

# A Review on Strategies for Sustainable Buffalo Milk Production in Egypt

Hagos Arefaine\* Mokhtar Kashwa

Department of Animal Nutrition and Management, Swedish University of Agricultural Science, PO box 7070, SE-750 07 Uppsala, Sweden

\* E-mail of the corresponding author: hagos.amu@gmail.com

## Abstract

The review was made to give an account on current milk production, challenges and strategies for sustainable buffalo milk production in Egypt. Buffalo is a multipurpose and economically important animal especially for developing countries. In Egypt, buffalo represents 47 % of the total population compared to cattle. And buffalo's milk is preferred by the Egyptian consumer due to its high fat content, color and flavor. This indicates that Egypt have great opportunity to produce buffalo milk because of its high consumer preference and demand. However, milk yield per dairy buffalo is still low which is 4-10 kg. Furthermore, despite the much higher population of buffaloes in Egypt, the productive and reproductive performance is lower compare to Italy which has a smaller buffalo population. This indicates that the dairy buffaloes are not fully utilized in Egypt. Therefore, there is a need to improve the current production potential through capacity building, appropriate feeding strategies, health care, appropriate milking routine, use of milk storage and processing facilities and creating strong market linkage with dairy companies. Furthermore, proper recording of individual buffalo cow milk yield, selection based on pedigree information, accurate estrus detection and nucleus herd breeding strategies will bring sustainable improvement for efficient utilization of buffaloes in Egypt.

**Keywords;** Strategies, Sustainable, Buffalo Milk

## 1. Introduction

By 2050, the world human population is expected to become 9 billion, because of this food production has to increase by 70 percent to feed the expected world population growth (IFAD, 2010). To achieve this goal, strategies that are simple, low-cost and environmentally suitable farming systems are needed (Sansoucy *et al.*, 1995) to ensure food security and bring economic sustainability as well as to protect the environment sustainably. Among these strategies, maximizing crop yield through use of improved technologies and improved crop varieties, fertilizers and other management inputs have been practiced. As a result, crop yield has increased more than doubled (J. Pretty *et al.*, 2008). However, the yield is still insufficient to meet the demand of smallholder households due to small land holding capacity. Alternatively, dairy animals like buffaloes holds the greatest promise and production potential to solve food security through generating cash income from milk, milk product, meat, sales of live buffalo (Cockrill, 1994) and provision quality protein, energy and other required nutrients to solve malnutrition (FAOSTAT, 2009).

Water buffaloes are the main source for milk in Egypt and contribute more than 70% of the annual milk production (Abou-Bakr, 2008). Furthermore, El-Salam *et al.*, (2011) reported that buffalo's milk is preferred by the Egyptian consumer because of its white color, high fat content and flavor. As a result there is high demand for buffalo milk in the country (Helal *et al.*, 2008), but milk yield per dairy buffalo is low which is 4-10 kg (Ibrahim, 2012). This indicates that Egypt have great opportunity to produce buffalo milk because of its high consumer preference and demand. However, the sector is not poetically utilized yet due to many constraints. Hence, the aim of this review was to give an account on buffalo production in Egypt with milk production as the main focus. The Current situations, challenges and issues for sustainable buffalo milk production are also discussed

## 2. Literature Review

### 2.1. Features of Water Buffalo

Buffaloes are members of bovine animals classified into two main species (Chantalakhana and Bunyavejchewin, 1994). These are African wild Buffaloes (*Syncerus*) and Asian Buffaloes (*Bubalus bubalis*), which is the most domesticated (El-Salam *et al.*, 2011). Asian buffaloes are further classified in to river and swamp buffalo sub Species (Perera, 2008). River buffaloes are often called water buffaloes and have high lactation yields than swamp buffaloes (Nanda and Nakao, 2003). Egyptian water buffaloes are characterized by blackish grey in color, sword like horn, height at withers of 144 cm, average body weight of 500 kg and are mainly found along Nile delta (Ibrahim *et al.*, 2012).

### 2.2. Socio-economic Importance of Buffalo

Buffalo is an economically important livestock species especially in low-income countries and plays a

significant role through contributions in social and cultural aspects (Desta, 2012). It is also source of meat and milk (Nanda & Nakao, 2003). Buffalo milk can be converted into many kinds of cheese, primarily mozzarella (Aspilcueta-Borquis *et al.*, 2012). Furthermore, buffaloes are valuable work animals (Perera, 2008), commonly used as draught animals in crop fields (Nanda & Nakao, 2003). Due to these reasons, water buffalo is often called the living tractor of the East since it is relied upon for draught and transportation in many parts of Asia (Chantalakhana, 1994).

Moreover, in case of crop failures due to drought or flood, buffaloes can be sold in order to obtain sufficient cash income to purchase a grain supply for year-round family consumption (Chantalakhana, 2001). Leather is another major contribution of buffalo in the world market (FAOSTAT, 2014). Dung is used as organic fertilizer. Buffalo racing and plowing contests and fighting are among traditional festivities after rice harvest in Thailand (Chantalakhana, 1994).

### 2.3. Population of Water Buffalo in Egypt

The Buffalo population in Egypt represents 47 % of the total population compared to cattle (Galal *et al.*, 2007). According to FAOSTAT (2013) the buffalo population in Egypt has increased from 325,000 heads in 1993 to about 4,200,000 heads in 2013. This increasing trend might be due to high demand for buffalo products such as milk, cheese and butter.

### 2.4. Husbandry practice

Borghese (2010) reported that majority of the buffalo milk is produced by smallholder production system which is characterized by 1 to 5 heads of buffalo per household. Most of the buffalo populations are indigenous breed type (Galal *et al.*, 2007). The input of this system is relatively low while the output seems to be medium and buffaloes are much fitting to this system, this might be due to their better utilization of poor quality forage (Pradhan *et al.*, 1991). Milk is mainly produced from buffalo and used either for family consumption or sold to neighbors or middlemen at low price (Abou-Bakr, 2008).

Pri-Urban production system is common near cities with an average herd size of 9 heads per household and characterized by higher milk production, longer lactation length (Galal *et al.*, 2007) and better feeding (Abou-Bakr, 2008) compare to smallholder production system. On the other hand, intensive milk production in Egypt is characterized by having more than 50 heads of dairy buffalo per farm with better management system (Galal *et al.*, 2007). Under this production system, milk recording is practiced mainly for improving management routine of the farm and some farms have milk processing plant and feed milling machine (Abou-Bakr, 2008).

In Egypt, there are six breeding stations with a total of 60 bulls and all smallholders take their buffaloes to breeding stations, where as in intensive farms, breeding bulls are mainly raised from their own male calves (Borghese, 2010). Age puberty in buffalo is difficult to determined (Jainudeen and Hafez, 1993). This may delay age at first calving. Furthermore, Ibrahim *et al.*, (2012) noted that the use of Artificial insemination is very low (1%) and mainly used in intensive buffalo farm types.

The most common housing system is traditional, consisting of keeping buffaloes indoors at night and confined in fenced areas during the day (Borghese, 2010). Buffaloes fed on green forage composed of green forage and hay made mainly of *Trifolium alexandrinum* (*Egyptian clover*) during summer and winter season respectively. The most common by-products given to buffaloes include cotton and cane residuals, stalk, cobs and straw (Borghese, 2010).

Pradhan (*et al.*, 1991) reported that buffalo have a better capacity to digest poor quality forages than cattle. This might be due to large rumen volume, high rate of salivation, slower passage rate of through reticulo-rumen, slow rumen motility, higher cellulolytic activity of microbial population, lower dry matter intake per unit body weight (Mudgal, 1991).

### 2.5. Dairy performance

The water buffalo is the second most important species in the world in terms of milk production, after dairy cows (Coroian *et al.*, 2013) and main source of milk in Egypt (El-Salam *et al.*, 2011). Comparing to cow, buffalo milk is higher in protein, fat, lactose and energy (Table 1). According to Jainudeen and Hafez (1993), the river type (water buffalo) exhibits first estrus 15 to 18 months than the swamp type which is 21 to 24 months. Borghese (2010) emphasized that estrus of buffalo cow is influenced by season, genetics and length of daily light hours. Furthermore, calves with good feeding levels and sprayed with water during hot season are reported the youngest age of puberty for the Egyptian buffalo 9.9 months (Mohamed *et al.*, 1980). In Egypt, milk yield of most buffalo ranges from 1200 to 2100 kg per lactation and lactation length of 210 to 280 days (Ibrahim *et al.*, 2012) and some of the Egyptian traditional cheeses includes karish, domiati, mish and rass (Borghese, 2010).

## 3. Discussion

Dairy buffalo production has been a tradition in Asia, Iraq, turkey, Afghanistan, Egypt and some parts of Europe

where fresh buffalo milk, cultured sour milk, ghee and yoghurt are popular products (FAOSTAT, 2009). Based on FAOSTAT (2013) report, Asia is the continent possessing the largest buffalo population (Figure 1) with 119 breeds. Whereas, Africa is the second continent with buffalo population possessing 6 breeds of buffaloes (DADIS, 2011), and the largest number of buffaloes in Africa is present in Egypt. Majority of the buffalo milk in Egypt is produced by smallholder producers (Borghese, 2010).

The major share of buffalo milk in total milk production of Egypt is actually much higher. This is because of milk production of sheep and goats are devoted to rearing suckling lambs and kids (Ibrahim and S. A., 1997). Moreover, the society prefers buffalo milk than milk from other livestock species. The buffalo population yields about 54.5% of milk production, which was about 1,555,929 tons in 1993. This share increased to 70 %, which is 2,614,500 tons in 2005 (Abou-Bakr, 2008). However, the contribution of Egypt to the world buffalo milk and meat is 2.7% and 8.4% respectively (FAOSTA, 2009).

Despite the much higher number of buffalo population in Egypt than in Italy, the productivity of Egyptian buffaloes is much lower (Table 2) with less milk yield, due to the fact that Italy has established a great deal of effort in recording, selection, breeding and improving feeding strategies (Borghese, 2010). This indicates that Egypt did not apply appropriate production strategies to fully utilize and benefit from the available buffalo resource. Galal *et al.* (2007) emphasize that lack of effective sustainable breeding programs for local buffalo breeds is the major reason that such breeds are not efficiently utilized. Moreover, nutritional deficiency, infrastructure, diseases and lack of skilled manpower cause inefficient utilization of buffaloes in Egypt.

#### 4. Conclusion

Buffaloes are economically and culturally important livestock species especially in developing countries. They possess the highest potential for production with a promising gene pool, which is still not fully used. In Egypt, Water Buffaloes are the most important and popular livestock for milk production. Despite the high population of buffaloes in Egypt, the productive and reproductive performance is still low. Due to this fact the country is not obtaining maximum benefit from the sector. Therefore, there is a need to improve the current buffalo production potential through providing training, credit and finance, consultancy service, adequate veterinary service, feed conservation, adoption of improved forage and use of agro-industrial by products such as oilseed cakes and infrastructure. Beside to this, use of milk storage and processing facilities and creating strong market linkage with dairy companies. Furthermore, appropriate milking routine especially increasing milking frequency at early lactation to gain carry over effect for the whole lactation; proper recording of individual buffalo cow milk yield information, selection of buffalo cow or bull based on pedigree information, accurate estrus detection and nucleus herd breeding strategies will bring sustainable improvement for efficient utilization of buffaloes in Egypt.

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## 6. Appendix

Table 1: Chemical analysis of buffalo and cow milk (adapted from Ménard, 2010)

	Buffalo Milk	Cow Milk	Significance
Fat (g/kg)	73.4 ± 9.9	41.3 ± 3.7	
Lactose (g/kg)	45.7 ± 1.2	33.6 ± 1.7	
Protein (g/kg)	55.8 ± 0.9	48.7 ± 1.6	

Table 2: Buffalo productivity in Egypt and Italy (adapted from Borghese, 2004)

Countries	Total Number	Adult Female	Lactation Milk Yield (kg)	Days of Lactation	Milk Recorded Buffaloes	Recorded (%)
Egypt	3,717,000	1,487,000	1,600	312	3,040	0.2
Italy	265,000	133,000	2,175	270	36,966	27.8

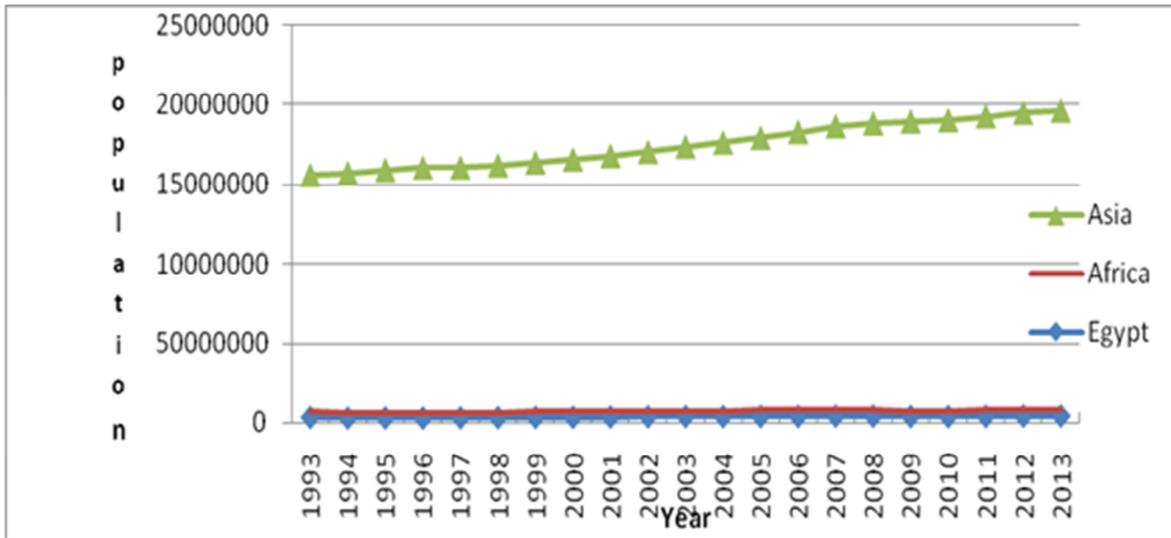


Figure 1: Buffalo population trends of different continent (a data analyzed from FAOSTAT, 2013)

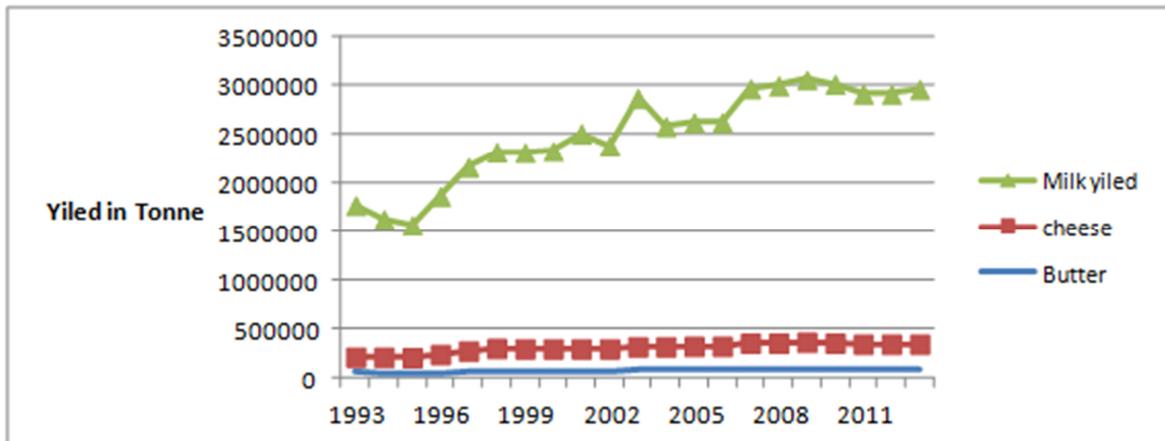


Figure 2: Buffalo milk, cheese and butter yield in Egypt (analyzed from FAOSTAT, 2013)

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