products.