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# Buffaloes as Producers of Meat and Milk

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A FAIRLY extensive review has been undertaken on work done with buffaloes on milk and meat production. Since buffaloes resemble cattle in many aspects of productive and reproductive characters, the very same methods used for the improvement of the latter maybe applied with the former. It is well known that the problems of the developing countries varied and complicated. However, under-nourishment among the populations, especially in relation with protein, is one of the major challenges. Definitely any increase in milk and meat output will mean a great deal. The potentiality of buffaloes as milk and meat producer is barely touched. Through beter management, a balanced ration and sound hygiene, results will be greatly felt faster than through effects of changing the genetical constitution. This by no means rules out what should be done towards genetical improvement. It cannot be over-emphasized that imporvement of well-adapted buffaloes is much easier than trying to create an environment suitable for the imported foreign breeds of cattle.

Contrary to the common belief, buffaloes are widespread allover the world; from the far East to South America, and from many European countries to deep in Africa, the Middle East and Asia. It is to the buffaloes' credit that they are still existing in spite of the fact that they are the most neglected animals among all classes of livestock. The budget alloted to their improvement is almost nil when compared with cattle, sheep, swine, goats or poultry. However, only recently the potentiality of buffaloes as meat and milk producer has been realized and some projects have been set up. These projects are by no means adequate but serve as a start.

There are more than 150 million domestic buffaloes in the world in comparison to 847 million cattle. Buffaloes are divided into two groups. African (Syncerus) and Asian (Bubalis). The present report will be limited to the domesticated River Buffalo (Bubalis bubalis) in Egypt. It is about smilar in characteristics to that of India and Pakistan; and probably originateid there. Caution is needed here before proceeding any further. It should be noted that statistics in many developing countries are not accurate. For obvious reasons, a lot of work is done on a limited number of animals and quite often control groups are lacking or inadequate at best. The great dispersion of animals among millions of owners adds to the complexity of the problems involved in any study or improvement sought. Almost all the data are based on animals at governmental of university farms which cannot represent the country as a whole.

In Egypt, most buffaloes are black or grey in colour. The mature male weights 450 to 800 kg and the female 350 to 700 kg black colour is dominant or epistatic to grey and the brown is recessive. Horn shape and size are quantitative characters. For the purpose of clarity, the present topic will be divided into four sections: I- General information, II- Work production, III- Meat production and V- Milk production.

## I - *General information*

The reproductive organs of buffaloes conform to the general picture of the mammalian type; with considerable similarity to the anatomy of the generative organs of cattle (Gockrill, 1974). The testicles are smaller in the former than those of the latter (78 g vs. 400 g). The weight of each ovary is about 3.7 g (half that of the cow). Male buffaloes attain sexual maturity later than bulls. The former reach puberty at an average age of about 81 weeks (Say, *et al.*, 1960). Average age at first estrus was 405.5 days (body weight about 200 kg). The period from estrus to conception was quite variable (52 to 438 days). The average age at first pregnancy was 647 days (mean body weight 319 kg ). The age at first calving ranged from 22 to 56 months with an average of 38 months. The mean age when bulls are used for service was 3.0 to 3.7 years; and the average useful life for them was 4 to 5 years (El-Itriby and Asker, 1957). A male may serve 100 females in a year; however, it is recommended to limit the number to 50 females only (1 to 2 services per week).

Twinning is rare (0.30 to 0.63%). Gestation period lasts about 316 days. Estrous cycle is 3 weeks and heat continues for 24 to 36 hr. Ovulation takes place few hours after the end of estrus. Signs of heat are not obvious, hence a number escapes undetected, which is a major problem, in addition to the frequency of silent heat (Oloufa, 1960). Like cattle, buffaloes are right-ovulators. The most efficient way of detecting estrus is through the use of teasers. It is claimed that seasonal variations in reproduction are more pronounced in buffaloes than cattle. However, this point is quite debatable, since they maybe due to the effect of heat stress on both sexes in the former rather than as an inherent characteristic (the buffalo being more sensitive to heat than cattle). More will be mentioned later in this connection. Post-partum estrus appears after 10 to 136 days (Cockrill, 1974). Post-partum conception averaged 67 days; ranging from 31 to 114 days. Calving interval was 541 to 650 days; with a repeatability and heritability of 0.179 and 0.130, respectively (Asker, 1968). Calf crop averaged 62.64 to 67.37% (Oloufa, 1960 and Cockrill, 1974).

The mean service period was 141.6 days Primiparous buffaloes had significantly longer post-partum service period than pluriparous ones. Also those weighing less than 400 kg after calving had the longest service period.

Data based on 28 years of natural service showed conception rate in buffaloes to be 41.10%, while it was 36.46% for native cattle with 50 to 58% of all conceptions requiring one service (Oloufa, 1960). Asker and Ragab (1951) and Asker (1968) reported that calving interval in buffaloes averaged 14 to 18 months, with a repeatability of 0.05 to 0.16. The mean generation interval was 6.05 years. According to El-Fouly *et al.* (1977) it took 37 to 39 days after parturition for complete uterine and cervical involution; whether buffaloes were milked or suckled.

Mortality rate until the age of three years is a major problem. This is especially true in the first 6 months of the life of calves. The mean mortality rate on reaching 3 years of age was 35%,80% of which occurred during the first six months, and especially before weaning. The claim that buffaloes are more resistant to diseases than cattle needs to de substantiated before being accepted. In fact, data collected by Reda and oloufa (1954) failed to support this claim. The same applies to the notion that buffaloes are more efficient than cattle in utilizing poor quality roughage.

Buffaloes are more sensitive to heat and cold thancattle; although sexual activity continues throughout the year with varying degrees (Cockrill, 1974). The high sensitivity to heat stress is related to their colour, thickness of the skin and the number of sweat and sebacious glands (Cockrill,1974). Badreldin *et al.*(1951) found seasonal variations in body temperature and respiration and pulse rates in buffaloes. When exposed to direct solar radiation, Badreldin and Ghany (1954) reported buffaloes to be more hyperthermic than cattle. Skin thickness in the former was doube that of the latter; and increasing with age. According to Ragab *et al.*(1953) sprinkling and shading were more effective than shading alone on the effect on body temperature and respiration rate. Sebum secretion from the skin was higher in buffaloes than cattle (111 mg. vs. 25-40 mg sq.mm. On exposure to direct solar radiation; while sebum secretion decreased in cattle, it increased in buffaloes. Sebacious glands were more active in buffaloes than cattle (Shafie and Abou-El-Kheir, 1970).

According to Cockrill (1974), respiration rate followed air temperature very closely. Body temperature and pulse rate continued to rise after air temperature began to fall (lag of 3 hr). Calves under one year of age suffer more from heat than adults. Body temperature, respiration rate and pulse rate are lower under shade for buffaloes than cattle. In buffaloes, hair grows singly and not in groups. Dark skin is a grave disadvantage to buffaloes in direct sun.

The general picture of the physical and chemical characteristics of buffalo semen resembles that of the standard breeds of cattle (Sayed and Oloufa, 1956). However, on the average, the quality of buffalo semen is lower than that of the bull. As in cattle, some buffalo males fail to do well when used for artificial insemination. A completely satisfactory diluter for buffalo semen is yet to be developed. There are varying degrees of success from the use of both fresh and frozen semen, especially the latter. Sayed *et al.* (1960) found that both physical and chemical characteristics of buffalo semen were affected by the month and season of the year, with the

second ejaculate being usually better than the first one. Yassen and El-Kamash (1972) stated that the highest rate of sperm survival was in glycine extenders (1.7% glycine, 7.% glycerol, 1.% fructose and 20 % egg-yolk)

II - *Work production*

The buffalo is the animal of the small farmer. It is common to find animals 25 or 30 years of age or more and still capable of work. Buffaloes are ideal for being able to move in deep mud as in padi fields inaccessible to machines. A buffalo may work 5 to 10hra day with intervals of rest. Draught animals may disappear in the future; but so far 85% of the total draught power in the world are provided by animals (Cockrill, 1974). In Egypt, buffaloes may work in padi fields, raise water from wells and pull carts. However, using buffalo females for work lowers their milk production. It is hoped that animals, especially buffaloes, are relieved from work in the future and are raised soley for meat and milk production. It is known that feed efficiency is at its lowest level when feed is converted into work as compared to meat, milk, *etc.* In a study by Oloufa (1949), it was found that the cost of using machines on the farm was half that when the same work was done by animals.

III- *Meat production*

The general practice of the Egyptian farmers is to sell to the butcher all male buffalo calves when reaching the age of 20 to 40 days. This is a purely economical undertaking; since the price of such veal is quite high. By so doing, the farmer also avoids much of the heavy losses due to calf mortality during the suckling period. Furthermore, he saves the milk and sells it at a good price because of its high fat content or transfers it into ghee. As for sire replacement, this is left almost entirely to the few governmental farms. Most female calves, however are saved for replacement because of the high rate of mortality at their early ages as mentioned before.

Meat from buffaloes are considered by and large a by-product from ulled animals or in emergency. The potentiality of buffaloes as a meat p[e]roducer is hardly touched. The average weight of calves at birth was found t[b]y Badreldin (1955) to range from 23 to 40 kg: with males a litte heavier t[h]an females. While cattle calves doubled their body weight in 8 weeks, s[h]ose of buffaloes required 12 weeks to do so (Ghoneim *et al.*, 1957). The ame authors concluded that male buffaloes were the best for meat production when compared with female buffaloes or both sexes of native catte up to 18 months of age.

Since body weight and growth rate are characters of high heritability and can be measured in both sexes, no progeny testing may be necessary for their selection (Ragab and Abdel-Salam, 1963 and Cockrill (1974). Cockrill claims that it is generally believed that buffaloes make more efficient

use of fibrous forage than cattle, however, careful experiments should be conducted to compare digestibility of different feeds before accepting this point of view. Studies on microbal populations in rumen are meagre and often using only one animal.

There is a correlation between body weights of calves and those of both parents during the early stages of growth. More immediate improvement in growth rate be attained by better feeding and management than by changes in the genetic constitution. The mean daily gain up to 12 months of age was 0.58 to 1.00 kg. Up to 24 months of age, buffaloes showed gain and fattening ability that might surpass those of native cattle, fattening mature animals was no less responsive to good feeding. Dressing percentage of buffaloes is less than that of cattle because of thicker hides and bigger heads of the former. However, the structure of the edible parts of the carcass is almost identical to that of cattle. But in buffaloes, fat accumulates more under the skin and the wall of body cavities and less between and within the muscles. The structeur of meat from older animals has a coarse appearance. However, it has more protein, iron and phosphorus and is easily digested. Meat from old buffaloes is darker in colour, and less tender with a stronger odour than that of cattle.

From several experiments, Ragab and Abdel-Salam (1962) and Ragab *et al.* (1966) stated that it is best to kill male buffaloes at 12 months of age weighing 230 kg on the average, with a dressing percentage of 53%. Animals may be finished, however, for 6 more months until reaching a mean weight of 360 kg. They added that buffalo calves should not be killed at the suckling stage, since this is a great waste of valuable resources. They further recommended setting up projects, governmental or preferably cooperative, to buy these young calves from farmers and feeding them on suitable milk substitutes until weaning, then using concentrates and green feed for fattening until the age of 12 or 18 months. It was well phrased by Cockrill (1974) that it will be more effective to increase meat output from well-adapted buffaloes than to try to create favourable conditions for imported breeds of cattle.

Efforts should be directed towards discouragingfarmers from getting rid of the baby calves before weaning by providing them with subsidized milk replacers and feeds and by advising appropriate hygienic measures to keep diseases and mortality at a minimum. The drain on animal resources should be checked since already a lot of harm has been done in this connection. This is reflected by the soaring prices of meat, with the condition getting worse.

*IV- Milk production*

Averages for milk production as reported in the literature do not give due credit to buffaloes as a valuable source for milk in this country. Although the number of buffaloes is about the same as that of cattle in Egypt, 70% of milk are produced by the former. The number of buffaloes in each experiment is usually quite limited and feeding especially during the early stages of

life is by no means adequate. Asker (1968) and Mostageer (1978) stated that the mean milk yield was 1230 to 1800 g for the first lactation. Maximum milk production is claimed to occur at the third to the fifth lactations (Ragab, *et al.*, 1954; Ragab and Sourour, 1963; Cockrill, 1974 and Fahmy *et al.*, 1975). However, if well-managed and fed , a buffalo might maintain its peak milk yield until the sixth or seventh lactations (Cockrill, 1974 and Fahmy *et al.*, 1975).

Heritability and repeatability of milk yield ranged from 0.24 to 0.36 and 0.36 to 0.55, respectively (Asker, 1968). The same author stated that the annual genetic gain through selection amounted to only 0.04 to 1.8% of the total milk yield.

Buffalo milk is white in colour. It contains no carotene although it is as rich as cow's milk in its vitamin A content, but ascorbic acid is distinctly higher in the former. Its specific gravity is 1.305 and the freezing point is 0.545. Most buffaloes are milked in the presence of their calves, although this is not necessary. Proteins in the milk of buffaloes resemble those in cows' milk, though not identical. Butterfat in the former is 6.4% or more (Asker *et al.*, 1969). It is also higher when animals are milked thrice than twice daily. There was a negative correlation between milk yield and butterfat content (-0.106) and the repeatability of butterfat percentage was 0.511 according to Asker *et al.* (1969). Asker (1968) reported that lactation period averaged 300 days, with a heritability and repeatability of 0.11 to 0.24 and 0.16 to 0.31, respectively.

Ragab and Sourour (1963) found the dry period to average 147 days; while Asker (1968) stated that it was 201 days with a repeatability of 0.12 to 0.20 and a heritability of 0.02 to 0.26. As far as the reproductive life (longevity) is concerned, Asker *et al.* (1954 and 1969) stated that it averaged 2.45 to 3.45 lactations with no effect of age at first calving. They estimated the heritability of longevity to be 38.4% .

Oloufa *et al.* (1953) found thyroprotein feeding to buffaloes to increase milk yield by 4.18% with no change in butterfat percentage and body weight. Conception rate was lower in the treated group while body temperature and respiration and pulse rates were slightly higher in the control. However, all the above-mentioned characters showed no statistical significant differences.

Some studies were conducted on heat tolerance in buffaloes. As mentioned before, buffaloes are more affected by heat and cold than cattle. Milk production is reduced by the effect of high environmental temperature. The same is true with fertility in both sexes. Cockrill (1974) stated that selection should be directed towards milk yield rather than heat tolerance. The animals then should be protected from heat by management: shade (which is the most important factor), indoor feeding or grazing at night, protection from hot wind, and frequent showering or wallowing.

Probably the most well-planned experiment with buffaloes in recent years is the one being carried out by Mostageer and associates (1978). The number of animals used is reasonably large. Ten sires per year are being progeny tested. Body weights at birth and every month thereafter are taken, besides some body measurements. Both fresh and frozen are used. Milk yield, butterfat percentage and several repoductive traits are studied. Data are yet to be completed. However, the following are some of the preliminary results: Out of 505 services, (fresh semen) conception rate was 52.63%. First lactation averaged 1257 kg of milk in 261 days. The age at first calving was 39.5 months. Work on heat tolerance showed that body temperature decreased with age. It was higher in summer than winter and in the afternoon than in the morning with no effect by pregnancy. Respiration rate increased with the advance of pregnancy, but decreased with age. Pulse rate decreased with age also but increased in winter than in ummer, and at night than in the morning The advance in pregnancy was accompanied by an increase in pulse rate.

Since estimates of both repeatability and heritability of the different traits studied are about the same for cattle and buffaloes, then the same methods of selection used with the former may be applied to the latter. Heritability of age at first calving, calving interval, service period and dry period showed that most of the variations among individuals are of no genetical origin. Thus improvement in management will undoubtedly improve these traits. Attempts, should be directed towards lowering the age at first calving. This can be accomplished by raising the calves under a high standard of feeding before and after weaning in addition to proper feeding of their dams especially during the last stages of pregnancy.

Another important point often overlooked is the detection of estrus. All efforts should be exerted to minimize the number of heats escaping undetected. Accurate records are the corner-stone for a sound breeding programme for both production and reproduction purposes. Due attention should be given to hygiene so that high mortality rate especially among calves is checked.

Estimates of heritability of milk production in buffaloes are close o those reported for dairy cattle. Thus much improvement may be attained by raising the standard of feeding and management. Buffaloes may be selected on the basis of the record of their first lactation. The great dispersion of animals among millions of owners, however, is unquestionably a serious handicap. Artificial insemination should be used on a largest possible scale to make the full use of the rare improved sires available. Selection should be limited to the least number of the most important productive and reproductive traits.- More attention should be directed towards progeny testing if real progress is sought. The use of frozen semen may be postponed at present until the important problems involved are solved.

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# انتاج الجاموس من اللبن واللحم

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يعتبر هذا البحث استعراضا للدراسات التى اجريت على الجاموس كحيوان منتج للحم واللبن • وحيث ان الجاموس يشابه الماشية فى كثير من خواصه الانتاجية والتناسلية فان نفس الطرق التى اتبعت فى التحسين فى الماشية يمكن تطبيقها على الجاموس •

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ان قدرات الجاموس كحيوان منتج للبن واللحم لم تمس تقريبا حتى الآن وانه بتحسين الرعاية والحالة الصحية للقطيع علاوة على التغذية المتزنة سينتج عنه بلا شك نتائج محسوسة أسرع من التغير فى التركيب الوراثى ـ وهذا لايعنى مطلقا عدم اهمية التحسين الوراثى • ويجب الاشارة هنا الى ان تحسين حيوان كالجاموس موافق للبيئة المحلية أسهل بكثير من محاولة خلق بيئة صالحة للأنواع المستوردة من الماشية •