

Planetary Impacts of Dairy Buffalo

Antonio Borghese 1, Carlo Boselli 2, G.M. Terzano 3

1, General Secretary International Buffalo Federation, Coordinator FAO-ESCORENA Buffalo Network, 2 Animal Prophylaxis Research Institute for Lazio and Toscana Regions, Roma 3 CREA Animal Production Research Institute, Roma

Corresponding Author. [*antonioborghese@live.it](mailto:antonioborghese@live.it); antonio.borghese@email.it

Abstract. The dairy buffalo holds a strategical role in the world economy and society, as human requirements of proteins of high nutritional value could be satisfied by milk availability coming from buffalo species, represented in the world by more than 200 million head. The milk production is depending particularly from genetic capacity of females, that can be increased by animal recording and selection. The genetic improvement can be realized easily by the spreading of artificial insemination of the best selected bulls. Correct management and nutrition of the herd, as health and welfare of the animals are basic conditions for the expression of the capacity to produce milk and milk of high quality. Udder conformation and physiology as ability for milk ejection are factors to be considered in the farming economy. Milk quality is today a pivotal factor in the progressing and in the diffusion of the milk processing industry.

Keywords: genetic improvement, milkability, milk products, milk quality.

1. Buffalo population trend linked to dairy buffaloes

The buffalo is a priority animal in the world as a source of protein food for human survival and sustainability, as it is evidenced in each country, where buffalo is bred and where it has a pivotal role in human food sustainability. In the World, according FAO data, there were 180,702,923 buffalo head on 2010, about 182 million according Borghese on 2013 (Borghese, 2013), with a positive trend (+8.3%) in comparison with the value of 168 million reported in a previous book "Buffalo Production and Research" (Borghese, 2005). And, as now the total population is more than 200 million, the positive trend is confirmed. This positive trend is due to the increasing population in India and Pakistan, where milk purpose breeds were selected and where the buffalo milk market is very strong, balanced by the decreasing in other countries where draught animals are less required than in the past. In Africa, where the buffalo is found only in Egypt, there are about 5,000,000 head, as buffalo in Egypt is a basic draught animal in rice fields and irreplaceable for milk production for direct consumption. In Europe this year, the most of population is in Italy with about 403,000 buffaloes, while the European buffalo population is 459,000 (0.25% on world population), less than the found one 7 years ago (500,000; 0.30%) (Borghese, 2005) for the decreasing trend in many Balkan countries as Romania, Bulgaria, Macedonia, Greece, Albania, Serbia, partially balanced by the increasing trend in Italy, link to the expansion of mozzarella market of mozzarella and other cheeses and milk products. In America we can consider 4,227,000 buffalo head, 2.32% of total population, while 11 years ago there were only 3,345,000, about 2% of the global one, with a very positive trend (+26.4%) due to the enormous availability of land and free pasture in South America,

the unique adaptability of buffalo to lagoons and marshy land, the changing from a meat purpose breeding to a double purpose (milk and meat) livestock. The increasing trend in Asia, Italy and in America is essentially due to the increasing number of dairy purpose buffalo breeds, linked to the high demand of milk, cheese and processed products in all the market of the world. Really now the Governments and the people, also in some Asian and American countries where milk and cheese were not traditional food at high level as in European culture was for centuries, understood that milk is very important for human need of food and particularly for children request of protein of high biological value. Cheese and products of milk processing in general are going to be introduced more and more in Asian and American countries too, as the consumers are being more exacting and requiring food of nutritional and taste quality. The selection of Buffalo dairy breeds as in Italy, India, Pakistan is moving to satisfy the increasing demand of world market.

2. Economy from Dairy Buffalo in Italy

In Italy the Buffalo Genealogical Book was instituted by Italian Ministerial Decree on June, 23, 1980 and was held by A.I.A.(Italian Association of Breeders) and after by A.N.A.S.B. (National Association of Buffalo Species Breeders). The decree on July, 5, 2000 recognized buffalo enrolled in Genealogical Book pertaining to the only own race: “Mediterranean Italian”. The D.O.P. (Denomination Origin Protected) Mozzarella di Bufala Campana was recognized with the Ministerial Decree on May 10, 1993, and after from European Union; that means that this cheese mozzarella has to be produced in defined areas coming only from fresh milk of buffalo cows of Mediterranean Italian breed, registered in the Buffalo Genealogical Book. The Decree establishes the milk characteristics (fresh within 16 hours from milking, raw, minimum fat 7%), processing techniques (acidification, coagulation, stretching, moulding) and mozzarella characteristics. The control and guardianship is effected by “Consorzio per la tutela del formaggio Mozzarella di Bufala Campana”, so the European consumer is guarantee that the logo means a quality product of the made in Italy, according the best standard of animal management, welfare and health, according also the best characteristics of mozzarella, as sanity, freshness, flavour and juiciness. The execution of the milk recording in buffalo is applied according ICAR. The highest proportion of milk recorded buffaloes, in fact, is found in Italy (30%). In Italy there are 403 000 buffaloes and the mean milk production is over 2200 kg for lactation, in confront of other Mediterranean countries where the maximum production is less than 1900 kg. In 2013, the number of recorded buffaloes increased more until 56, 812 (ANASB,2014). In other countries the buffalo productivity is lower, due to the fact that only Italy has undertaken a great deal of work on recording, on selection, on reproductive and genetic improvement, on health, on feeding and livestock systems, as is shown in the following analysis. At the present time there are many females in Italy producing more than 5,000 kg milk/270 days of lactation) until the maximum production of 5600 kg with 8.32% fat and 4.63% protein. There are in Italy two Bull Buffalo Centres for semen production: the COFA (Cooperativa Fecondazione Artificiale) in Cremona Province, Lombardia Region, in North of Italy, and the Chiacchierini Bull Centre in Perugia Province, Umbria Region, in Middle Italy: this one actually produces semen from 16 tested bulls from different bloodlines, coming from mothers over 3100 kg milk yield per lactation with more than 4.5% protein. Chiacchierini Bull Centre produces sexed semen too, available from a lot of bulls. The hygienic control of the milk and milk products in the industry is of a particularly high standard. The market is mainly based on mozzarella cheese, very famous one, not only for the local consumption according the traditional Italian cooking style, but

also in many foreign countries. There are different types of mozzarella, the best one is produced in D.O.P. area. The mozzarella D.O.P. consumption is about 82% for the Italian market, 18% for the export, particularly for Germany (20% of the export), France (20%), USA (18%), U.K. (12%) (Borghese, 2005, 2010). Another very appreciated product is the ricotta that is not really cheese because it is produced boiling the serum proteins remaining after the produced curd. Very appreciated and common products are: mozzarella, treccia, scamorza, crescenza, robiola, caciocavallo and other cheeses, ricotta, yogurt; meat and meat industry products: bresaola, salami, sausages, caciocorollo, cacciatorini (little salami). Finally Italy is a reference point as buffalo importance in human food sustainability for high quality products.

3. Economy from Dairy Buffalo in Asian countries

Buffalo livestock in Asia plays a crucial role to supply the requirement of animal protein for millions of people: buffalo supplies milk, meat, leather, bones, pharmaceuticals, dung and manure besides draft energy power. India buffalo population with 100 million animals represents 50 percent of the world buffalo population. India is the first country in the world for number of buffaloes and milk production. India possesses the best River milk breeds of Asia as Nili-Ravi, Surti, Jaffarabadi and particularly Murrah. Buffalo population in Pakistan is about 30 million head, the second in the world, after India. The major proportion of buffalo (65%) is inhabited in Punjab. Buffalo breeds are River types Kundi and Nili-Ravi and among the best milk producers of the world. Total milk production is 43.6 million tons of which 62% derives from buffalo with 27 million tons, therefore buffalo role in milk production system and in food availability in Pakistan is very important. Chinese buffalo is Swamp type, as a total of 18 local breeds. Milk performance has been markedly improved in crossbreds through the crossbreeding system applied in upgrading the two breeds such as crossbred Murrah F1, F2 and crossbred Nili-Ravi F1, F2 with average milk yield per lactation respectively: 1240, 1423, 2041, 2325 (Yang Bingzhuang et al., 2003). Murrah buffaloes are also used to provide milk and milk processed food to poor people in the villages. Recently crossbreeding was applied using Mediterranean Italian semen with better results. There are 30,000 milking buffalo in China, 61.5% of them are crossbreds, while 38.5% are local buffaloes. There are few special buffalo milk processing factories distributed particularly in Guangxi Province, of small scale and poorly equipped. The products are pasteurized milk, yogurt, condensed milk, fancy milk drink, milk cake, milk bean curd, creme. The total number of buffalo in China is 23.27 million, the third largest population in the world. Dairy buffalo is important also in the Near East Asian Countries, as Turkey, Iraq and Iran, where the buffalo population is represented by 122,000, 286,000 and 470,000 head respectively. Many products are available from buffalo in Iraq: fat skimmed from milk and used to produce butter, ghee, sweet and cake; skimmed milk is used for direct consumption and to produce curd, fresh cheese and sweet. The most appreciated products in Iran are: yoghurt, fresh cream, fresh cheese, butter, ice-cream, rice pudding, churned yoghurt, dried whey, ghee. In Iran, the price of buffalo milk is twice that of cows' milk. Buffalo skin is used in the leather industry. Buffalo manure is used for fuel in rural areas. The milk production of the water buffalo in Turkey is renowned and favoured particularly for the production of the famous Turkish desserts. Ayran is a drink with water and buffalo yogurt. Common strategies are going to be adopted in the three Asian countries to increase the milk production and products availability for the market: to apply crossbreeding, using semen from Mediterranean Italian breed. Buffalo population

and economy is going to be more attended now in Bangladesh, Indonesia, Philippines and Thailand, where in the past years there was a decreasing trend in population, because of the population is Swamp buffalo or River buffalo used for draft. The policy neglected in the past the selection of dairy purpose breeds and the possibilities to create a market of dairy products. Buffalo development in the future should be based on animal production improvement with population increase to achieve food of animal origin, actually very poor in the country. The primary objective is a new pilot program with stakeholders to increase the availability of animal protein for improving human nutrition; these goals could be achieved by increasing the production of buffalo milk and meat through the improvement of the genetic capacity, producing F1 and backcross buffaloes from Swamp and Mediterranean Italian River buffalo (Borghese, 2005). Finally a new program started in Sumbawa to create a Buffalo research Centre, where the best local dairy buffaloes will be introduced and where the crossbreeding with Mediterranean Italian semen will be applied, with the purpose to create a Sumbawa buffalo breed with dairy characteristics. A similar project is starting also in Sumatra.

4. Economy from Dairy Buffalo in the Americas

Today there is great enthusiasm about buffalo in America, particularly among buffalo breeders and livestock associations. Buffalo numbers have significantly increased to about 5 million head, as buffalo is not bred only for meat purposes as in the past in extensive system as in the recent years the emerging request of cheese market produced a developing interest for milk purposes, similarly to Italian feeding style. Therefore many American farmers developed the buffalo management for milking organization: this is the only role in the North American countries, but is coming more and more diffused also in Central and South American countries.

5. Milkability

As buffaloes are carefully selected for yield and easy to milk, improvement in these characteristics is possible (Borghese et al., 2007) The animal becomes conditioned to let down milk and has thus developed a conditioned reflex. A general definition of milkability is the ability of a female to give a regular, complete and rapid milk secretion by the mammary gland in response to a proper milking technique (Boselli et al., 2004). Milk yield and milkability can be observed through the milk flow profiles, both are important parameters to be recorded and evaluated, in fact they give various advices on milking management (Thomas et al, 2008). The milk flow curve is typical for each species and for each animal and must be recorded singly. Automatic Milking System (AMS) in Mediterranean Italian buffalo cows was studied for milk flow curve. There is a considerable variation in milk ejection and consequently in milk flow curve for the buffalo milked in AMS with forced system, in comparison with the conventional one (Boselli et al., 2014).

6. Conclusions

The Buffalo species (*Bubalus bubalis*) plays a pivotal role in the local and in the national economy of the South Asian countries for a lot of products (milk, meat, skin, horns, dung) meanwhile the meat is the most important product for the export in the South American countries, as the milk processed products are the most important for the Italian economy. In the countries of great impact on the markets, the buffalo number was speedily increased. The animal recording and progeny test

remain the basic approach for selection and genetic improvement as for milk as for meat purposes, as in extensive as in intensive systems. In intensive systems, where dairy purpose buffalo breeds are managed, the selection parameters have to take in account also the udder and teats anatomy and conformation, the adaptation to milking machines and, in the next future, to automatic milking systems, by the anatomy, the physiology and the behavior of the animals. Great attention must be dedicated to the milk flow parameters, to select female lines without problems of milk ejection and with short times and more efficiency in milk yield. Selection criteria, according previous purposes, will achieve the goal to increase milk availability, to satisfy the requirements of animal proteins of high biological value, that are a must for the children growth and for the priority economy of many countries.

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