Developments of Buffalo Industry in America

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ABSTRACT

The buffalo population in America nowadays arrives to 4.2 million heads, approximately (nearly all in South America, and 90,000 in Central and North America). This means only the 2% of the world population, but America actually has the higher annual average increase of buffalo population comparing to all the other continents (12%). This species has been introduced into the continent in the end of the XIX century, being utilized first for draught, later on for meat production and finally for dairy, in a slow process at the beginning, that has speed up in the last 50 years. Still nowadays in some American countries the buffalo is entering as a draught animal (Panamá, Guatemala, Ecuador, etc.) occupying afterwards its space as meat and milk producer. From Argentina in the south to Canada in the north, the buffaloes are mainly riverine type. There are limited swamp buffalo populations in the northern Brazil (Pará State), Venezuela, Cuba, Guyana, and United States. In nearly all the countries buffalo meat production systems have been developed, more intensive in some cases and less in others, all of them with a great efficiency. Reproduction biotechnologies are used since years ago, the same as intensive pastures management. Selection programs are being followed to improve meat and dairy productions. There are large areas with natural pastures waiting to be utilized for buffalo meat production. As a draught animal, the buffalo is essential mainly for the African palm plantations, and also for the transport of sugarcane, for pulling carriages (carts), boats, etc. The buffalo dairy industry has been increasing in a significant way during the last 30 years, with spectacular results, mainly in Brazil, Venezuela and Colombia; and in a smaller scale, in Cuba, Costa Rica, Guatemala, Bolivia, México, United States, etc. Meat and dairy products are supplying internal markets, but also are exported. Argentina and Brazil are working the buffalo hide, and they produce, through an excellent manufacturing industry, products as first quality leather goods, polo stirrup leathers, engine joints, soles, belting, saddles, luggage, handbags, chamois (suede), upholstery, boots, etc. In most of the cases, in America, the buffalo production is located in middle size farms; and in some cases, in large scale farms or ranches. Actually the American buffalo population could be enough to accelerate its diffusion in the small exploitations in order to change radically the life quality and the income of millions of people that are working and living in little family farms developing an economy of subsistence. Official information referred to buffaloes is generally limited in America. This information has been used for this paper, plus the information supplied by several breeders associations trough the continent, by universities, and by personal communications with breeders, researchers, etc.

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INTRODUCTION
Buffaloes in America have only 220 years of presence, approximately. At the end of 1800 buffaloes were brought into South America, for draught power. Swamp buffaloes were imported from Asia by French to Guiana and by Dutch to Surinam. English imported Riverine breeds to Guyana and Trinidad. Brazilians brought Mediterranean breed buffaloes from Italy to Marajó Island, in the delta of the Amazon River. After the 60’s of last century buffalo population increase turned to be explosive, especially in South America. More recently, Riverine buffaloes from Trinidad, and Swamp buffaloes from Guam and Australia, were introduced in Central and North America. Actually the buffalo population in America reached the number of 4,225,000 heads: 4,130,000 in South America, and 95,000 in Central and North America (Zava, 2011). Most of them are located in the equatorial and tropical regions. The buffalo is the only livestock that produces efficiently in all the Brazilian ecosystems. 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 it is opening its way in the rest of America.

MATERIALS AND METHODS
The different situations and developments of buffalo industry in countries of North, Central and, mainly, South America sub-continents are described. In Central America, among the Caribbean Countries, Cuba has 63,000 buffaloes (Zava, 2011). Swamp buffaloes are distributed in all the provinces, in marginal farms, managed in extensive breeding systems for meat and draught power production. The Trinitarian breed buffaloes and its crosses (60% of the national population) are milked, reaching daily productions of 10-12 litres. In these herds, males are fattened, and slaughtered with 420 kg of life weight (AWBA, 2001). In 55 dairies of all the country it was reached an average of 1,400 litres per lactation (Valdés et al., 2006). In Continental Central America there are around 15,000 buffaloes, distributed mainly in Panama, Guatemala and Costa Rica. In Belice there is only a herd of 350 heads, 200 in Honduras and 350 in Nicaragua. In Panama, there are 5,000 buffaloes, owned by few breeders (Roldán, 2007). In Guatemala there are 8,000 buffaloes, distributed in different regions. The 80% are owned by 20 breeders, and the rest by small farmers. After the first population of Trinitarian breed, buffaloes Mediterranean and Murrah were introduced, and then Mediterranean semen was imported. Buffalo meat is sold in some cities at the same price of cattle meat. They export the leather to Mexico for shoes manufacturing. In Panama and Guatemala, buffaloes are used to transport trough humid lands coconuts, pineapples, bananas, mangos and the African palm fruits. The buffalo feeds 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 (Roldán, 2007). In Costa Rica there are 2,100 buffaloes, owned by 40 breeders, used mainly for draught in the palm plantations. In the last
years new buffalo dairy farms were organized. The Agricultural School of Humid Tropical Region has buffaloes for draught (to carry the milk) and for dairy, producing yoghurt and creams (Rosales, 2007; Zava, 2011). Buffaloes were introduced into Trinidad and Tobago to carry the sugar cane. These Caribbean islands have an equatorial climate and high temperatures the whole year. After observing their excellent adaptation to food and management conditions, 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, 2011). The bubaline population now is reduced to 5,700 heads (Zava, 2011), due to the exportations into more than 14 countries of America, and to the tourist developments realized in fields close to the coasts. The 50% of the population is of Buffalypso or Trinitarian breeds (Bennett et al., 2007). Buffaloes for meat production are managed in different production systems, varying from extensive (rational grazing on Pangola Grass pasture 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 kg) with 24 months 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 kg. 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, 2011). 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 = 16.07%; Calcium = 0.23%; ashes = 8.5%; and lactose = 5.6% (Rastogi and Rastogi, 2004). Regarding North America, 10,000 buffaloes are located in Mexico, all of them bounded for meat production. One breeder has more than 5,000 heads in Chiapas, Veracruz and other southern tropical states (Zava, 2011). In a ranch near Puebla city, with 1,000 heads, they fatten buffalo males 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). Canada joined to buffalo production since 1999, and already has 1,000 heads. There are three dairy buffalo herds, one in British Columbia, another one in Ontario and the largest in Toronto (Zava, 2011). Actually there are 6,000 buffaloes in the United States. The buffalo began to develop there 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 in California and then in Vermont and other states. There are also 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 US 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 go into restaurants that are close to the buffalo farms, focusing to its low cholesterol and in the good ratio of poli-insaturated fat acids,
those groups as CLA (Conjugated Linoleic Acids), especially those Omega 3 and Omega 6. The buffalo meat in US also reached excellent results in sausages manufacturing (AWBA, 2007) (Zava, 2011). South America has more than 4 million buffalo heads, mainly located in Brazil. Venezuela and Colombia began with riverine buffaloes coming from Trinidad and Swamp buffaloes from Australia. Brazil, together with Venezuela and Colombia, had during the last 30 years a great expansion in meat and milk production with buffaloes. In the last years in Argentina the expansion of agriculture is displacing animal production towards the tropics, producing a significant increase of buffalo meat production, and more recently, dairy production. With 300 heads introduced in 100 years, Brazil has 3.5 million buffaloes, divided in 25,000 herds. 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 the population are Murrah breed and its crosses, and 20% Mediterranean breed. The dairy productions have different levels, depending on management. The most are in extensive systems, with one milking, and have an average production of 1460 litres. With two milking the average is 2,500 litres, and adding genetics, 3,000 litres. One of the greatest individual productions reached 5,142 litres. Nearly 92 million litres per year are produced, coming from 82,000 dairy buffalo cows that belong to 2,500 herds. And 150 dairy factories are processing 45 million of buffalo milk litres per year (Bernardes, 2007). Four pastoral ecosystems are utilized for rearing buffaloes in brazilian Amazon Region in grazing production systems: 1) Natural pastures of floodable lowlands in the Marajo Island, Delta of the Amazon River; 2) The natural pastures of floodable lowlands areas of the coasts of the Low and Middle Amazon River; 3) High fields natural pastures; 4) High fields implanted pastures. In Brazil prevails the grazing system in buffalo breeding for meat and in dairy. Frequently, they use for dairy production the supplementation 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. Is unusual the supplying with concentrates. In the tropic and sub-tropic, in the rearing herds, is usual to observe calving levels higher than 80 and 90%. The males reach the slaughter weight (near 430–480 kg.) with 18–24 months of age, and with 30–36 months in the dairy herds. In Brazil the buffalo meat annual production reaches at least 155,000 ton, resulting of 743,000 heads slaughtered. It’s leather, in spite of a real demand, especially 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). The buffalo in Venezuela was limited in the poor and floodable lowlands, but in the last 35 years it spread out through all the plains and also the mountains, producing a “red and white” revolution in the local livestock industry. Actually there are 350,000 buffaloes, producing 105 million litres of milk per year and 17 million kg of meat. And they occupy more than 700,000 hectares, improving them with their presence (Coirán, 2008). The 57% of the 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.). 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 (1,500–1,700 litres per lactation of 250 days). 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, 26°C of average temperature with maxims of 40 – 45°C, 1,500 to 2,000 mm of rain per year, concentrated in the 6 months). The buffaloes are prevailing cross-bred (66.7%). The Murrah is the predominant pure breed (26.7%), and second is the Mediterranean breed. The size of the average herd varies from 50 to 200 heads (Reggeti, 2007). Colombia had 380 buffaloes in 1977 and reached 150,000 in 2011. They began using them for draught power in African palm plantations, then for meat production and finally for dairy. 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. Actually machinery is improving and is used again, and buffaloes are being bounded for dairy and beef. Trinitarian breed buffaloes were first imported to Colombia. 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 40°C and average rainfall of 1,200 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 40°C, with an altitude ranking 120 to 250 mts. above sea level, and with an annual average rainfall of 2,300 mm distributed in two rainy seasons per year, has arid woods and humid tropical woods, with a plain and a topography lightly undulated. This region groups the 35% of buffaloes in the country, bounded to breeding, weaned buffalo calves breeding and fattening. And fattening is done through intensive and extensive pastoral systems, and feed lot. There are a great number of farms and ranches with pastoral production systems working with ecological certified production, with identification and tradability. 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 Brute 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 BP. 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 (Roldán, 2005; Zava, 2011). In Argentina, buffaloes
increased from 1,300 heads in 1976 to 120,000 in 2012. This increase has been mostly vegetative, adding importations mainly from Brazil, and also from Paraguay and Italy. The buffaloes are located in 11 of the 23 argentine provinces, mostly in Formosa (40,000 heads) and Corrientes (35,000), in the North East Argentine Region. The buffalo breeding cows are 45,000 and are slaughtered 17,500 buffalo males per year. 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 ranks 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 northern medium cities. The meat buffalo production systems evaluated are extensive (with loads ranking from 0.5 to 0.7 heads per hectare), are located in natural pastures fields of the Paraná River Basin, mostly in open low fields and also in high fields, with humid subtropical climate, north of 31° south latitude, with 1000–2500 mm. annual rainfall and temperatures varying from 7 to 43°C (average 25°C), where cattle produce not much. Calving rate, with good management varies from 80 to 98% (vs. 60–75% of cattle). The daily weight gain is remarkable: 700 gram/day pre-weaning and 500 gram/day post-weaning. 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.

In Bolivia there are 10,000 buffalo heads, all of them in the east of the country, with high humidity, rivers and high temperatures, typical of the subtropical climate. A dairy farm in Santa Cruz de la Sierra produces a daily average of 6 litres and a milking average of 1.672 litres (maximum 2.600 litres). They have a modern milking parlour 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 a trademark, and sell through aggressive market promotion. Other ranches breed and fatten buffaloes, slaughtering males with 450 kg and 24 months, reaching excellent prices in supermarkets. They have Murrah and Jafarabadi buffaloes and its crosses, although most are Mediterranean. Buffaloes are also spreading into Beni Department, in the bolivian amazon region (Zava, 2011). In Paraguay there are about 10,000 buffaloes spread all over the country, mostly in small herds of 20 to 50 buffalo cows. Only few ranches, that own the 50% of the national herd, breed and fatten buffaloes rationally and successfully, in natural pastures fields, with 1,600 mm annual rainfall and high average temperatures, even in winter. Whole males are slaughtered at 24–28 months, without suffering hormonal changes in the carcass. Pregnancy in buffalo cows is higher than cattle: 70-87%. Demand of fatten buffaloes is excellent, with the same price of cattle. There is good demand for purchasing and processing hides. In Ecuador buffalo population is about 1,300 heads. One ranch located 90 km. from Guayaquil city have a dairy with Trinitarian breed buffalo cows, and they sell in good prices
buffalo males for draught power in African palm plantations. 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 were brought for draught power more than 100 years ago. Afterwards were introduced Murrah breed buffaloes for dairy production.

RESULTS AND DISCUSSIONS

In America the buffalo became an exceptional 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 its 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, buffalo is producing a revolution in livestock of Venezuela and Colombia, replacing the surviving cattle breeding with an efficient production with buffaloes. In Brazil, in its equatorial, tropical, subtropical areas, buffalo surpass cattle in efficiency for meat and milk productions, and spreads all through its enormous territory, with an excellent demand for dairy products and local markets for beef. The same occurs in the subtropical area of northern Argentina, where the buffalo produces meat with efficient calving rates and weight gains; with slaughtering at early age and very good carcass quality. Dairy is more recent but it has an excellent internal market for its products. The rest of the countries of South America, are doing the first steps with buffalo. America today is the continent with the highest annual growth in buffalo population. Buffalo consolidates its suitability for meat, milk and draught in different regions, being irreplaceable in areas with most rigorous ecosystems of tropic and equator. American 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.

REFERENCES


