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# WATER BUFFALO FOR OUR NEXT GENERATION IN EGYPT AND IN THE WORLD

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***Abstract***

*The total number of buffaloes in Egypt reached about 5.317million in 2011, of which 42 percent were dairy cows, 6 percent buffalo bulls, 32 percent heifers less than two years old and 20 percent male calves less than two years old. While the annual growth rate for the buffalo population approached 3 percent over the last two decades, it still only accounts for 1 percent of the cattle population. The aggregate share of buffalo milk, from all types of production systems is about 81 percent of total milk production in Egypt. The cost of milk production from buffaloes is also less than the cost of reconstituted imported powdered milk at the international market price. Most common name: Baladi Other local name: Beheri, Menufi, Egyptian. Livestock population is in great part located in the Nile delta and Nile valle, Total population size 5371000. The distinction between different types of Egyptian buffaloes is only environmental. It is the most important and popular livestock for milk production in Egypt. Buffalo productivity in Egypt is about 210-280 days/lactation, an average of seven lactations and a milk yielding of 1 600 kg. The age at the first calving is 34-41 months. The average animal production per year represented 30.8% of national agricultural production, the average annual red meat production reached 495,000 ton during the same period, contributing by 45% to overall meat produced. Artificial insemination is used in one percent of the medium to large herds. There are six AI stations owned by the Government and one by the University, possessing a total of 70 bulls. Artificial insemination is still performed at research level; usually only one semen dose is offered at each oestrus, conception at the first oestrus being 30 percent. Milking is done by hand, twice a day, mainly by women. Average slaughter weight is 500 kg, at the age of 18-24 months. Carcass yield is 51 percent. Overall growth rate is 700 g/day. Dairy performance: Lactation duration 210-280 days Milk yield 1 200-2 100 kg Milk fat 6.5-7.0 percent. Buffalo exceed cattle in their ability to convert poor quality and forage to meat or milk. The greatest buffalo losses are often among calves. Newborn buffalo calves, like cattle calves, can die in large numbers due to viruses, bacteria, and poor nutrition. Artificial insemination, embryo transfer, cloning. Biotechnology is important to improve feed utilization and disease control for the next generation.*

***Keywords***: *Artificial insemination; Beheri; Calves; Egyptian buffaloes; Menufi.1.*

## INTRODUCTION

Egypt is in the north-eastern corner of Africa between latitudes $21^{O}$ and $31^{O}$ North and longitudes $25^{O}$ and $35^{O}$ East (see Figure 1a) with a total area of 1 001 450 $km^2$; the country stretches 1 105 km from north to south and up to 1 129 km from east to west. It is bordered in the north by the Mediterranean Sea, in the east by the Gaza Strip, The Red Sea, in the south by Sudan and in the west by Libya.

Egypt is predominantly desert and arid and semi-arid rangelands (see Figure 1b) and can be divided into 4 major physical regions The Nile Valley and Delta, Western Desert, Eastern Desert and Sinai Peninsula.

Egypt is divided into twenty-six governorates (see Figure 1c) , which include four city governorates (Alexandria, Cairo, Port Said and Suez), nine in Lower Egypt (in the Nile Delta region), eight in Upper Egypt along the Nile River from Cairo to Aswan, and the five frontier governorates covering Sinai and the deserts that lie west and east of the nile[12]

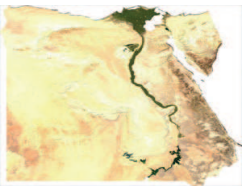

Fig. 1. Egypt showing the vast desert area and the Nile Valley and Delta

Egypt is known as one of the oldest agricultural civilizations; the River Nile allowed a

sedentary agricultural society to develop thousands of years ago. It has a predominantly rural population (the percentage of rural inhabitants is estimated at about 58%) and according to World Factbook the July 2011 population was estimated at 82 079 636 with a growth rate of 1.96%. The capital city is Cairo with an estimated population of 10.902 million, while Alexandria has 4.387 million persons (2009 estimates). Figure 2 shows the population distribution and density in Egypt[12]..

Fig. 2. Map of Egypt's Administrative Divisions/Governorates

Livestock form an important component of the agricultural sector, representing about 24.5% of the agricultural gross domestic product with value of around EGP [Egyptian pounds] 33.6 billion [US$6.1 billion] in 2007 In 2005 local production covered about 92.5, 82.2, 100, 81.9, 100, 100 and 100% respectively for milk, red meat, white meat, fish, eggs, wool and leather. Each of cattle, buffalo, sheep, camel, and goat populations contributes about 51.6, 33.2, 6.5, 5.9 and 2.7% of local red meat production, respectively, which reached 629 000 tonnes in 2005. There is no surplus of animal production for export except some limited numbers of sheep and goats. The sector is depending mainly on the private sector, with the majority of animal Breeders being smallholder farmers and the share of the government sector is less than 2% of the total animal numbers. The ruminant sector is well-integrated with cropland since Egypt has limited natural pastures. Animal production is highly dependent on cattle and buffaloes as milk-producing animals, as well as male animals and un-reproductive females are fattened for meat. The cattle population totalled 4.6 million head, while the buffalo population reached 4.3 million head in 2006.

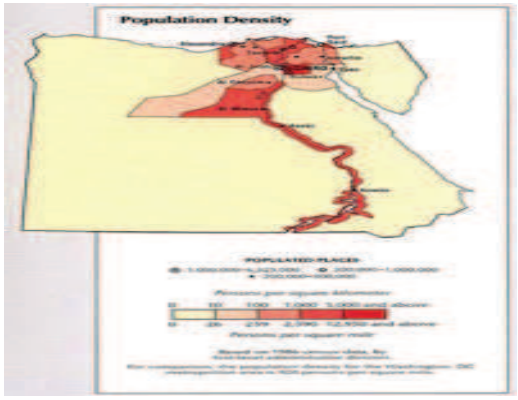


Fig. 3. Map of Egypt showing Population Density

Regarding small ruminants, the sheep population reached 5.4 million head, while the goat population exceeded 3.9 million head in 2006. The camel population was about 120 thousand head, while horses and asses exceeded 3.2 million head in 2005The cattle population is concentrated in both Middle Delta and Middle Egypt regions with percentages 22.4 % and 26.2%, respectively. While 32.2% of the buffalo population is in the Middle Delta region and 22.4% is in the Middle Egypt region. Nevertheless, 31% of the sheep population is concentrated in Upper Egypt, compared to 22.38% in Western Delta region. The goat population is concentrated in both Upper Egypt and Middle Egypt regions with percentages of 36 % and 23.5%, respectively[12]..Indigenous cattle represent about 60% of the all cattle, while mixed-breed cattle represent about 37% and imported cattle about 3%. It These averages represented about 0.34%, 2.98%, and 0.96% to the total annual average of cows and buffaloes and goats in the world, respectively, in the same period [13].

Is worth mentioning that 65% of the cattle population in the Western Delta region is mixed-breed, while in Middle Egypt the percentage of mixed-breed is 18.5% only.

Meat and milk productivity of both cattle and buffalo experienced significant increases during the period 1980-2007. Average cow milk production increased from around 675

kg/head/season in 1980 to around 1.3 tonnes/head/season in 2007, due to increased number of indigenous cows mixed with foreign cows. As to buffaloes, milk production increased from around 1.15 tonnes/head/season in 1980 to around 1.4 tonnes/head/season in 2007, as a result of increased mechanization of farm operations. With regard to meat production, average weight of the cow carcass increased from around 132 kg/head in 1980 to around 200 kg in 2007, due to establishing fattening farms as well as improving animal feeding practices. The average weight of the buffalo carcass increased from around 129 kg/head in 1980 to around 176 kg in 2007, as a result of expanding the first and second stages of the young male animals fattening project.

Agricultural production is dominated by peasant agriculture in which livestock are often kept for multiple functions. summarized the multiple functions of animal husbandry into the following categories: Food production function, insurance, capital accumulation and income generating functions and internal integration function. Among output uses are subsistence consumption, direct supply of farm inputs, cash through sale of live animals or their outputs,

savings and investment through increasing size and quality of herds and social functions such as holding wealth

In Egypt the average annual number of cows and buffaloes and goats reached about 4.38, 5.31, 5.42 million head, respectively, for the period (2011).

**What is a Buffalo?**

Buffalo are members of the bovine group of animals. They are cloven footed ruminants With 4teats There are two main species of buffalo.[15].

1- The African wild Buffalo (Syncerus)

2- Asian Buffalo (Bubalus) which for the most are domesticated( Bubalus bubalis).

Water (domestic) buffaloes is ~ 150x 10 6 in 5 countries world wide:1/9 the Nr. of cattle in the world. It is an economically important livestock species in many Asian and Mediterranean countries.3- American buffalo (Bison)[1].

**Buffalo population and strategies in Egypt**

The total number of buffaloes in Egypt reached about 5.317million in 2011, of which 42 percent were dairy cows, 6 percent buffalo bulls, 32 percent heifers less than two years old and 20 percent male calves less than two years old. While the annual growth rate for the buffalo population approached 3 percent over the last two decades, it still only accounts for 1 percent of the cattle population. The aggregate share of buffalo milk, from all types of production systems is about 81 percent of total milk production in Egypt( [19][20].

**Baladi general information**

Most common name: Baladi Other local name: Beheri, Menufi, Egyptian Taxonomic classification Breed Current domestication status: domestic Country: Egypt Main location of variety within country: Livestock population is in great part located in the Nile delta and Nil valley.

Main use:

1-food: milk

2-food: meat.

Risk status: not at risk POPULATION Year of data collection: 2011 Total population size 5371000 Percentage of females being bred pure: 100 Number of males in AI service: 0

Population trend: increasing Additional information: The distinction between different types of Egyptian buffaloes is only environmental. It is the most important and popular livestock for milk production in Egypt[4].There are different research institutes at the Ministry of Agriculture and in Kafr el sheikh Univ. at the University Giza (Cairo) involved in developing projects concerning buffaloes and buffalo products. The breed is the River Egyptian. The buffaloes are spread along the river Nile, in the Delta Region and at the Fayum Oasis. Buffalo productivity in Egypt is about 210-280 days/lactation, an average of seven lactations and a milk yielding of 1600kg. The age at the first calving is 34-41 months[8].

**Breeding and selection of dairy buffaloes in egypt the cattle:** Information System/Egypt (CISE) of the Cairo University records about 290 small (one to five animals), 27 medium (six to 20) and six large herds. Due to a lack of financing, fat and protein content cannot be recorded. The Ministry of Agriculture and Land Reclamation (MALR) through the Animal Production Research Institute (APRI) records four State herds, belonging to APRI, the sizes

of which are respectively 50, 70, 75 and 80 and 500 breedable females. The Breeders' Service Unit of APRI provides free complete milk analysis and Somatic Cell Count for the enrolled herds[8].

CISE is the only institution in Egypt performing data analysis centrally, producing monthly herd summaries and individual milk yield information. Calculation of the genetic merit of recorded buffaloes and breeding bulls is in progress.The average milk production of milk recorded buffaloes (year 2002) is 2 030 kg (312 days) and the fat content is 8.2 percent. There are six breeding stations with a total of 60 bulls with an average age of five years. These stations belong either to APRI or MALR. All smallholders (one to five animals) take their buffaloes to the breeding stations, as well as 20 percent of the medium size (6 to 20) owners. The red meat producers face several problems that hamper both vertical and horizontal expansion of production[5].

The field study reveals some significant problems that can be listed in terms of relative importance as follows:

a) The high prices of concentrates.

b) The lack of fodder which is associated with weak control over its manufacturers.

c) The high prices of calves to be fattened.

d) Inadequate veterinary car and the high prices of veterinary medicaments.

e) The low supply of summer fodder.

f) The need to protect the local industry against the imported red meat.

g) The financing problems facing the red meat producers

Recommendations:

1. The rise in processed fodder prices (from LE 38/ton in the 1980s to 400-450/ton at present) entails the review of cost items with the fodder plants in order to produce it at lower prices, which will help producers reduce meat production costs, raise production capacities and eventually upgrade the farms' economic efficiency. 2. Find solutions for the inadequacy of animal feed such as: improve fodder qualities, encourage research to develop new low-priced types of fodder and strengthen the control over fodder industry to ensure standard products. 3. Support the programs that are concerned with the genetic improvement of local cow breeds in order to develop breeds of higher transformation rates, which will eventually contribute to the promotion of red meat production

4. Under the bovine production pattern, the study shows that the recommended operating capacities for maximized profit are 10, 16, 5 and 341 head/cycle for small-scale, medium-scale, graduates and cooperatives/projects farms respectively

5. Under the buffalo production pattern, the recommended operating capacities for maximized profit are 3, 49, 25 and 1562 head/cycle for small-scale, medium-scale, graduates and cooperatives/projects farms respectively 6. The results indicates that the cooperatives/ projects farms achieve the lowest cost of bovine and buffalo meat (LE 2.25 and 3.86/kg. gross respectively), followed by medium-scale farms (LE 3.2 and 4.6/kg gross respectively)

Therefore, both systems must be supported as an effective means for the development of red meat local production. In bigger herds, breeding bulls are mainly raised from their own male calves although 20 percent of them buy adult buffaloes (two to three years) from different owners. In all cases, breeding bulls are chosen on the basis of pedigree and performance results of the dams, when provided by CISE.

Artificial insemination is used in one percent of the medium to large herds. There are six AI stations owned by the Government and one by the University, possessing a total of 70 bulls.

Artificial insemination is still performed at research level; usually only one semen dose is offered at each oestrus, conception at the first oestrus being 30 percent. Domestic buffalo are generally regarded as having low reproductive efficiency. This largely because of the conditions under which the majority of them are raised, being small holder farming systems with harsh environments, poor nutrition and minimal managerial inputs. However, they can have good fertility when managed and fed properly. Modern methods in molecular genetics are helping to unravel the evolutionary and genetic status of the river and swap types of buffalo, but from a practical viewpoint, the disparity in the number of chromosomes in the

2 types needs to be considered in cross-breeding programs in order to avoid decline in fertility. Buffalo, cows and bulls are capable of breeding through out the year but often show seasonal fluctuations in fertility because of climatic and nutritional factors that modulate ovarian and testicular functions. The physiology and endocrinology of reproduction in buffalo are basically similar to those in cattle, but some important differences exist that must be considered in attempts to improve reproductive efficiency through the use of modern reproductive technologies [7][12].

**Buffalo breeds and management systems:** Buffaloes were introduced into Egypt from India, Iran and Iraq approximately during the temperament middle of the 7th century.

**Principle usage**: milk, meat, fertilizer- no longer used for plowing, pulling, riding, etc. The distinction between the different types of Egyptian buffaloes is only environmental. It is the most important and popular livestock for milk production in Egypt. Population size: 5,317 000

**Description:** Blackish grey in colour, horn form varies from lyre to sword-shaped. The head is long and narrow, the jaws are long and strong. Ears are long and dropping. The neck is rather long, thin and straight. The forelegs are rather short and heavy boned. Ribs are wide, deep and well sprung. The rump is sloping and the tail setting is low. Height at withers of adult male is 178 cm, body weight is 600 kg. Height at withers of adult female is 144 cm, body weight is 500 kg. Distribution: All over the country, mainly in peri-urban areas and the Nile delta. Husbandry: The farmer keeps manure in a solid state inside the animal enclosure. The solid manure is taken twice a year and spread in the fields before planting. The animals are slaughtered only in slaughterhouses, following the Islamic practice of cutting the jugular vein. Milking is done by hand, twice a day, mainly by women. Average slaughter weight is 500 kg, at the age of 18-24 months. Carcass yield is 51 percent. Overall growth rate is 700 g/day. Dairy performance: Lactation duration 210-280 day Milk yield 1 200-2 100 k Milk fat 6.5-7.0 percent Products: The following cheeses are produced with the addition of cow milk: Domiati, Karish, Mish, Rahss.

**SOURCES OF EGYPTIAN WATER BUFFALOESS:** Villagers in medieval Egypt adopted the water buffalo, and become the most important domestic animal in modern Egypt. Buffalo population increased gradually and has reached over 5 million head. Buffaloes now supply Egyptian with more meat, milk, cooking oil, and cheese.

**Dimensions:** height at withers: 125-150cm- Weight: 350-600 kg- Color: dark grey- Horns: extend backwards(sickle shape).

Egyptian buffaloes are considered one of the most important farm animals that kept for dual purposes (milk/meat production). There can be vicious when handling (temperament can depend a lot on environment and level of confinement). Milk production: 4-10 kg of milk twice daily, depends of the amount of concentrate fed- Has at least a 7% milk fat- Milk is whiter in color than cow's milk- Days in lactation per year:210-280- Average number of lactations: 7 Calving: age at first calving: 34-41months Housing. In isolated pens beside the house- In pens connected to the house- In fields (usually tied to the ground) Watering: Through pipes for those kept in houses.- From irrigation can also for those in a field feeding usually fed base emduring the day and concentrate (corn, bran, cotton seed, etc.) at night.

**Behavior and physiology of water buffalo:**

In general the husbandry of buffalo is more or less similar to that of cattle. Buffalo are generally docile and easy to handle & unless wounded or severely stressed. Breeding throughout the year and having a calf every year. They carry their calf for 10 months; twin calves and dystokia are very rare. Adult females may reach 350kg, in Himalayans, to 800 kgin Bulgaria and Italy Longevity: up to20 years old Buffalo love to wallow in water but it is not necessary.

De-horning is not recommended as the horns provide a mechanism for body heat loss. Well constructed house is preferable can be loose yard or cubicles Buffalo exceed cattle in their ability to convert poor quality forage to meat or milk. Buffalo consume 2.5% of its body weight as a daily dry matter intake. tocking rates for buffalo:10-20%higher than for cattle. Buffalo prefer to graze a shorter sward to cattle, nearer to that for sheep.

**Comparison with Cattle**: Cattle and water buffaloes are obviously different animals.

**Genetics**:Swamp buffalo has 48 chromosomes. The River buffalo, 50 chromosomes. The chromosomal material is however similar in the two types and they crossbreed to produce fertile hybrid progeny. Cattle have 60 chromosomes, hybrids from the union are unlikely to occur.

Egyptian buffaloes are considered one of the most important farm animals that kept for dual purposes (milk/meat production). There are nearly 4 million buffaloes, representing 44% of dairy animals in Egypt (FAOSTAT, which contribute 44 % (2,640,638 ton) of total milk production (5,960,102 ton) and 18 % (270,000 ton) of total meat production (1,528,789 ton) in Egypt (FAOSTAT, 2008). Egypt suffers from a huge production gap in milk and meat detected in annual imported milk and meat Production of buffalo in Egypt couldn't fill such a gap due to the absence of specialized breeds/lines for (meat/milk) and the need for national genetic improvement programs. Therefore trials for the introduction of foreign breeds of buffalo (crossbreeding with both Italian and Pakistani breeds) were performed with the aim to significantly improve the genetic makeup of the Egyptian buffaloes for economic traits, as in case of the native cattle crossbreeding. Pakistani buffaloes have the potential of producing over than 5,000 liters of milk per lactation under efficient breeding, feeding and health care program. Nili Ravi is the best breed at national and international level in terms of its production potentiality, reflected in average milk yield per lactation of 2,430 liters, while some high yielding Nili Ravi also produce 3000-5000 liters/lactation (Bilal *et al., 2006)*. In Italy there are 300,000 buffaloes, used to be found in the central and south of Italy. Due to the quota on cattle milk, buffaloes have moved towards the north and replaced a portion of dairy cows. The number of recorded Italian milking buffaloes is around 44,000 (one third of the total buffalo population). Average milk production is 2,250 kg/lactation. It has increased the last 17 years

Buffalo meat, like the milk is lower in cholesterol and higher in mineral content than that of cows. Lean buffalo meat has less than half (44%) the total fat content of lean beef and has less saturated fat. When cooked there is little noticeable difference in the two meats, either visually or in taste or texture.[15]

Table 1: Comparison between buffalo and cows parameters

| | **Buffalo** | **Cows** |
|---|---|---|
| Butterfat % | 8.0% | 3.9% |
| Protein % | 4.5% | 3.3% |
| Cholesterol | 8mg | 14mg |
| Color | Pure white | Creamy |
| Texture | Smooth | Less smooth |
| Taste | Sweet | Salty |
| Cell Counts | Very low | Higher |
| Yield/Lact'nKg | 1850 | 5500 |

Meat Production:

**Buffalo meat production.** In developing countries of Asia where meat from ruminants constitute only about 21.0% of the total meat production, buffalo meat is about 11.52% of the total ruminant meat, and about 2.7% of all meat produced in the region. The average annual growth rate in production was about 1.3%. Undoubtedly, majority of world's buffalo meat is Asian, representing 91.89% and with volume of 3.08M tons in 2008 [7], About 78.5% of Asian buffalo meat was produced in South and South West Asia with the greater bulk contributed by India and followed by Pakistan. This is easily explained by the fact that these two countries have 75% of the buffalo population in the region. Improvement in buffalo meat yield is contributed by the increasing usage of male calves which were not fully utilized. In the past in the greater part of India, farmers were not paying enough attention to rescue the young animals from high mortality before reaching 6 months of age. In recent years, however, the rising export of Indian buffalo meat have given enough incentives for small herd farmers to rear these animals and put additional weight prior to slaughter, thereby sustaining the growth in the meat harvest from the Indian buffalo sector. On the average, however, the extraction rate registered among Asian countries is highest in Pakistan, Nepal and China [1]

**Genetic Improvement:**

Select superior buffalo bulls and cows for breeding. Performance testing, leading to the mass selection of superior animals, deserves high priority. A massive selection program is needed to bring about genetic progress. For each breed, bulls and cows with the potential for improving production of meat and milk and increasing draft power should be identified and used for breed improvement Crossbreeding of Swamp and River buffaloes is a potentially important route to genetic improvement[5]. Infusing genes for high milk production into the Swamp buffalo, now used mainly for meat and work, creates the potential for atriple-purpose animal. The use of artificial insemination and deep-frozen semen should be a major help in upgrading the buffalo. Transfer of live embryos for implantation in the uterus of surrogate mothers could be important for water buffalo [14].

**Asian Water Buffalo:** 97% of the world's water buffaloes are located In Asia

There are two types

1- Swamp buffalo:

Indigenous to those parts of Asia which do not have a great culture from consuming milk & milk byproducts (Indonesia northwards to China) It is a dual purpose animal (meat and draught) 2- River buffalo:

It is a triple purpose animal (milk, meat and draught power), Found in those countries where milk plays a more important part in the human diet e.g India, Pakistan, middle east, Caucasus and Balkans[5].

In addition to its for meat and/or milk, Buffaloes are still used in Asian countries as Drought animals (transport, land Cultiv. and carriage). An old Chinese women say:

"To my family, the buffalo is more important than I am. When Idle, they'll weep for me; but if our buffalo dies, they may starve.

South Asian countries where the rice cultivation depends mainly on buffalo-workload

Water Buffalo:

Kingdom: Animalia,Phylum:Chordata

Class:Mammalia,Order:Artiodactyla

Family:Bovidae ,Subfamily:Bovinae

Tribe:Bovini , Genus:Bubalus

Species: B. bubalis

**Water buffalo: an asset undervalued**

**Buffaloes - their distribution**

There are about 185 million buffaloes in the world (FAO Statistics). Roughly 97 percent of them or 176 million heads are water buffaloes essentially found in the Asian Region

The overall buffalo numbers are increasing at about 1.3 percent annually, while on other contraries, the numbers are dropping dramatically.

**The different types of water buffaloes**. The water buffaloes are of two types; the RIVERINE type and the SWAMP type.

**Features of riverine and swamp buffaloes**: Riverine buffaloes are usually black and have long curled horns. The Swamp buffaloes are usually dark grey but may also be black, black and white, or even all white. They have long gently curved horns.

**Unique features of buffalo contributions**: Richer Milk: Buffalo milk contains higher Total Solids (protein, fat, minerals) of 18 – 23 percent as compared to 13 – 16 percent in cow milk. This confers advantage to the production of cheese and some other dairy products Leaner Meat: Buffalo meat is tasty and lean. It contains lower saturated fat than beef and pork, and hence is considered a meat of good dietary value. Efficient Converter of Low Quality Feed: Buffaloes can utilize less digestible feeds (eg. rice straw, maize stovers, sugar-cane wastes, etc.) better than cattle to grow. This makes buffaloes easy to maintain using locally available roughage and crop residues. Buffaloes' values increase day by day as they grow (in contrast to machinery!). They need no costly fuel, never rust, and they reproduce!

Best Draught Power for Wet Environments: Buffaloes are superior to other draught animals inwet or waterlogged conditions, such as in muddy paddy fields. They can also be used for car haulage, carrying heavier loads than cattle. Enrich Soil Fertility: Buffaloes improve soil structure and fertility while treading paddy fields. Each year, an adult buffalo produces 4 to 6 tonnes of wet manure plus additional urine as bio-fertilizer to the land. This reduces or eliminates the need for chemical fertilizers as well as provides essential soil humus which chemicals can not provide. Secure Socio-Economic Status of Farmers: Buffaloes are

often used as cash savings, can be sold when needs arise (school fees, marriage, crop failure, debts etc.). Thus, the animals ensure the farmers' socio-economic security [2].

**What should be done? Should buffalo rearing be promoted? Or should cattle simply replace buffaloes?**

Also in future there will be an important role for buffaloes in Asian farming systems. Buffaloes and cattle are complementary.

Buffaloes can utilize feeds, especially low-quality feeds, more efficiently than cattle. Buffaloes also have unique advantages over cattle: they are less susceptible to ticks and other ecto-parasites (due to their wallowing); they can better withstand wet conditions underfoot and are therefore more suitable in many areas; and they are more docile (children/old people can manage them relatively easily)[18].

**Future strategies for survival of buffaloes:**

Improve access of small farmers to buffaloes through the many "Royal Initiatives" such as provision of animals to small farmers through the "Buffalo Banks" scheme, boosting buffalo raising in line with the "New Theory" for self-sufficient and sustainable agricultural production collect and effectively disseminate more and better quality information on farming systems (particularly with regard to economical and sustainable production) to farmers and other concerned parties. Further develop "model buffalo raising villages" based on best-practices and promote the concept. Provide incentives for production of quality meat and meat products from buffaloes. Buffalo meat should not merely be regarded as a cheap source for meat products like meat bulls, but should be valued as high quality meat, especially if derived [3]. From young animals, develop breeding schemes to improve buffaloes for those traits of importance to the long-term sustainable use of the species[3]. The three main areas for buffalo R & D Develop appropriate biotechnology innovations specific to buffaloes. At present, developments in biotechnology occur in other species, and the same techniques may be tried with buffaloes. Possible areas are artificial insemination, embryo transfer, cloning, biotechnology to improve feed utilization and disease control[8].

Fig 4: Reproduction

Fig 5: Feed and management

Fig 6: Disease control

**The importance of buffalo in the world.**

There are only countries in Asia, Africa and Europe that have reported milk producing buffalos to FAO, and the USA has reported meat producing buffalos [1]. The superior amount of the buffalos is in Asia with 95.5% of the world buffalo population. In Africa, 4.2% are found, in Europe 0.2% and in America 0.1%. India has the biggest buffalo population with about 33 million dairy buffalos and 10.8 million meat producing buffalos. India also produces most buffalo milk and meat in the world and the quantity is about 52 million tonnes of milk and 1.5 million tonnes of meat [1] These statistics shows that it is in the South and South-East part of Asia were most of the buffalos can be found. In Africa, Egypt has reported about buffalos. Number of animals for milk production is 1.6 million and for meat production 1.5 million .Three countries in southern and eastern Europe have to FAO

reported to have milk and meat producing buffalos in 2006; Bulgaria, Greece and Italy. Italy has the biggest amount of these animals; about 154 000 dairy buffalos and 5000 meat producing buffalos. Thereafter is Bulgaria, but with a strikingly lower number of animals; about 4000 dairy buffalos and 2000 meat producing buffalos. Greece has 150 dairy buffalos and 450 buffalos for meat production. [14] reported that buffalos are well adapted to hot and humid climate and therefore makes a good production animal in the Tropic Zone. The milk is consumed both as fluid milk, cheese and other dairy products. In Egypt, the milk is mainly used to make a product called "Queshta Mosakhana" of the floating cream after boiling the milk. In Bulgaria and Greece, the buffalo milk is mainly processed into yoghurt and in Italy buffalo milk is used to make mozzarella cheese, both for the national and international market.

**Role of FAO in buffalo development:** FAO has always emphasized the important role that buffaloes play in overall agricultural production in Asia. FAO has worked over the years on various aspects of buffalo production and draught animal power.

In the feed sector, as amply demonstrated through FAO projects, the development of systems to improve ruminant feed quality from straw (urea treatment) and the use of mineral feed blocks (urea-molasses blocks) can greatly assist in the improved efficiency of buffalo production. FAO provides a forum for information about the importance of the species. Various FAO publications provide information and know-how on buffalo development. Workshops have been held addressing new technologies for buffalo production (e.g. multiple ovulation embryo transfer, nuclear techniques in buffalo breeding and disease diagnostic, etc.). FAO was also instrumental in the establishment of the Asian Buffalo Association (ABA) formed to foster further scientific exchanges within the major buffalo-keeping countries. FAO also has linkage with the World Buffalo Federation (WBF) which attempts to involve other various regional associations. The International Livestock Research Institute (ILRI), which has only recently assumed a global role, is involved in examining the genetic diversity found in buffaloes. FAO has close cooperation with ILRI. Donor countries to international agricultural development have been involved in efforts to carry out crossbreeding strategies to improve productivity of buffaloes. FAO has been coordinating many of these efforts. FAO has been developing a global strategy on Animal Genetic Resources and has established a global databank in which disappearing breeds are identified and the status designated as "risk of extinction". Two editions of the "World Watch List for Domestic Animal Diversity" have been produced (1993 and 1997) FAO has whenever possible provided assistance to the global effort of buffalo promotion. It is feared that what's happening in Thailand may soon also take place in other countries (Cambodia, Indonesia, Laos, Myanmar, the Philippines) where the swamp buffalo population is still stable. Increased agricultural mechanization in these countries especially in the small farming sector may induce the decline of buffalo numbers similar to the situation witnessed in Thailand.

Table 2:Vital Clinical And Laboratory values:

| **Animal** | **Cattle** | **Buffaloe** |
|---|---|---|
| Normal Temperature °C | 38.5 | 38.2 |
| Pulse rate/min | 50-80 | 40-60 |
| Respiratory rate/m | 10-20 | 8-20 |
| RBCs (T/l) | 5-10 | 6-8 |
| Hb (G/dl) | 8-14 | 11.5-15.5 |
| WBCs (G/l) | 4-12 | 7-9 |
| PCV (%) | 26-42 | 32-52 |

Buffalo blood parameters diseases susceptibility vs cattle: [15]

The greatest buffalo losses are often among calves. Newborn buffalo calves, like cattle calves, can die in large numbers due to viruses, bacteria, and poor nutrition.

Calves especially rarely suffer from pneumonia or non-nutritional scours. Poor management during the calf's first2months of life may attribute to these losses., e.g. depriving calves from their valuable mother milk to sell it. Proclivity of buffalo calves for wallowing exposes them to water borne diseases. I- Non infectious disease

1-Exposure to heat and direct sunlight

•Buffaloes suffer if forced to remain, even for a few hours, in direct sunlight.

•They have only one-tenth the density of sweat glands of cattle and their coating of hair is sparse, providing little protection from the sun. Accordingly, buffaloes must not be driven over long distances in the heat of the day. They must be allowed time for watering and, if possible, for wallowing. Driving under a hot sun for long hours will cause heat exhaustion and possibly death; losses can be very high and can occur suddenly Young calves are particularly affected by heat[17].

the sun is inadequate to ripen, Sudden drops in temperature and chill winds may lead to pneumonia and death[17].

2- Exposure to extreme cold Buffaloes are also sensitive to extreme cold and seem less able than cattle to adapt to truly cold climates, Buffaloes don't do well where

3- Lameness and clinical mastitis is also rare in adults.

4-Lymphangitis and Limb Abscesses were frequently noted on Egyptian Buffalo.

5- There has been no incidence of BSE in any buffalo anywhere in the world. Traumatic reticuloperiton it is and its.

6-Allied syndrome Traumatic pericarditis[17]

7- Phytobezoar obstructing The reticuloomasal orificecausing

ruminitis, regurgitation,aspiration pneumonia and deathin a she-buffalo 8- Frothy Tempany

9- Metabolic diseases- Hypophosphatemia It occurs mainly at late pregnancy, It is related closely to feeding with Barseen (Sweet Clover). In Cattle it occurs primarily at peak of lactation and related directly to heavy milk production Milk fever occurred in mild form and respond to ca therapy as well as Tail Tip Necrosis in buffaloes Zinc deficiency/or microfilaria[ 10].

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