Nucleus breeding system for enhancing milk production in Buffaloes

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World buffalo population during the last decade increased at approximately 0.87 % per annum (FAO, 2002). The increase in number is primarily in the Asian countries which account for about 99.9% of the total increase in the population. . However, in the recent past buffalo breeding has generated interest in some of the Latin American and European countries where earlier this species was completely neglected. Of the approximately 166.4 million buffaloes spread in some 42 countries around the world, 161.4 millions are found in Asia (97.2 %), 3.55 millions in Africa (2.13 %), 1.4 million in South Americas (0.87%) and 0.257 millions in Europe (0.154 %). India has over 94.13 millions and they number to approximately 56.6 percent. Buffaloes of the world have been classified in two main categories namely riverine and swamp depending upon variation in their habitat and genome structure. River buffaloes are generally large in size mostly with curled horns and are mainly found in India, Pakistan and some of the west asian countries, prefer to enter clear water and have 50 (2n) number of chromosomes and are primarily used for milk production and also used for meat production and draught purpose. Swamp buffaloes are stocky animals with marshy land habitats and have 48 (2n) number of chromosomes. They are primarily used for draught power and haulage and are also used for meat and milk production. Swamp buffaloes are mostly found in south east asian countries and few animals are also available in north eastern states of India.

India posses the best milch breeds of the world e.g. Murrah, Nili Ravi, Surti, and Jaffarabadi, which had their origion in north – western states of India and have high potential for milk and fat production besides being used for work and surplus stock used for meat production. There are several other breeds in India which have regional importance and add to economic value of the farming community e.g. Bhadawari and Tarai in Uttar Pradesh, Nagpuri and Pandharpuri in Maharashtra, Parlakhemundi, Manda, Jerangi, Kalahandi, Sambalpur in Orissa and Andhra Pradesh, Toda and South Kanara in Tamil Nadu and Kerala. Mehsana breed has been developed from grading up of Surti buffaloes with Murrah in Mehsana Distt. of Gujarat. Similarly continued grading up of local non descript buffaloes with Murrah breed in Krishna and Godavari Distt. of Andhra Pradesh resulted into a strain popularly known as Godavari . The number of purebred animals of above specified breeds is expected to be about 20 to 25 % of the total buffalo population in the country. Rest of the buffaloes are non – descript in type and have extremely variable composition being either non descript or crosses among various breeds and cannot be categorized in any other well established breed. The number of purebred animals is further reducing day by day due to immigration and inter breed crossing.

NUCLEUS BREEDING SYSTEM FOR GENETIC IMPROVEMENT

Nucleus breeding system involves the elite herd (Nucleus) and the producer herd. The genetic superiority of the Nucleus herd is transmitted by males to the producer herds. Replacement in nucleus herd is generally done with the elite animals identified in the producer herd. The factors which determine the genetic gain in the population are listed below.

Selection Intensity: The rate of genetic gain per annum depends upon the accuracy of selection (R_{IH}), selection intensity (i), genetic standard deviation ($á_G$) and generation interval (t). Two major factors in achieving fast improvement are the accuracy of selection and the intensity of selection, which on small herd size, even under artificial insemination programs, are hard to achieve. Since we cannot test several sons of selected sires (SS), which of course is the major source of genetic progress (43%), other sources of genetic progress are selection of dams (DS) of the future bulls (33%), selection of sires (SD) of the future dams (18%) and selection of dams (DD) of the future dams (6%). A maximum genetic gain of 193.9 litres per generation was expected when the test was done on 8 daughters per bull, and 2 out of 15 tested bulls were selected (Parmar and Dev, 1985). However, slightly lower genetic gain was obtained when 2 out of 12 bulls were selected and the test was based on 10 daughters per bull.

Generation Interval:

In most of the buffalo progeny testing programs the sires have been used for so long as to result in overlapping of generations. This increases the environmental variance in progeny test evaluation and reduces the genetic gain per unit time due to increased generation interval. This leaves the challenging task of reducing the generation interval by reducing the test mating duration for candidate bulls to only 1 to 1½ year, optimum feeding and management of young bull calves for future sets so that they become fit for breeding by the age of 2 to 2 ½ years, optimum feeding and management of heifers to bring down the age at first calving to about 3 years; and computerization of herd records to obtain prompt evaluation of progeny performance and evaluation of buffalo cows for elite mating.

In a progeny testing program the daughters of sires under evaluation cannot be obtained at identical stage of lactation. The use of part records in combination with complete records of certain daughters for ranking of the sires gives an advantage of increasing the annual genetic gain by reducing the generation interval and also improving the accuracy of selection.

Population Size:

Most of the institutional farms, where progeny testing programs were undertaken, had small herds of 150 to 300 buffaloes. This is why small batches of 4 to 8 bulls were evaluated and ranked on as low as 2 daughters per bull. Consequently, field units were attached to obtain additional daughters from farmers' herds under the program. In India it has also been suggested to undertake progeny testing programs in native tracts of various breeds in collaboration with breeders' herds so as to increase the population size. Data on a sample progeny testing program in small herds of Surti breed in and around Anand, were analysed, which could be taken to represent the situations in Asian countries. The results gave an indication of the factors that need to be taken into account in a situation such as is prevalent in countries where 85% of the farming families possess herds of 2 or 3 buffaloes. At institutional herds , associated herds progeny testing is the best option to undertake progeny testing with large test population and elite animals spread over all the institutions as nucleus herd. This approach can be supplemented by undertaking field testing by involving farmers animals in the progeny testing.

Reproductive Problems:

One of the important constraint in implementation of progeny testing in buffaloes is the low fertility in summer and the seasonality of calving since maximum calving take place from July to November in almost all the breeds in India. In Murrah buffaloes exported to Sri Lanka maximum calving took place from November to January and in those exported to West Indies from January to March. Murrah buffaloes exported to Bulgaria had maximum calving from June to September. Egyptian buffaloes had maximum calving from October to January. Among Italian buffaloes, calving were mainly from July to October. In Pakistan too, highest calving were indicated during July to October in Nili Ravi buffaloes. The above findings suggest that buffaloes in general come in estrus during the favourable months and are sub-fertile during the stress months. The causes of sub-fertility could be poor thermoregulation. Investigations on management practices in India revealed that in summer months wallowing or water sprinkling during the hot hours of the day helps in maintaining the level of milk production and reproductive efficiency in breeding buffaloes (Nagarcenkar and Sethi, 1988).

Keeping above factors in view a progeny testing program for associated herds of Murrah breed was initiated in 1993 under the preview of Network Project on Buffalo with its coordinating unit at Central Institute for Research on Buffaloes.

Associated Progeny Testing Through Network Project on Buffalo

The associated progeny testing through Network Project on Buffalo involves testing of some of the important breeds of buffaloes. Testing for Murrah breed was initiated in 1993 wherein 12-15 bulls are tested on about 800 breedable buffaloes at 6 organised herds participating in this project namely PAU Ludhiana and HAU Hisar from SAUs, CIRB Hisar, NDRI Karnal and IVRI Izetnagar from ICAR institutions and CCBF Alamadi from ministry of animal husbandry. From each bull 60-70 pregnancies are expected to be obtained over 18 months test cycle so as to make available 15-20 recorded daughters spread over all the centres for evaluation of the bulls. From each bull approximately 8000 doses of semen are frozen of which 1000 doses are used for test mating at the institutional herds, 2000 doses in the field units and 5000 doses are stored till progeny test results are available. A nucleus of about 150 elite buffaloes spread over all the herds are bred with top ranking progeny tested bulls through nominated mating for young bull production. Remaining herd of about 1000 buffaloes spread over all the institutions is used for test mating.

From July 93 till date test mating from 6 sets of bulls have been completed. Seventh set of 12 bulls started from July 2002 and shall continue up to December 2003 for test mating. Brief summary of the duration, the number of bulls, their average age at the time of selection, average of the dam's best yield and highest dam's yield in each set is shown in Table 1.

Table 1

Set No.	Duration	Centre wise no. of bulls				Av. age of bulls at selection (months)	Av.of 305 day or less dams best yield (kg)	Highest dam 305 day yield (kg)	305 day or less herds average (kg)
		CIRB HAU	NDRI		PAU				
1.	July, 93 to Dec., 94	2	9	0	-	60.5	3050	4114	1820/---
2.	Jan., 95 to June, 96	4	5	6	-	47.5	3002	3898	1920/487
3.	July, 96 to Dec., 97	8	5	2	-	44.0	2876	3275	2053/476
4.	Jan., 98 to June, 99	5	4	5	-	43.5	2999	3401	1973/457
5.	July, 99 to Dec., 2000	6	5	4	-	46.5	3120	3898	1943/551
6.	Jan.,2001 to June 2002	5	5	4	2	40.2	3055	3898	1972/562
7	July 2002 to Dec., 2003	5	2	4	1	34.3	2928	3544	2017/505

Health Evaluation and Semen Quality Testing of Selected bulls.

From seventh set, all bulls selected for breeding are subjected to disease surveillance schedule employing standard test procedures. Certificate with respect to health status of the bulls and vaccination in the standard format is issued to the respective semen freezing laboratories and only disease free bulls are allowed to enter the test breeding. The disease testing is conducted prior to the entry of the bull for semen collection and subsequently at six months interval. The bulls that react positive to the test are immediately isolated and retested for confirmation (Sire Directory-2002).

List of the diseases and proposed tests.

Disease	Test
Brucellosis	BBAT, CF / ELISA, PCR
Tuberculosis	Tuberculin test, PCR
Paratuberculosis	Johnin's test
Campylobacteriosis*	Agent id.
Trichomoniasis *	Agent id.
Leptospirosis *	MAT / ELISA
Bovine viral diarrhoea *	ELISA
Infectious bovine rhinotracheitis	ELISA, PCR

* Under standardisation

Abbreviations: Agent id: agent identification; BBAT: buffered brucella antigen test; CF: complement fixation test; ELISA: enzyme linked immuno sorbent assay; MAT: microscopic agglutination test; PCR: polymerase chain reaction.

Brucellosis : The buffered brucella antigen test (Rose Bengal plate agglutination test and buffered plate agglutination test) is conducted. The reactivity of animals is confirmed by the complement fixation test/ELISA. PCR assay shall be conducted for detection of Brucella in semen and other body fluids..

Tuberculosis : Tuberculin test (delayed type hypersensitivity test) is conducted for detection of tuberculosis. It involves injecting bovine tuberculin intradermally and measuring the subsequent swelling at the site of injection 3 days later. The PCR based assay shall be standardized and used for detection of mycobacteria in semen or other body fluids.

Paratuberculosis : Johnin's test is conducted for diagnosis of paratuberculosis.

Campylobacteriosis : Preputial material shall be cultured (5 times at 7 days interval) and examined for *Campylobacter fetus venerealis*, the result shall be negative. As an alternative procedure, the preputial material will be examined using the fluorescent antibody(FA) technique as a screening test. Any positive FA test shall be followed by a culture of preputial material, the result should be negative.

Trichomoniasis : The series of microscopic examinations (4 times at 10 days interval) of the cultured preputial material collected from the fornix shall be done.

Leptospirosis : A serological tests either microscopic agglutination test or ELISA will be conducted for the prevalent serotypes. Any animal with significant titre may be subjected to a second blood test within two to four weeks after the first. Animals with a stabilized low titre (negative at 1:400) on two consecutive tests will be considered satisfactory.

Bovine viral diarrhea : The ELISA shall be done for detection of antibodies.

Infectious bovine rhinotracheitis/ Infectious pustular vulvovaginitis : The ELISA is conducted for antibody detection. The PCR assay will be standerdized and conducted for detection of virus from semen or other body fluids.

Others : The semen collection is not done during the outbreak of foot and mouth disease and blue tongue in the herds as the virus is shedded in the semen during viremic phases of these diseases.

Progeny Test Evaluation of bulls

First set of 11 bulls was initialed in July 1993 by selecting the best available bulls from all the centres and used up to December 1994. These bulls were evaluated on the basis of daughters first lactation 305 days or less milk yield by the contemporary daughters comparison method and their sire indices, percent superiority over contemporary daughters and other pedigree details are presented in Table 2 and that of set 2 is presented in table 3.

Table 2 Progeny Test Evaluation of first set of bulls.

Bull No.	Centre	Date of Birth	Sire No.	Dam No.	Dam's Best yield	Daughters 305 day or less yield/no.	Sire index	Rank	% superiority over contemporary daughters
392	CIRB	06.04.89	PQ1	238	2594	2074/13	2118	I	22.8
896	CIRB	27.07.87	644	911	3003	1796/26	1844	III	5.5
3098	NDRI	12.02.86	1039	360	3164	1589/18	1547	IX	-8.2
3108	NDRI	29.04.86	368	2221	4114	1780/28	1822	IV	4.4
3117	NDRI	24.05.86	1039	377	2858	1652/20	1626	VI	-4.2
3125	NDRI	14.04.86	2361	1091	2828	1717/17	1717	V	0.0
3127	NDRI	15.06.86	1039	1608	2927	1499/14	1462	XI	-13.6
3206	NDRI	18.11.86	1992	2376	3124	1605/08	1611	VII	-6.8
3294	NDRI	03.08.87	2288	1393	3003	1592/11	1590	VIII	-7.7
3462	NDRI	08.11.88	2666	2372	3072	1398/08	1524	X	-18.0
3567	NDRI	07.09.89	2304	2408	2877	1813/20	1852	II	6.4

Note: Frozen semen of three top ranking progeny tested bulls (392,3567,896) has been used for nominated mating at the centres.

Table 3. Progeny Test Evaluation of Second Set of Bulls (01.01.1995 – 30.06.96)

Sr No.	Bull No.	Location	Date of Birth	Dam No.	Sire No.	Dam's best lact. 305 day yield (kg)	Daughter's first lact 305 day or less av. yield (kg)	No. of daughters	Sire index	Rank	% superiority over contemporary daughters	Semen doses available as on 31-03-03 at respective centres and CIRB
1.	93	CIRB	03-11-90	-	PQ-1	22.0*	1874.1	16	1889.8	II	3.96	6000
2.	759	CIRB	17-11-90	208	963	2650	1860.7	14	1868.9	IV	2.80	5000
3.	761	CIRB	20-11-90	474	366	2878	1960.4	15	1987.4	I	9.37	5995
4.	829	CIRB	04-07-91	597	766	2626	1877.8	10	1876.3	III	3.53	7100
5.	3551	NDRI	09-08-89	2762	2321	3898	1837.5	19	1845.0	VI	1.49	2955
6.	3638	NDRI	26-04-90	2929	2848	3278	1857.5	14	1865.2	V	2.41	4590
7	3689	NDRI	18-09-90	2118	101	3424	1650.8	9	1665.4	X	-9.73	4890
8.	3736	NDRI	08-02-91	63	610	3264	1661.1	10	1665.1	XI	-9.19	125
9	3750	NDRI	27-04-91	2929	2880	3278	1747.9	14	1735.0	VIII	-4.22	2005
10.	1241	PAU	18-09-91	576	82	2971	2015.4	5	1939.0	Rejected being ranked on only 5 daughters.		2174
11.	1253	PAU	27-10-91	716	82	3348	1844.0	9	1841.6	VII	1.29	2256
12.	1290	PAU	06-03-92	448	883	2628	1711.1	14	1691.4	IX	-6.92	4482

Table 3. Progeny Test Evaluation of Second Set of Bulls (01.01.1995 – 30.06.96)

* Peak yield

Note : All daughters 305 day or less first lactation yield = 1818 kg.(Herd Average)

→ Three top ranking sires at each of the center are being used for elite mating

Performance Characteristics at various participating centers.

Herd performance with respect to various production and reproduction traits at different participating centers has been compiled and is presented in table 4- 7.

Age at first calving : Average age at first calving (AFC) since 1992 – 93 at various participating centers is presented in table 4. At CIRB where in the initial years, AFC was high, there has been significant improvement in this trait. At PAU Ludhiana this trait remained almost constant at 44 months where as at NDRI Karnal it slightly improved from 45.5 to 42.4 months. At HAU Hisar there has been no change. AFC of 51.6 months in 1993–94 ended up in 2000 – 01 at 50.6 months. At IVRI Izatnagar AFC increased from 36.6 months in 1992 – 93 to 42.4 months in 2000 – 01. Similarly at CCBF Alamadi it significantly increased from 44.0 to 60.5 months during the same period. Overall weighted average (Average of all the participating centers) during the year 2001 – 02 was estimated as 46.4 months from 154 calving.

Table 4. Average Age at first calving at various participating centres

Year	CIRB	PAU	NDRI	HAU	IVRI	CCBF	Weighted average
1997-98	45.5±0.5 (49)	45.0 (45)	44.8 (34)	48.7 (28)	40.1±3.4 (6)	51.0	45.6 (162)
1998-99	50.0±0.1 (57)	47.0 (34)	46.2 (54)	47.3 (22)	43.4±2.3 (8)	54.0	47.6 (153)
1999-00	46.2±1.0 (54)	42.0 (54)	42.6 (29)	49.4 (15)	48.8±7.0 (6)	55.0	44.0 (143)
2000-01	46.2±1.2 (45)	44.4 (27)	42.4±0.7 (42)	50.6±2.0 (17)	42.4±2.8 (4)	60.5 (41)	48.6 (176)
2001-02	49.8±0.8 (51)	44.7±1.4 (32)	44.0±1.0 (34)	46.7±4.9 (14)	44.4±2.6 (11)	45.0 (12)	46.4 (154)

Figures in parenthesis indicate number of calvings

305 day or less milk yield: Consistent increase in 305 day or less lactation milk yield has been observed at CIRB, PAU, IVRI and CCBF. At HAU, Hisar initially 305 day lactation milk yield increased from 1819 kg in 1993 – 94 to 2104 kg during 1997 – 98. However, after this it decreased to all time low of 1689 kg during 1999–2000 and then immediately in the year 2000 – 01 it increased to all time high of 2183 kg.(Table 5). Fluctuations during the years are primarily due to management variations over the years. Similarly at NDRI Karnal average 305 day lactation yield decreased from all time high of 2576 kg in 1995 – 96 to 1822 kg during 1999 – 2000 and then slightly increased to 2019 kg during the year 2001-02. Weighted average during the year 2001-02 has been estimated as 2017 kg from 505 lactati

Table 5. Average 305 day or less milk yield at various participating centres

Year	CIRB	PAU	NDRI	HAU	IVRI	CCBF	Weighted average
1997-98	1688±37 (123)	1995 (98)	2191 (128)	2104 (83)	1715±95 (23)	2007	1973 (455)
1998-99	1702±33 (141)	2101 (125)	2033 (112)	1965 (51)	1980±97 (22)	2179	1928 (412)
1999-00	2042±31 (141)	2041 (114)	1822 (102)	1689 (64)	2026±98 (18)	2135	1981 (375)
2000-01	1914±36 (173)	2032 (103)	2019 (126)	2183 (42)	1898±147 (20)	1875 (98)	1973 (422)
2001-02	1898±35 (152)	2175 (112)	1963±61 (91)	2119±46 (50)	2102±75 (19)	2000 (81)	2017 (505)

Figures in parenthesis indicate number of records

Service Period : There has been substantial improvement in service period at CIRB and NDRI. Shortest service period has been reported at NDRI (107±14 days) followed by (146± 11 days) by CIRB Hisar and HAU Hisar (146±27 days). PAU Ludhiana reported the highest service period (197 days) which is more or less the same since inception. This is much higher than the target value of 130 days therefore this centre need to improve reproductive ma

Table 6. Average Service period at various participating centres

Year	CIRB	PAU	NDRI	HAU	IVRI	CCBF	Weighted averagel
1997-98	175±14 (106)	248 (94)	97 (59)	107 (55)	83±06 (11)	175	167 (325)
1998-99	137±09 (121)	232 (81)	118 (63)	109 (47)	153±25 (11)	186	159 (323)
1999-00	138±09 (104)	213 (59)	159 (82)	148±34 (49)	190±28 (16)	187	162 (310)
2000-01	146±09 (151)	197 (81)	107±14 (53)	146±27 (25)	165±22 (17)	155 (43)	153 (370)
2001-02	146±11 (125)	202±14 (83)	123±9 (77)	147±14 (31)	134±25 (12)	126 (69)	150 (397)

Figures in parenthesis indicate number of records.

Calving Interval

Weighted average of calving interval for the year 2001 – 02 was estimated as 460 days (Table 7) and ranges from 428±13 days at NDRI Karnal to 496±15 days at PAU Ludhiana. Data over the years indicate that this trait is more or less stabilized around 400 to 500 days at various participating centers. However looking into the variation of data it appears that still there is scope for improvement of this trait by providing better management so as to improve this trait further to about 400 days.

Table 7. Average calving interval at various participating centres

Year	CIRB	PAU	NDRI	HAU	IVRI	CCBF	Weighted average
1997-98	491±10 (118)	553 (94)	395 (60)	389 (55)	392±13 (11)	574	431 (338)
1998-99	455±10 (126)	553 (87)	424 (62)	417 (46)	438±15 (10)	522	469 (331)
1999-00	451±08 (120)	518 (63)	435 (52)	459±34 (49)	422±21 (11)	513	463 (295)
2000-01	454±09 (154)	511 (82)	408±21 (56)	479±33 (25)	411±13 (9)	491 (101)	468 (427)
2001-02	456±11 (135)	496±15 (84)	428±13 (43)	457±14 (31)	440±24 (12)	445 (69)	460 (374)

Figures in parenthesis indicate number of records.

Improvement program for breeds other than Murrah: Performance evaluation and improvement of other important riverine breeds of buffaloes for which centers of Network Project on Buffalo under ICAR have been established during the year 2001 involves Nili Ravi breed at CIRB sub campus Nabha Panjab, Jaffarabadi breed at GAU Junagarh Gujarat, Bhadawari breed at IGFRI Jhansi Uttar Pradesh, Surti breed at MPUAT Vallabhnagar Rajasthan and Pandharpuri breed at MPKV Kolhapur Maharastra. At each of these centers an elite herd of 50 to 60 buffaloes is to be established as bull mother farm for young bull production, bull rearing and semen freezing laboratory is being setup. Each set is likely to have 8 – 10 bulls of 18 months duration. From each bull 4 – 5 thousand doses of semen will be frozen. Semen from these test bulls is to be used on farmers buffaloes covering about 3000 breedable population in the field with the target to breed atleast 150 animals from each bull and to obtain at least 15-20 recorded daughters from each bull. 25 % top ranking bulls are to be selected for nominated mating on the elite buffaloes at the farm as well as on identified buffaloes in the field.

Germplasm requirement and availability

In order to cover large breedable population of approximately 45 million buffaloes through AI and or natural service, large number of superior breeding bulls from superior germplasm of milch breeds is required every year. Rough estimate of bulls requirement in India is presented below

Requirement of superior germplasm for breeding of buffaloes in India

Proportion of population bred through AI	NS	Number of frozen semen doses required (millions)	Number of breeding bulls required per annum for NS as replacement
0	100	0	12600
10	90	7.875(985)	11340
20	80	15.750(1970)	10080
30	70	23.625(2953)	8820
40	60	31.500(3940)	7560
50	50	39.375(4922)	6300

Breedable population = 45 million. Replacement rate of bulls per annum = 20%
Breeding efficiency = 70% No. of AI per conception = 2.5
No. of natural services per bull per annum = 500
No. of doses frozen from each bull per annum = 8000

Considering the all India status of AI activities (2001 – 02) it is estimated that about 25 million artificial inseminations are performed annually covering the entire cattle and buffalo population under AI. With greater proportion of AI being done on crossbreds and cattle, it is expected that Buffalo share for AI is likely to be about 25 % (approximately 6 millions) of the total inseminations. This shows that by the modest expectation only 10 – 15 % buffaloes of the total breedable population in the country are covered by AI while 90 % through natural service. To meet this population we require about 12000 superior breeding bulls to be selected and reared for replacement either for semen production or to be used for breeding through natural service. Major share of these bulls (about 50 %) has to be from Murrah being the improver breed while rest of the bulls can be from other well established breeds to be used in the respective breeding tracts for selective breeding / grading up of non descript local stock. Germplasm dissemination in the form of bulls and frozen semen from various centers over the last 5 years is presented below which has been used extensively for breeding purpose.

Superior germplasm dissemination from various centers is presented below.

Year	CIRB		PAU		NDRI	
	Bulls	Semen	Bulls	Semen	Bulls	Semen
1998-99	32	50	10	6000	15	1740
1999-00	26	100	22	5847	11	1320
2000-01	16	70	33	3449	9	2230
2001-02	18	21648	18	8579	8	5030
2002-03	29	2270	7	1002	7	2655

OPEN NUCLEUS BREEDING SYSTEM

Open Nucleus Breeding System (ONBS) with multiple ovulation and embryo transfer (MOET) technique is a new breeding option for enhancing genetic gain in animal population (Smith, 1988, Hodges, 1988). This technique enables the production of more than one offspring and the desired type of family e.g. Full sibs and half sibs. Selection in this scheme is on the basis of full-sibs and half-sibs group rather than on progeny or pedigree. Nicholas and Smith (1983) examined the possible impact of MOET nucleus scheme on dairy cattle improvement, indicating gain equal to that possible from an efficient progeny testing scheme. In this system the selection intensity of females is dependent on the number of embryos transferred per donor, success rate and donor herd size.

The specific advantages of undertaking ONBS in buffaloes are to establish an elite buffalo ONBS herd, faster multiplication of superior germplasm, evaluate buffalo bulls on the basis of sibs performance with reduced generation interval. and achieve higher genetic gain though accuracy of selection is slightly lower than in progeny testing. Since breeding value of males is judged on the performance of their half sisters (sibling test) and not on the performance of progeny, the generation interval is considerably reduced. Although the accuracy of selection under sibling test is generally lower than that achieved in progeny test, the benefit of reducing generation interval of sibling test is reduced to about 4 years in buffaloes as compared to approximately 7 years in conventional progeny testing scheme (Nicholas, 1979).

The effect of inbreeding is expected to be slightly higher in ONBS than in conventional progeny testing. Land and Hill (1975), estimated rate of inbreeding by using the number of males (Nm) and females (Nf) entering the donor herd each year using the expression Df=(1Nm + 1/Nf) / 8L where L is the generation interval. The rate of inbreeding can be controlled by keeping the nucleus herd open from male and female sides.

Results on multiple ovulation and Embryo transfer in India on cattle and buffalo have shown that in comparison to on an average 5 embryos in single flushing from cattle, the average in buffaloes was only about 0.66 (Madan et al., 1989) however, higher number ranging from 2.66 to about 4 embryos per flush have also been reported in buffaloes. Embryo transfer in buffaloes has resulted in the production of several calves at different institutions e.g. NDDB, Anand, PAU, Ludhiana, NDRI, Karnal and CIRB, Hisar.

The technique in buffaloes is still under standardization but this has been made use of as a breeding tool for faster multiplication of superior germplasm and obtaining higher genetic gain in a single herd open mixed MOET program by NDDB (Trivedi, 1992) at its Buffalo Breeding Center located at Nekarikallu (AP). Project involves 32 top buffaloes selected from roughly 250 buffaloes in the herd, 4 donors assigned to each bull with total 8 bulls in each set, 16 embryos per donor to be recovered in 5 to 6 flushing every year, 8 pregnancies per donor with expected 4 male and 4 females calves born, in all 130 male and 130 females evaluated each one on two Dam's records, 4 full sibs records and 12 half sibs records from 8 families, one young bull per family selected for the next cycle, First 50 bulls to be used for Progeny testing under NDDB Herd improvement program and remaining 30 for natural service and 30 heifers enter in the program from 4th year of which 32 donors selected for next cycle. The rate of increase in inbreeding by the use of male and females in the nucleus herd per year is estimated as 0.0023 per annum.

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W T O Meet Failed

Cancun WTO ministerial summit failed because many developing as well as least developed countries refused to approve proposals to begin talks on new WTO treaties on several issues including subsidies

Buffalo production in the state will be strengthened

Dr. N. N.Sasi

Buffalo population in the state shows a declining trend. In an exclusive interview to JIVA Director of Animal Husbandry Department, Kerala Dr.N.N.Sasi explained the measures taken to alleviate the problem. Excerpts from the interview are given below.

Q. Buffalo population in the state reduced from 1.65lakhs during1996 to 1.11lakh during 2000 cattle census, which shows a drastic declining trend. How do you assess this change?

A. There are several reasons for this drastic. Cattle development activities in the state had focussed more on white cattle rather than buffaloes. There were no focussed activities for Buffalo development in the state. Moreover being the animals of the demon group due to discrimination buffaloes were partially neglected. Previously Buffaloes were increasingly used for draught purpose. Reduction in cultivable land especially paddy fields and increased mechanization in agriculture paved the way for reduction in buffalo population in the state. Compared to cows, management of buffaloes were not so easy. People prefer to consume cows milk rather than buffalo milk in the state.

Q. What are the measures taken to improve the situation?

A. In order to create awareness among farming community about the importance of buffalo production, Animal Husbandry department is planning to implement massive awareness programs in the state. Measures will be taken to include female buffalo calves under calf feed subsidy programme. Buffalo rearing areas will be given enough attention. There are plans to implement buffalo village concept on a pilot basis and to propagate fodder cultivation on a massive scale.

Q. About Buffalo meat production and export potential in the state?

A. First priority will be to increase the Buffalo population in the state. Measures will be taken to reduce mortality of male Buffalo calves. Then only we can think of buffalo meat production and export.

Dr.T. P. Sethumadhavan

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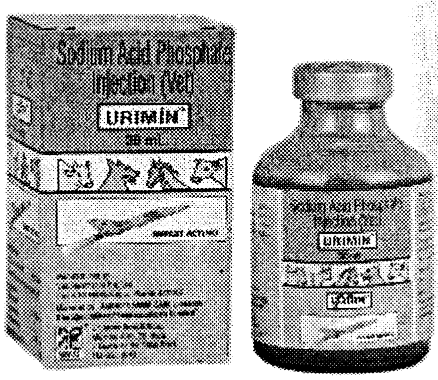

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