Overview and Prospect of Buffalo Milk Production in the World

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Summary of Annual Milk Production in the World (1000 tonnes)

Region	Cow	Sheep	Goat	Buffalo	Total
Africa	12,523	1,512	1,990	1,420	17,445
North America	85,184	-	345	-	85,529
South America	29,119	39	153	-	29,311
Asia	48,820	3,665	3,787	36,743	93,015
Europe	172,557	3,716	1,663	94	178,030
Oceania	14,209	-	-	-	14,209
USSR	105,950	86	360	-	106,396
World					
Year 1988	468,362	9,017	8,299	38,257	523,935
% of the world	89.39	1.73	1.58	7.30	100
Year 1997	471,794	8,385	10,592	55,873	546,644
% of the world	86.31	1.53	1.94	10.33	100
Year 2001	493,828	7,808	12,445	69,248	583,339
% of the world	84.65	1.34	2.13	11.87	100

Advantages in Raising Buffalo

1. Ability to subsist on a low quality, high roughage diet.
2. Resistance to most internal and external parasites that affect cattle.
3. Generally low birth weight and low incidences of calving problems.
4. Quick and easy calf growth due to the high percentage of butterfat and mild solids in the dam's milk.
5. Growth rate is comparable to cattle.
6. Meat flavor is comparable to beef with about one half the cholesterol, and less than one-fourth the amount of fat.
7. Milk, with an average of 8 percent butterfat, is used in the production of mozzarella cheese and other dairy products, such as ghee.
8. Requirements for fencing, handling equipment, immunizations, and health programs are similar to those of cattle.
9. Ability to thrive in the United States, with swamp buffalo best kept in the southern states and the river buffalo ranging throughout the country.

INTRODUCTION

- There are 165.7 million buffaloes in the world, and India possess the highest buffalo population of 94.1 million (FAO 2002).
- FAO data also showed that the buffalo milk production increased during 1982-2001 by 58.2% in the world and by 57.9% in Asia.
- Increases in buffalo milk production in India, Pakistan, China and Italy for th e same period was 59.0, 37.0, 63.5, 154.8 %, respectively.
- The contribution of buffalo milk production to the dairying in Asia is 96.8 per cent.
- India has the highest volume of buffalo milk production followed by Pakistan, China and Italy with contribution of 65.9, 25.2, 3.83 and 0.23 percent, respectively.
- Latin America is emerging as a predominant area for buffaloes with largest concentration in Brazil.

TYPES OF BUFFALO

1. Swamp buffaloes are from China, Southeast Asia, Philippines, and Indonesia. These animals are used primarily for draft purposes and have broad, wide horns, a chevron on the chest, legs lighter in color, and larger hooves.

2. River buffaloes are from India and Pakistan. These animals are used primarily for dairy products and meat production, have tightly curled horns, and hold their heads high.

INTRODUCTION-Cont'd

1. Buffaloes in South America:

a) Buffaloes were imported into Brazil in 1902.

b) These buffaloes were river type. Later on swamp buffaloes known as Carabao were also introduced.

c) Indian breeds of Murrah and Jafarabadi were introduced later on in 1918 to 1921.

d) Mediterranean buffaloes were introduced from Italy. Most of the buffaloes are left on ranches under an extensive range system.

e) Semi-intensive rearing is formed only on dairy farms where selective breeding is practiced.

2. Buffaloes in Caribbean:

a) Similarly buffaloes were introduced in Columbia, French Guiana, Guyana, Trinidad, Peru and Surinam.

b) In Caribbean countries, the buffaloes were first introduced by Sugar companies as draught animals in early nineteens.

C) Later on they were also used as meat animals.

INTRODUCTION-Cont'd

3. Buffaloes in South East Asia:
   a) The water buffalo is an economically important animal in Thailand both for draught and meat purpose.
   b) The swamp buffalo does not produce sufficient milk to allow it to be classified as a milk animal but is regarded as an excellent meat type.
   c) Water buffalo in Philippines are classified into swamp and river type.
   d) The river type is exemplified by the Indian and sub-continent breeds, which is considered under dairy category because it possesses high genetic capacity for milk production.
   e) Most of the water buffaloes in Indonesia are the swamp type and widely used as draught animals.

4. Buffaloes in Europe:
   a) Buffaloes in east Europe are found in Greece, Albania, Yugoslavia, Bulgaria, Romania, Hungary and Italy.
   b) The European buffaloes are usually black, dark grey, grey black, black brown, dark brown and slate black in colour.
   c) In many countries white marks are found on the head, lower legs and tail tips.
   d) In European buffaloes, milk production is of primary importance followed by a meat production from the culled animals including surplus young males.


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Total milk production by species in the period of 1980-2001 and relative proportion for each continent within species.

Year	1980 1,000 MT	2001 1,000 MT	Change, % 2001-1980	World, % 1980	World,% 2001
Goats	7,236	12,455	+ 72	100	100
Sheep	7,980	7,808	- 2	100	100
Buffalo	27,491	69,248	+152	100	100
Cow	423,034	493,828	+ 17	100	100
All milk	465,741	583,339	+ 25	100	100

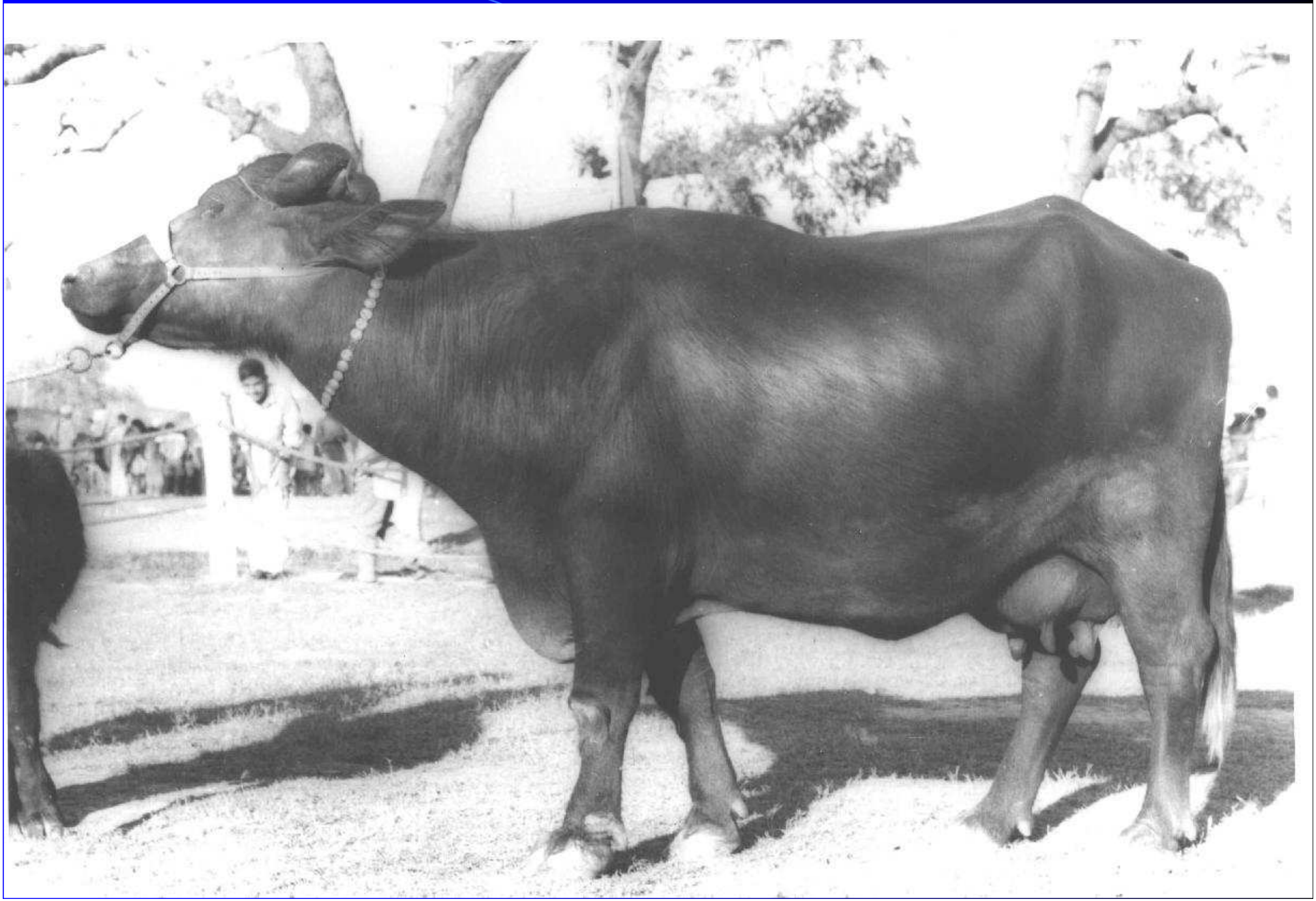
(FAO, 1986, 2002)

Production of Buffalo milk in the world

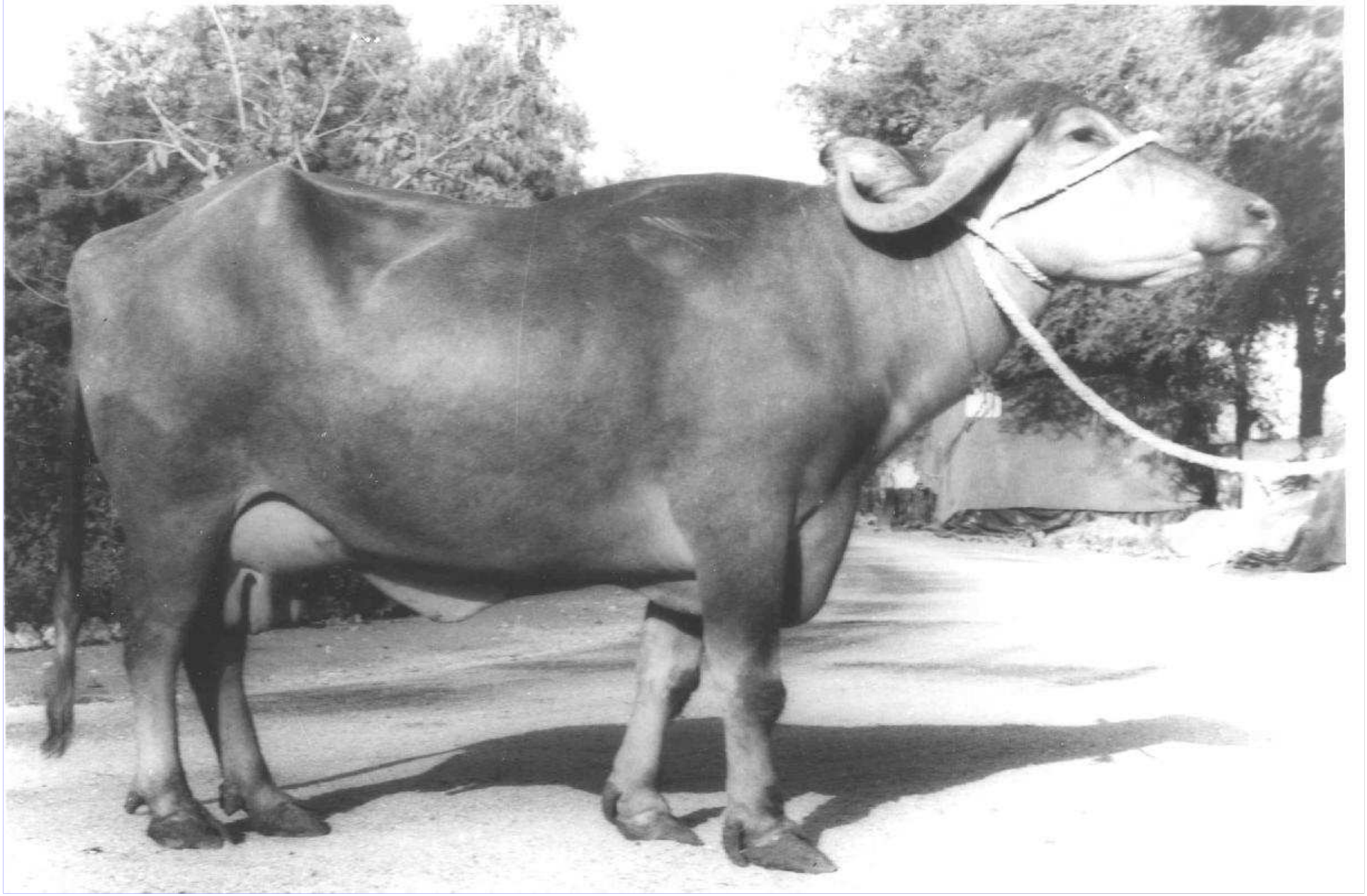
Year	1989-1991	1999	2000	2001
World	43777	65990	68177	69248
Africa	1261	2018	2030	2051
Egypt	1261	2018	2030F	2051F
Asia	42434	63802	65975	67028
Bangaladesh	22F	22F	22F	22F
Bhutan	3	3	3	3
China	1907F	2600F	2650F	2650F
India	28717	43000	44550	45650
Iran	121	214	226	155F
Iraq	24F	26F	27F	27F
Malaysia	10	7	7	7
Myanmar	93	109	111	114
Nepal	601	744	760	781
Pakistan Philippines	10672 4	16910	17454	17454F
Sri Lanka	61	70	68	68F
Turkey	175F	66F	66F	66F
Viet Nam	24	30	30	30
Europe	82	169	172	170
Bulgaria	19	11	12	12F
Italy	62	158	160F	158F

Source: FAO (2002) ; F = estimate

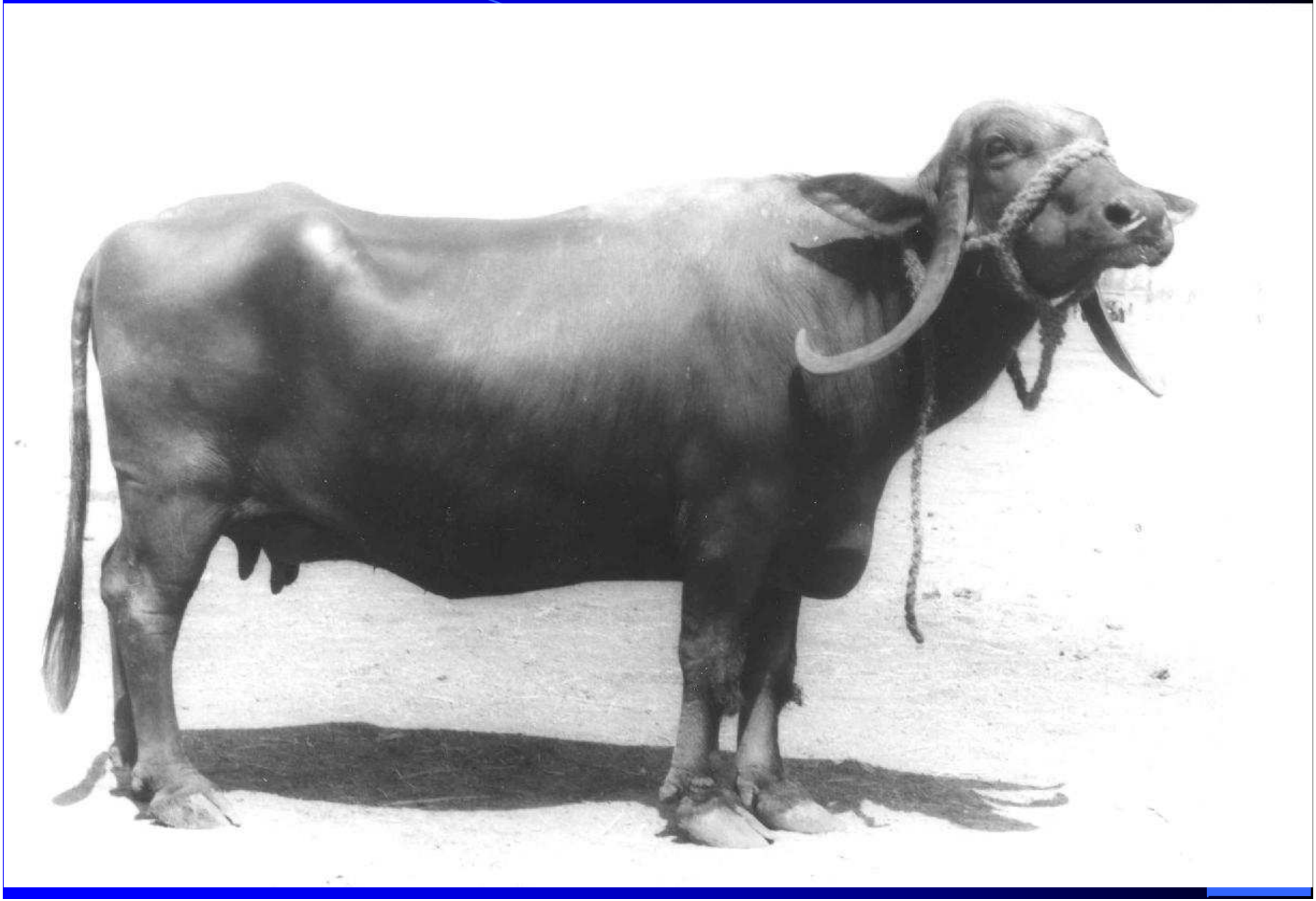
Murrah Female Buffalo



Surti Female Buffalo



Jaffrabadi Female Buffalo



Average composition (%) of milk from different species

Milk nutrient	Buffalo	Cow	Sheep	Goat	Human
Fat	7.0	4.3	6.0	4.5	3.5
Protein	4.0	3.4	4.8	3.8	1.9
Lactose	5.1	4.8	5.0	4.7	6.5
Minerals	0.8	0.7	0.9	0.8	0.2
SNF	9.8	9.0	10.3	9.0	7.3
Total solids	16.7	13.3	16.3	13.5	12.1

Pandya and Khan (2006)

Hans Bieri on his dairy farm in Schangnau, Switzerland, with the water buffaloes he imported from Romania for their rich milk, which he uses to make mozzarella cheese.

Difficulties making in Cheddar cheese from buffalo milk

1. Slow development of acidity
2. Shorter renneting period
3. Low moisture retention in cheeses
4. Hard, dry, crumbly and corky body and texture
5. Slow flavor development
6. Higher fat losses in whey
7. Slower proteolysis
8. Higher curd tension

Manufacture of buffalo milk Mozzarella cheese

1. The conventional approach or “starter culture method” involves fermentation of milk by starter cultures, rennet coagulation, separation of curd, stretching and brining of the product.

2. The other procedure referred as “direct acidification technique” involves addition of acids instead of starter culture before renneting.
   (Addition of 1.6-3.5 ml of HCl or 2-4 ml acetic acid per liter of buffalo milk gives the desired pH at 6-8^{o}C).

Manufacturing Procedure of buffalo milk Mozzarella cheese

1. Buffalo milk is standardized to casein: fat ratio of 0.7:1, and pasteurized at 72°C/ no holding.
2. The milk is inoculated with 2% starter culture of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* (1:1).
3. Then incubated at 37°C for 40-45 minutes, until an acidity of 0.01 to 0.02% lactic acid develops.
4. Rennet is added at 37°C, and the milk allowed to set for about 30-45 minutes.
5. The curd is cut and cooked with the whey at 40°C for about 2 h and 30 min until an acidity of about 0.4% lactic acid is developed.
6. After draining of the whey, 2.5-3.0% sodium chloride is added, and the curd immersed in boiling water for 4-5 minutes.
7. The curd is then plasticized, manually or mechanically at 85-90°C and shaped into balls or rectangular blocks.
8. The product is immersed in pasteurized cold water at 4-5°C for 2 hours, and finally packaged in polyethylene bags or other suitable packages and stored at 5-8°C

Effects of Management Conditions on Buffalo Milk Yield and Reproduction

- Milk yield in buffaloes decreases with high ambient temperature.
- The daily milk yield was improved from 0.75 to 1.00 kg by splashing water twice daily before milking (Sinha and Minett, 1947).
- Splashing water reduced the body temperature by 0.4^{o}C.
- Providing wet screens around the shed improved the feed consumption and milk yield by 44 and 29%, respectively.
- In India, the conception of buffaloes has been reported as 63 per cent, much lower than cows.
- Buffaloes in India and Pakistan are characterized by seasonal pattern of calving. The peak calving season is from August to October.
- The marked seasonality of buffalo milk production may be attributed to the scarcity of green fodder during Summer (April to June).
- High environmental temperature shorten the estrous period in buffaloes.
- In India, the average daily milk yield of buffaloes is usually 7-10 kg. The dry matter intake in lactating buffaloes is 90-125 g per kg $W^{0.75}$.