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PRESENT SITUATION AND FUTURE PERSPECTIVE OF BUFFALO PRODUCTION IN AMERICA

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ABSTRACT

America has a buffalo population of approximately 4.12 million heads. It's number is growing at the explosive rhythm of 12.7 % per year, well above all other continents. Within this context the different situations of countries in North, Central and, mainly, South America subcontinents are described. They all share a brilliant future for the buffalo. The production systems in North and Central America are described, mainly in the United States, Cuba and Trinidad. And the fist steps of buffaloes in Canada, Mexico, Panama, Costa Rica, Guatemala, Honduras and Belice. South American countries production systems are described too. First of all Brazil, a subcontinent itself rearing 3,5 million buffaloes, together with Venezuela and Colombia, during the last 30 years they had a great expansion in meat and milk production with buffaloes. In Argentina buffalo meat production increased significantly in the last years, because of the expansion of agriculture, that is displacing animal production toward the tropics, where buffalo is more efficient than cattle. The first steps of buffaloes in Guyana, Surinam, French Guiana, Perú, Ecuador, Paraguay, Bolivia, Uruguay and Chile are described. In equatorial, tropical and subtropical areas of America the buffalo has proved to be very superior in productivity compared with cattle, thanks to its very good adaptation to these conditions. And in the temperate areas buffalo is increasing its milk industry, near important urban markets. Thus, american continent has enormous areas available for buffalo, converting it in an extremely valious tool to achieve prosperity and increase food production of latin american developing countries.

Key words: buffalo, America, production systems, future perspective.

INTRODUCTION

At the end of 1700 buffaloes were brought into North America, but they were extinguished years later. Only at the end of 1800 buffaloes were brought again, but into South America, for draught power. Swamp buffaloes were imported by French (from Indochina to French Guiana) and by Dutch (from the actual Indonesia to the actual Surinam). English imported Riverine buffaloes, including several Indian breeds, as Murrah, Nili Ravi, Jafarabadi, etc. (from India to the actual Guyana and Trinidad). And at the same time Brazilians brought Mediterranean breed buffaloes from Italy into Marajó Island, in the Delta of the Amazon River (North of Brazil). At the beginning the buffalo population increase was slow, but after the 60's of last century turned to be explosive, with a rhythm of 12,7 % per year, specially in South America. The introduction of buffaloes in Central and North America is more recent one: Riverine buffaloes coming from Trinidad and Swamp buffaloes from Guam and Australia. The buffalo population in America reached the number of 4.120.000 heads: 4.060.000 in South America, and 60.000 in Central and North America. Most of the buffaloes in America are located in the equatorial and tropical regions, between the Tropics of Capricorn in the south (Paraguay, South of Brazil and North of Argentina) and of Cancer in the north (North of Mexico and Cuba); and also there are important populations in the Sub-Tropic (Brazil, Argentina, United States). Brazil with 200-300 animals introduced during 100 years (the last ones were of Murrah and Jafarabadi breeds in 1962, and Mediterranean breed in 1989) reached the 3.5 millions heads. It Is the only domestic animal that produces efficiently in all the Brazilian ecosystems: floodable lowlands, high fields, with equatorial, tropical, sub-tropical, temperate, humid and sub-humid climates. The buffalo has expanded as producer of meat, milk and draught power all through Brazil, Venezuela, Colombia, Argentina, Central America and Caribbean, United States and Mexico and is opening it's way in the rest of the American countries.

Buffalo status in America: Among the countries of **Central and North America**, with their different production systems, **Cuba** has 30.000 buffaloes. There are Carabao or Swamp buffaloes in all the provinces, in marginal farms, managed in extensive breeding systems for meat and draught power production. The Trinitarian buffalo breed and it's crosses are milked, reaching daily productions of 10 to 12 liter. In these herds the males are fattened for meat, and are slaughtered with 420 kilos of live weight (AWBA, 2001). In 55 dairies of the country it was reached an average of approximately 1400 litres per lactation. (Valdés *et al*., 2006). In continental Central America there are around 13.000 buffaloes. Within this

region we mention now the different countries. In **Belice** there is only a herd of 400 buffalo cows and in **Honduras** a dairy herd in the Zamorano Panamerican Agriculture School (AWBA, 2001). In **Panama** there are 5.000 buffaloes, owned by few breeders, including 2.000 buffalo cows in Bocas del Toro and 500 in Chiquiri (Roldán, 2007). In **Guatemala** there are 5.000 buffaloes, owned by 16 breeders distributed in different regions. After the first population of Trinitarian breed, buffaloes Mediterranean and Murrah were introduced, and then Mediterranean semen was imported. Buffalo meat is sold in butcher's shop of some cities at the same price of cattle meat. They export the leather to Mexico for shoes manufacturing. As in Panama, in Guatemala buffaloes are used to transport trough humid lands coconuts, pineapples, bananas, mangos, and the african palm fruits. The buffalo is able to feed itself with the local vegetation and stands perfectly the high humidity and temperatures of tropic. A palm's by-product is a main ingredient of the buffalo's diet: the palm pith meal. In the southern Guatemala in 2006 it was obtained 389.000 litres milking twice a day 1672 buffalo cows (Roldán, 2007). In **Costa Rica**, in the Earth University, Trinitarian buffaloes make up a training herd of 60 dairy buffalo cows, and they also transport food products (AWBA, 2005). Is estimated a population of 950 heads in all the country (R. Rosales, 2007). Into **Trinidad and Tobago**, caribbean islands with equatorial climate and high temperatures the hole year, the buffalo was introduced by the English to carriage the sugar cane. Their adaptation to this kind of work, to food and management conditions has been exceptional. After observing this performance, the coconuts plantation companies began to use buffaloes to clear weeds among palm trees, to pull carriages specially designed for the collection of coconuts: and also for meat production (Taboada, 1992). The bubaline population now is reduced to 5.000 heads, due to exportations into more than 14 countries of America, and to the touristic developments realized in fields close to the coasts. The 50 % of buffalo population is of Buffalypso or Trinitarian breed, the resultant of crossing 6 (six) Riverine Indian breeds (Murrah, Surti, Jafarabadi, Nili Ravi, Nagpuri and Bhadawari), and of 50 years of selection (Bennett *et al*., 2007). Buffaloes for meat production are managed in different production systems, varying from extensive systems (rotational grazing on Pangola Grass pastures with loads ranking from 1 to 1.75 heads per acre), to semi-intensive systems (diurnal access to pastures and nocturnal housing in sheds), and finally to feed lot. In the first case they reach their slaughtering weight (350-400 kilos) with 24 moths of age; in the second, with 15-18 months; and in the third they enter with 12 months of age and in 6 months they are ready for slaughtering with 400 kilos. The animals fed with ration gain 850 grams of life weight per day. The ration includes mainly sugarcane, molasses, corn, soy meal, minerals, etc. (Taboada, 1992). Since 1990 there is a Research Dairy Project with Trinitarian buffalo cows in the Aripo Experimental Institute, where they obtained the following average values in the milk composition: fat = 7,15 %; protein = 4,03 %; no fat solids = 8,84 %; total solids = 16,97 %; Calcium = 0,23 %; ashes = 8,5 %; and lactose = 5,6 % (Rastogi and Rastogi, 2004).

In **Mexico** there are 5.000 heads, bounded for meat production. In a ranch near Puebla city, with 1.000 heads, they fatten male buffaloes in natural fields and sell meat cuts to supermarkets in very good prices: common cuts in USD 20,00/kg and premium cuts in USD 45.00/kg. (Coronel, 2008). In **Canada**, recently joined to buffalo production, there are two dairy buffalo herds, one in British Columbia and another one in Ontario. The buffalo began to develop in the **United States** since 1975, due to the action of breeders of the States of Florida, Louisiana, Arkansas, California, etc., supported by the University of Florida, and years later, by the University of Davis in California. They first developed meat production in marshy lowlands of Florida, and in fields of Louisiana, Texas and Arkansas. Then dairy productions began, first in California and then in Vermont and other States. There are also water buffaloes in New York, Montana, Oregon and Washington. They began with buffaloes of Carabao or Swamp breed, then with Trinitarian breed; and then they inseminated and transferred embryos with Mediterranean, Murrah and Jafarabadi breeds. Today in the U.S. each breeder sells individually the buffalo meat produced by him. For lacking of scale they were not able to implement a supermarket commercial chain. Mainly, the meat selling goes into restaurants that are close to the buffalo farms, focusing to it's low cholesterol and in the good ratio of poli-insaturated fat acids, those grouped as CLA (Conjugated Linoleic Acids), specially those Omega 3 and Omega 6. The buffalo meat in U.S. also reached excellent results in sausages manufacturing (AWBA, 2007).

In **South America** there are more than 4 million buffaloes, most of them in Brazil, mainly introduced through importations from India and Italy. Venezuela and Colombia began with Riverine buffaloes coming from Trinidad and Swamp buffaloes from Australia. In **Brazil** there are 3.5 million buffaloes (and according to non official versions, they are reaching 5 million), divided in 25.000 herds. In this country 4 (four) breeds were spread: Mediterranean, Murrah, Jafarabadi and Carabao. The 62 % of buffaloes are located in the North Region (Amazon), the 9 % in the North East, 6 % in the Centre West, and 22 % in the South East and South Regions. More than the 50 % of brazilian buffaloes are of Murrah breed and it's crosses, and the 20 % are of Mediterranean breed. The lactation productions are different, depending on managements. In extensive systems, with one milking (the most), the production average is 1460 litres; with two

milking, 2500 litres; and adding genetics, 3000 litres. The greatest individual production is of 5142 litres. 92 million litres per year are produced, coming from 82.000 dairy buffalo cows that belong to 2500 herds. Actually 150 dairy factories are processing 45 million litres of buffalo milk (Bernardes, 2007). Rearing buffaloes in brazilian Amazon Region basically develops in grazing production systems, utilizing four pastoral ecosystems: 1) Natural pastures of floodable lowlands in the Marajo Island, Delta of the Amazon River, where is the most part of the Amazon buffalo herd. 2) The natural pastures of floodable lowlands areas of the coasts in the Low and Middle Amazon River. 3) High fields natural pastures. 4) High fields implanted pastures. In the lowlands, in the tidelands and reeds, among the natural pastures consumed by the buffaloes prevail the *Echinochloa polystachya sp*., *Himenea amplexicaulis sp., Paspalum fasciculatum sp., Paspalum repens sp., Leersia hexandra sp.,* and *Oriza sp*. Among the implanted pastures, the most utilized is the Brizanta Grass (*Brachiaria brizanta sp.),* and also the Amazon Quiquio Grass (*Brachiaria humidicola sp*.), the Colonial Grass or Tanzania Grass (Panicum maximum sp.), the Andropogon Grass (*Andropogon gayanus sp*.), Estrella Grass (*Cynodon neuflensis sp.)* (Junior *et al*., 2002). In lowlands with tropical climate, in very hard conditions, with flooding and droughts (for instance, in Maranhao State), the buffaloes produce efficiently, with 75 – 85 % of calving (25 % more than the cattle, with a slaughter weight of 450 kilos at 24 – 30 months of age (1,5 years earlier than cattle) and they can produce 5 litres of milk per day. In the Amazon Region buffalo is used for transport of military supplies, for pulling carriages, for riding, and for pulling boats in the water. In Brazil, since the '90 of last century, in order to obtain a better profit from the buffalo milk qualities for its elaboration in dairy products, there have been a significantly expansion of factory units, focused to the elaboration of specialized dairy products. These products, thanks to a higher factory output and to their higher added value, are able to permit the payment of a double price for the buffalo milk, compared to the price of the cow milk. As in buffalo breeding for meat, the prevailing dairy production system in Brazil has been the "grazing system". Anyway, in the case of dairy production, the supplementation is frequently used with volume (sugar cane, cutting green grass, silages, etc.) during the periods of worst forage supply (autumn and winter), that, due to the reproductive cycle, in buffalo cows coincides with the period of higher milk production. (Bernardes, 2006). Ten years ago the 80 % of buffalo farms produced meat, and actually more than half of them have milk as principal focus (Amaral, 2007). In the Brazilian tropic and sub-tropic is usual to observe calving levels higher than 80 and 90 %. In the rearing herds for meat the males reach the slaughter weight (near 430 – 480 kg.) within 18 – 24 months of age, and with 30 – 36 months in the dairy herds. In Brazil the buffalo annual meat production reaches at least 155.000 ton., resulting from 743.000 heads slaughtered. It's leather, in spite of a real demand, specially for exportation, is still scarcely exploited, mainly due to the great dissemination of the slaughterhouses, that turns the transport expensive and reduces the process scale (Bernardes, 2006).

In the last 30 years the buffalo in **Venezuela**, that was limited in the poor and floodable lowlands, spread out through all the plains and also the mountains, producing a revolution ("red" and "white") in venezuelan livestock industry. Actually there are 350.000 buffaloes, that contribute annually with 105 millions litres of milk (6 % of the total production) and 17 millions kilos of meat (3,4 % of the total production). And they occupy more than 700.000 hectares, improving them with their presence (Coirán, 2008). The 57 % of the Venezuelan exploitations combine buffalo with cattle. Within them, the 60 % focuses the double purpose of milk and meat. Natural pastures are utilized in the 60 % of the cases. In floodable areas there is an extensive system for meat production. In these areas of difficult access they work with not much domesticated animals, no more than twice a year (health, sale, etc.). On the other hand, in the double purpose systems, the use of land is more intensive (fenced fields, implanted pastures, drainage, etc.). A reduced group of ranches are focused to the buffalo dairy production, with semi-intensive managements based in diurnal grazing, and concentrate supplementation, hay and/or cutting green grass during night, with two milking per day. They have near 6 litres of average daily production (1500 – 1700 litres per lactation of 250 days). From each 5 litres of milk they obtain 1 kilo of mozzarella cheese. Most of the buffaloes are situated in the Venezuelan Plains Region (75 % of humidity, 26ºC of average temperature with maxims of 40 – 45º C, 1500 to 2000 mm of rain per year, but concentrated in the 6 months of the rainy season). The second in importance is the North Oriental Region. In the floodable lowlands is implanted the Aleman Grass (*Echinochloa polystachia sp.);* in the intermediate fields the Tanner Grass (*Brachiaria mutica sp*.) produces well; and in the well drained high fields is used the Estrella Grass (*Cynodon neuflensis sp*.). The buffaloes are mainly cross-bred (66,7 %). The Murrah is the predominant pure breed (26,7%). Second in importance is the Mediterranean breed. The size of the average herd varies from fifty to two hundred heads. Under grazing production systems young buffaloes produce carcasses with a good conformation, and with both better fattening and fat colour compared to Indian cattle of the same age, turning unnecessary intensive systems of feeding and management, that are more expensive. In Venezuela a great number of herds are for meat production: the great extensions of rough and /or poor quality pastures are efficiently used by the buffalo. Fattened buffaloes are slaughtered with eighteen

to thirty months of age, with a weight ranging from 425 to 550 kilos. Most of cattle go to slaughtering with a weight ranging 450 to 500 kilos, with 3,5 years of age. The carcass yield in the slaughtering varies from 48 to 53 %, depending on the age and fattening of the animal, and on the management to which they were submitted. Some breeders imported buffaloes from Bulgaria (Murrah, Nili Ravi) and Italy (Mediterranean) with the purpose of establishing dairy herds. Actually there are several dairy exploitations, that have their one milk factory. And their most common products are cheeses and milk sweet or "dulce de leche" (Reggeti 2007, Reggeti, 2008). In the Plains Region, in the State of Guarico, in a ranch of 1734 hectares, partially polderized (with embankments and pumping), they have 800 buffaloes, including 300 dairy buffalo cows, 200 of them milking. The average daily production is of 6, 9 litres (with two milking per day). In lactations of 250 days they obtain 1725 litres. In a semi-intensive management, the milking buffalo cows has diurnal access to pastures, grazing there during 8 hours in average, and nocturnal housing in sheds with concentrate (2 kg. per head) and hay supplementation during the night. The intermediate fields are implanted with Tanner Grass, and the lowlands with Aleman Grass. In the entrance hall floor of the milking parlor they have showers, coming from underground pipes (Reggeti, 2008).

In **Colombia**, from having 380 buffaloes in 1977, reached 100.000 in 2008. They began using them for draught power in african palm plantations, then for meat production; and some breeders focused dairy from the beginning. They do works like ploughing, transporting, pulling great carriages, tasks that before were realized with machinery or with mules, and they colonize areas where cattle couldn't be introduced. Colombia is becoming the third palm oil producer in the world. The use of the animal draught power increase productivity and reduce costs. In San Andrés de Tumaco, Nariño Department, on the Pacific coast, with 6000 to 8000 mm annual of rainfall, at an altitude of 0 to 50 mts. above sea level, 88 % of humidity and 28ºC of temperature, a research was done comparing buffalo drought power production efficiency in the carriage of the palm oil (*Elaeis guineensisjack sp.)* collect, related to the traditional use of the mule *(Equus cabalus sp. x Equus asinus sp.).* A group of 50 Riverine cross-bred buffalo males was used, trained for draught, with ages ranking from 5 to 8 years, of an average weight of 650 kilos, and of good physical condition. And 50 cross-bred mule females, with ages ranking from 5 to 10 years, an average weight of 450 kilos, with horseshoes in the four foots, and good physical condition. These animals are in rotational grazing on pastures of *Brachiaria brizanta sp*. and *Brachiaria humidicola sp*., and with supplementation of cutting green grass, molasses and minerals. The mules couldn't transport more than15 bunch of adult palm, but they realized two trips in the same space of time that buffalo utilized for doing one trip with 30 bunch. However, in the rainy period, when the fruit production increases quickly, the soil becomes muddy and the mules present reiterated sanitarian problems, with difficulty for mobility, even when they have horseshoes in the four foots. Buffaloes, with their broad articulation in the hoofs, are suitable for such situation. And they are excellent in their tameness, in their climate adaptation and in their poor forages conversion efficiency. Their strength, docility, sanitary and reproductive performances are optimum. These characteristics turned the buffalo in the animal draught power best option for the tasks of the african palm harvest in the tropic (Cortés, 2006). Trinitarian breed buffaloes were first imported to Colombia, receiving also the name of Colombian Buffalo. Afterwards, a great number of Murrah, Trinitarian and Mediterranean buffaloes came from Venezuela; and Murrah from Brazil. Also came from Brazil semen Murrah and from Italy semen Mediterranean (Sanint, 2006). The North Coast Region have the 60 % of buffalo population, bounded for meat and milk, with a climate varying from arid to humid in the different territories, with temperatures surpassing the 40º C and average rainfall of 1200 mm during the 6 months of the rainy season. Are plain lands with fertile soils and variable drainage, ranking from 0 to 50 mts. above sea level. The Middle Magdalena Valley Region, with a variable climate that changes from humid to dry, with temperatures of 29 to 40º C, with an altitude ranking 120 to 250 mts. above sea level, and with an annual average rainfall of 2300 mm distributed in two rainy seasons per year, has arid woods and humid tropical woods, with a plain and a topography lightly ondulated. This region groups the 35 % of buffaloes in the country, bounded to breeding, weaned buffalo calves breeding and fattening. There also are in the Bogotá Savannah Region, at 2900 meters above sea level, with temperatures varying from 4 to 15º C, with lands of high fertility, with grasses such as Kikuyo Grass (*Pennisetum clandestinum sp.)* and the Rye Grass (*Perenneal lolium sp.),* and leguminous like White Clover and Red Clover (*Trifolium repens sp.),* where they gain 800 to 1000 gr. / day. Fattening is done through intensive and extensive pastoral systems, and feed lot system. There are a great number of farms and ranches with pastoral production systems working with ecological certified production (including some of them that are certified by the German Government), with identification and traceability. Buffaloes are fattened in intensive grazing systems, in rotational grazing on improved pastures, some of them (Climacuna Grass, Angleton Grass, Estrella Grass, Pangola Grass) with more than 12 % of crude Protein (where buffaloes have an average gain of 1 kilo of life weight per day), and some others (like the *Brachiaria sp*.) with 4 to 8 % of crude Protein. They reached milk

production above 4000 litres in some individuals. And also there are exploitations for meat, where they achieve a production of weaned buffalo calves weighing 300 kg. We find also housing production systems for both industries. Already they are working successfully in the factory of meat, milk and hide, with first quality products. Actually buffaloes occupy a very important space in areas that have been assigned to cattle: Antioquia, Córdoba, Magdalena Middle Valley, Cauca Valley, Quindio, etc. A dairy ranch located in Córdoba Department has 3900 buffaloes in 3000 hectares. In 1200 hectares of high fields and uneven topography implanted with *Brachiaria humidicola sp*., there is a herd of mating buffalo cows, achieving there a pregnancy of 40 – 60 %. The rest of 1800 hectares are lowlands with natural pastures of an excellent crude Protein level, where are the milk buffalo cows and where arrives the mating buffalo cow herd in it's second stage looking for achieving a 100 % of pregnancy. They have 1000 milking buffalo cows, which in rainy seasons give an individual average production of 4 litres per day. All the ranch is divided in paddocks of 30 – 40 hectares, each one with a dam. Most of buffaloes in Colombia are fed in natural pastures, generally in floodable lands, with spontaneous ecosystems of great strength an stability, including several species: Gramalote Grass (*Paspalum fasciculatum sp.),* Bitter Grass (*Panicum laxum sp.),* Canutillo Grass (*Himenea amplexicaulis sp.),* Lambe Lambe Grass (*Leesia hexandra sp.),* and different kinds of weeds. And also are set aside for them improved pastures such as Climacuna Grass (*Dichantium anulatum sp.),* Angleton Grass (*Dichantium maristatum sp.),* Pangola Grass (*Digitaria Decumbens sp.),* African Estrella Grass (*Cynodon neuflensis sp.),* Braquipará Grass (*Brachiaria radicans sp.),* Humidicola Grass (*Brachiaria humidicola sp.),* Brachiaria Grass (*Brachiaria decumbens sp.),* and Brizanta Grass (*Brachiaria brizanta sp*.). The feed lot with buffaloes is an excellent alternative that allows optimal performances with low costs, and turn available the production in smaller areas, with supplying of high quality food coming from agriculture by-products such as rice, corn, cotton, palm, besides of the Angleton or Pangola hay. This system makes possible the recuperation of pastures and the utilization of organic manure. In a researching work, 190 feed lot fattened buffalo males, with an average weaning weight of 225 kilos and an average slaughtering weight of 406 kilos, they had an average weight gain of 181 kilos, equivalent to a daily gain of 0,785 kilos in 237 days, with a carcass yield of approximately 52 % (Roldán, 2005).

Buffaloes were introduced into Argentina from Brazil at the beginning of 1900 (they were descendants of the Mediterranean buffaloes of Marajo Island). In 1976 there were only 1300 buffaloes in **Argentina**, and actually there are more than 90.000 heads. The increase of the buffalo herd reaches an annual rate of a 13 % and has been mostly vegetative, adding importations mainly from Brazil, and also from Paraguay and Italy (the last one in 1989). Is located in 11 of the 23 Argentine provinces, mostly in Formosa (35.000 heads) and Corrientes (30.000), both Provinces belonging to the North East Argentine Region. 36.000 are the buffalo breeding cows and are slaughtered 14.000 buffalo males per year. In the last 40 years a technological revolution produced an enormous agricultural expansion in the temperate area, which has one of the more fertile soils of the world. So livestock breeding has partially been displaced into natural pastures relatively poorer with dry and humid sub-tropical climates. In the new areas bounded for livestock breeding buffaloes have an excellent performance in both meat and milk production. It's relatively low costs in lands and imputs turn buffaloes very competitive comparing to cattle. A great number of weight gain control tests realized since 1976 demonstrated that in the Argentine humid sub-tropic buffaloes surpass cattle adding a 60 – 70 % in weight gain, and a 15 – 20 % in the calving rate. They reach easily 220 kilos with 8 months of age, 480 with 24 months, and 550 with 27-30 months, arriving in that way to the slaughtering weight one year earlier than cattle, improving the carcass quality. The slaughtering carcass yield ranked from 49 to 57 %, being the more frequents from 52 to 54 %. The beef is lean, with excellent colour and tenderness. The suckling or baby buffalo of 11 months with 250 – 300 kilos of weight has good market niches in the medium cities of Corrientes, Formosa, Santa Fé, etc. Since the late 90's of last century the National North East University of Corrientes works in scientific research focusing reproduction and meat and milk production with buffaloes. In the country there are more than 100 breeders; two of them have 13.000 buffaloes each one; 13 have from 1.000 to 4.000; 35 from 250 to 600; and 50 up to 250. The meat buffalo production systems evaluated are extensive (with loads ranking from 0,5 to 0,7 heads per hectare), are located in Corrientes and Formosa Provinces, in natural pastures fields of the Paraná River Basin, mostly in open low fields, with humid subtropical climate, north of 31º south latitude, with 1000 – 2500 mm. annual rainfall and temperatures varying from 7 to 43º C (average 25º C), where cattle produce not much. It should also be highlighted that the buffalo cow productive life doubles that of cows. Due to it's superior efficiency in the region, already buffaloes spread from lowlands to high fields. Calving rate, with good management varies from 80 to 98 % (very superior to the 60 – 75 % of cattle in the same conditions). Production per hectare/year ranges from 40 to 60 kilos, whereas cattle only reaches 20 - 40 kilos. The daily weight gain is remarkable: 700 gram/day pre-weaning and 500 gram/day pos-weaning (70 to 100 % higher than cattle under equal conditions). The reposition of females is done, always in low quality natural grass, when they

reach 2/3 of their adult size (350 kilos) and 2 years of age (vs. 2 to 3 years in cattle). Buffalo cows are discarded at 18 – 22 years of age, and buffalo bulls at 6 – 7 years. A ranch in Formosa comprises 28.600 hectares, including 24.600 usable, with 5.000 of floodable land and Tanzania Grass pastures in the hills cleared from forest, used for buffalo castrated males' final finishing. There are 11.000 heads (0,45 heads/hectare), and they reach 13.000 when calving is completed. 4.800 are breeding buffalo cows, whose pregnancy ranges from 83 to 87 % (versus 50 % in cattle in the area). The weaning rate achieved is 3.500 buffalo calves per year, that have a weight of 170 to 220 kilos, weaned at 7–8 months of age. The annual production is of 41 live weight kilos per hectare. A production that doubles the 15 to 20 cattle kilos produced in the area. Buffalo milk production and processing at industrial level are not yet significant in Argentina. Near Buenos Aires city a dairy farm produce an average of 8 litres with two daily milkings, that are equivalent to 2.159 litres in 267 days of lactation, with 7,63 % of milk fat and 4,52 % of protein. Are 80 hectares, including 26 of corn (in a rotation corn/oats/corn) and 50 of pastures (alfalfa, barley and rye grass), with 350 bubaline heads. Buffalo calves are removed from their mothers at 3 days, after receiving colostrums. Dairy buffalo cows are basically fed pasture (in 80 – 90 %), in plains and good quality natural fields, together with corn ensilage (10 % of the feeding) and rolls of pasture hay. Besides, concentrate is supplied during milking, in an average of 2 kilos per milking. There is a herd of 140 buffalo cows, where 90 are being milked. They milk twice a day. The milking parlor has 12 units per side. It's location in temperate climate is due to the proximity of the consumer market. With 100 liters of buffalo milk they elaborate 22,2 kg. of mozzarella cheese. The 20 % of the production is exported to Chile. In Argentina, where 55 million cattle are more numerous than humans, that are only 40 millions (in the same area than India), buffalo has an enormous space to increase.

In **Uruguay**, in 1987 100 buffalo cows were introduced from Brazil, to be used for a forestry – breeding project in a ranch located in Rivera Department, in the north of the country. The purpose was to produce beef while cleaning areas planted with eucalyptus. Today there are more than 500 heads in the country. Buffaloes were brought into **Chile** in 2006, when a breeder, with the collaboration of the Chile National University, imported 9 buffalo cows and one buffalo male from Australia, with the purpose of beginning a dairy project. In **Bolivia** there are 5.000 buffalo heads, all of them in the east of the country, with high humidity, rivers and high temperatures, typical of the subtropical climate. A ranch close to the city of Santa Cruz de la Sierra keeps 2.000 buffaloes for meat and milk. They milk 200 buffalo cows, with a daily average of 6 litres and a milking average of 1.672 litres (maximum 2.600 litres). They have a modern milking parlor with 16 milking machines: milk and cheese are processed in modern plants that are sanitation and efficiency paradigms. They also fatten buffalo calves and sell the beef that they process, with promotion that emphasize the rate of cholesterol, 30 % lower than that of cattle. They produce several types of cheese, among them processed cheese and ricotta, under the trademark "Caserti", and sell through aggressive market promotion. They have Murrah buffaloes, although most are Mediterranean (AWBA, 2001).

In **Paraguay** there are about 9.000 buffaloes spread all over the country, mostly in small 20 to 50 buffalo mother buffalo herds, where are kept as something exotic and/or to cover the ranches' beef needs. Only one ranch located 180 kms. south east of the city of Asunción breeds and fattens buffaloes rationally and successfully, with natural pastures fields poor in protein and phosphorus, but with exceptional weather, 1.600 mm annual rainfall and high average temperatures, even in winter (with few 5 to 10º C "cold" days). Today they own 1.500 buffalo heads, including 600 breeding buffalo cows, Paraguay's main herd, totally used for beef production. Males are slaughtered non castrated at 24 – 28 months, without suffering hormonal changes in the carcass. Pregnancy in buffalo cows have been much higher than cattle: between 70 and 87 % from 2003 to 2006. Meat packing plants' demand of fat buffaloes is excellent. They pay the same price as for cattle. They even buy the whole male, without any price difference. There is good demand for purchasing and processing hides. Under such conditions growth possibilities are unlimited.

In **Ecuador** buffalo population is about 1.300 heads. One ranch located 90 km. from Guayaquil city have 200 Trinitarian breed buffalo cows, including 150 milking buffalo cows. They sell in good prices buffalo males for draught power in african palm plantations. And the females are kept for the dairy herd. They began to process mozzarella cheese. **Perú** actually has around 1.000 buffaloes, in Loreto Department, near the city of Iquitos, in the Peruvian Amazon. **French Giana, Surinam and Guayana** have together no more than 1.000 buffaloes. The first animals, brought for draught power, being introduced more than 100 years ago, coming from French Indochina and from Holland Indies (actual Indonesia); and Riverine buffaloes (of several breeds) introduced from India. Afterwards were introduced Murrah breed buffaloes for dairy production.

Conclusion: Buffalo has revealed itself as an exceptional, irreplaceable animal for draught power in tropics and equator, mostly in the plantations of Central America, Caribbean, Colombia, Guyana, Surinam, French Guiana, and for transportation in the Amazon Region of Brazil. In North America it's meat and milk products have great market niches to be exploited. In

Central America and Caribbean, besides its' increasing use for draught, buffalo has revealed as an excellent beef producer, and recently, also as milk producer. And its' products are being demanded in the same area of production. In South America already caused a revolution in the livestock breeding of Venezuela and Colombia allowing these countries to change from a suibsistance cattle breeding not much productive, to a production with buffaloes, which is efficient in spite of the difficult conditions of the ecosystems. In Brazil buffalo is acquiring a great economical importance, because in the equatorial, tropical, subtropical areas the buffalo surpass cattle in efficiency for meat and milk productions, and spreads all through it's enormous territory, with an excellent market for dairy products and local markets for beef. The same occurs in the subtropical north of Argentina, where the buffalo produces meat with a spectacular efficiency in calving rates, in weight gains, with slaughtering at early age and very good carcass quality. Dairy is more recent but it has already an excellent internal and external market for it's products. The rest of the countries of South America, without exception, are doing the first steps with buffalo. America today is the continent with the highest annual growth in buffalo population. Buffalo consolidates it's triple suitability for meat, milk and draught in different regions. The buffalo population reached already the necessary scale to maintain a high growing rhythm. The productive efficiency turns the buffalo into a developing valuable tool for nearly all the regions, and also to improve the income of small owners with small familiar business. And the buffalo is irreplaceable in areas with most rigorous ecosystems of tropic and equator. The conclusion then is that the specie has a brilliant future in a continent with spaces of high productive potential that are not much profited. Doing that is in the hands of America's man.

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