Recording System for Breeding and Production Performance of Dairy Animals in Bangladesh

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There are 160 million people in Bangladesh, of which roughly 50% are literate. There are 23.5 million cattle of which 90% are reared by smallholder farmers under village conditions, and 10% in organized modern dairy farming systems. In village conditions, there is no organized identification or recording system. Farmers usually identify their animal by differences in color, breed, size and by giving them the names of the renowned persons. Farmers keep their breeding records (date of estrus, date of service, expected date of delivery and date of calving) by memorizing the Bengali calendar month or lunar calendar, and some farmers keep breeding records in a pocket notebook. On organized farms, animals are usually identified either by metal or plastic tag. Individual daily milk yield is recorded by hanging weighing balance and recorded in a herd book. To improve the animal recording and genetic evaluation system the following actions are being taken in a limited area of Bangladesh;

(i) A national project on "Breeding-up through Progeny Testing" is being undertaken by the Department of Livestock Services (DLS), which is part of the Government of Bangladesh. The main objectives of the project are:

(a) Production of superior proven bulls and

(b) Conservation and improvement of native cattle genetic resources

(ii) For genetic improvement of indigenous cattle in the existing situation, an Open Nucleus Breeding Scheme (ONBS) as proposed by Cunningham, in 1981, is being undertaken as it is the most suitable system for a country like Bangladesh.

The following actions need to be taken; (i) animal identification and registration of dairy animals (ii) the existing data base system of the DLS project, as above, should be extended and strengthened (iii) recording of production traits either on a full or partial record basis.

It is concluded that keeping proper records and good information are keys to good management and more profitable dairying.

Keywords: *grading-up, organized farms, proven bulls, progeny testing, recording system*

Introduction

There are 160 million people in Bangladesh, of which roughly 50% are literate. There are 23.5 million cattle of which 90% are reared by smallholder farmers under village conditions, and 10% in organized modern dairy farming systems. In village conditions, there is no organized identification or recording system. Farmers usually identify their animal by differences in color, breed, size and by giving them the names of the renowned persons. Farmers keep their breeding records (date of estrus, date of service, expected date of delivery and date of calving) by memorizing the Bengali calendar month or lunar calendar, and some farmers keep breeding records in a pocket notebook. On organized farms, animals are usually identified either by metal or plastic tag. Individual daily milk yield is recorded by hanging weighing balance and recorded in a herd book. To improve the animal recording and genetic evaluation system the following actions are being taken in a limited area of Bangladesh;

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Use of Progeny Testing program as a Tool for Breeding-up

A National Progeny Testing Program is very important for continued genetic improvement in dairy cattle population. It identifies bulls with superior genetic merit for milk and other traits of economic importance. Bulls identified with superior genetic merit are utilized by dairy producers and AI studs as sires of future dams and sires.

The first phase of this project was initiated in 2002-03 and its second phase came into operation since 2008-09 with the gap of 2007-08 therein.

It was expected that fulfilling the aforesaid objectives will promote the economical and biological efficiency of milk production in the expanding dairy industry by improving the genetic potential of the national dairy herds. In this respect, the role of the A.I. industry is vital for the progeny testing of young bulls and for the distribution of semen from declared proven bulls through national AI network.

Steps of the Project

The progeny testing program for proven dairy bull production involves:

I. Decision of the number of bulls tested in a year
II. Acquiring young sires (Candidate bulls) to be progeny tested
III. Test herd (at station / field)
IV. Test AI using semen of candidate bulls
V. Registration of daughters
VI. Milk recording on daughters (at station / field)
VII. Data analysis (sire evaluation using BLUP methodology)
VIII. Proven bull selection for wide use

Table 1 Time frame for proven bull production and declaration

Sl. No.	**Step**	Time Required (Month)
1	Selection of candidate bulls, recipient cows/heifers and farmers	6-10
2	Production of heifer calves using semen of candidate bulls	11-12
3	Maturity of heifer calves (First Service)	20-30
4	Conception to delivery of heifers	10-12
5	Calving to milk production recording of young cows	5-6
6	Data analyses and genetic evaluation of candidate bulls	2-4
7	Paperwork and declaration of proven bull	1-2
	Total time required	55-76 (around 6 years)

Progress towards national dairy development

Role of Breed Development

Breed development can be called the “software” of any dairy development operation. To a breeder, right breed in the right production system; merit, quality and pricing of breeding materials and breeding services; development of system for the continuous improvement of breeding materials, development of national animal registration, recording and genetic evaluation system are the nuts and bolts of a breed development program for the dairy industry to be profitable and competitive. However, indiscriminate use of exotic breeds and strains and poorly designed breeding schemes (which are producing crossbred animals of dozens of stratified grades with uneconomic performance) are the major reasons for the loss of our valuable animal genetic resources.

The loss of locally adapted breeds is having long term negative implications, for instance, it is even removing the chance of producing required crossbred bulls (say F×L, S×L etc.) to cater the national AI industry. Locally adapted breeds will continue to be valuable in our country because the poor farmers can’t afford the inputs that are required to sustain breeds that have been developed in low stress, high input production systems i.e. exotic breeds. More importantly, indigenous breed matches better with the economy of poor livestock rearers. Therefore, for achieving significant growth in breed development aimed at dairy development, smallholder poor farmers needs have to be taken care of.

Inherent Challenges in a Progeny Testing Program

In general, the purposes of any progeny testing program are

i. To broadly screen a large number of potential young sires,
ii. To evaluate the genetic merit these sires
iii. To select the very best genetic merit sires, and
iv. To provide farmer’s access to these high genetic merit sires

However, global experience in implementing a progeny testing program indicate that this program’s complexity is involved in selection, rearing, training of bulls, production storage procurement and distribution of semen, monitoring the supply of various participating centers in the country and active participation in project formulation and implementation in association with the participating centers. Hence, it is clear that implementing a national progeny testing program and getting its impact visible in the farmers bucket need time, high initial investment, hard work and patience.

Main features of Progeny Testing Program in Bangladesh at a Glance

Name of the Project: Progeny Testing Program (phase I)

Total expenditure: 94.216 million Taka (1 US Dollar = Taka 80)

Timeline of the project: July, 2002 to June, 2007

Implementation area: 22 Districts (out of 64) of Bangladesh having Artificial Insemination Centre

Table 2 Activities of the Phase I

Activities	Projected target	Achievement up to June, 2007	Progress (%)
Training of Officer	663	663	100
Training of technical personnel	85	85	100
Training of farmers	1100	1100	100
Giving incentives to farmers	4322	4322	100
Distribution of vaccine, vitamin-mineral premix and antihelmintics	4322	4322	100
Candidate bull selection	-	5	-
Progeny show	44	44	100
Seminar	2	2	100
Workshop	4	4	100

Name of the Project: Progeny Testing Program (phase II)

Total expenditure: 115.769 million Taka (1 US Dollar = Taka 80)

Timeline of the project: July, 2008 to June, 2013

Implementation area: 22 Districts (out of 64) of Bangladesh having Artificial Insemination Centre

Table 3 Activities of the Phase II

Activities	Projected target	Achievement up to January, 2012	Progress (%)
Training of Officer	363	361	99.5
Training of technical personnel	194	146	75.3
Training of farmers	5000	4025	80.5
Giving incentives to farmers	4000	3525	88.1
Distribution of vaccine, vitamin-mineral premix and antihelminthtic	4000	3525	88.1
Collection of bull calves	100	62	62
Candidate bull selection	40	38	95
Progeny show	4	4	25
Seminar	2	1	50

Table 4 Breed Up-gradation Through Progeny Test Project (Phase II), Breed, Number and Brief Pedigree of some Selected Candidate Bulls in Savar, Dhaka, Bangladesh

Sl. No.	Date of Birth	No. and Breed	Name of district	Sire's breed	Dam's breed	Dam's milk production(L)
1	20/04/04	**BDN-26** (LxF) x (LxFxFxF)	Dinajpur	6087 L*xF**xFxF	LxF	11 lit./290 D
2	07/03/04	**T-06** (L)	Tangail	L	L	3.5 lit/245 D
3	10/07/04	**BDN-22** (SLxF)	Dinajpur	8269 SLxF	SLxF	7 lit./298 D
4	11/04/04	**D-11** (LxFxF)	Dhaka	F-60	LxF	10 lit./289 D
5	13/03/04	**PN-39** (LxF) x (LxFxFxF)	Pabna	6087 LxFxFxF	LxF	8 lit./295 D
6	14/02/06	**TH-104** (LxF)	Thakorgaon	629 LxF	LxF	10 lit./1st 100 D
7	13/05/06	**TH-107** (LxF) x (LxFxFxF)	Thakorgaon	GP3 LxFxFxF	LxF	10 lit./1st 100 D

Continued

8	18/06/06	**RJ-14** (LxF) x (LxFxF)	Rajshahi	D-22 LxFxF	LxF	12 lit./1st 100D
9	25/06/06	**KH-14** (LxF) x (LxFxF)	Khulna	SB-576 LxFxF	LxF	13 lit./1st 100 D
10	29/05/06	**KH-19** (LxFxF)	Khulna	SB-576 LxFxF	LxFxF	14 lit./1st 100 D
11	27/04/06	**KH-04** (LxFxF)	Khulna	A04 LxFxF	LxFxF	14 lit./1st 100 D
12	22/06/06	**NK-26** (LxFxF)	Noakhali	A04 LxFxF	LxFxF	20 lit./1st 100 D
13	08/02/08	**14801** (LxFxF) x (LxFxFxF)	Sheikh Akhroz Hossain, Khulna	GP-3 LxFxFxF	LxFxF	12 lit./1st 100 D
14	02/01/08	**14802** (LxFxF) x (LxFxFxF)	Bijoy Mondal, Khulna	GP-3 LxFxFxF	LxFxF	10 lit./1st 100 D
15	02/05/08	**14813** (LxF) x (LxFxFxF)	Elias Ali, Khulna	GP-3 LxFxFxF	LxF	08 lit./1st 100 D

Continued

16	08/05/08	**14202** (LxFxF)	Mohanondo Ghosh, Kustia	JR-01 LxFxF	LxFxF	18 lit./1st 100 D
17	20/12/07	**14821** (LxFxF) x (LxFxFxF)	Abul Kalam Moral, Khulna	GP-3 LxFxFxF	LxFxF	10 lit./1st 100 D
18	08/09/08	**14822** (LxFxF) x (LxFxFxF)	Kartik Kundu, Khulna	GP-3 LxFxFxF	LxFxF	16 lit./1st 100 D
19	08/03/08	**14001** (LxF) x (LxFxF)	Md. Mahbub Choudhury, Dhaka	1573 LxFxF	LxF	15 lit./1st 100 D
20	13/11/07	**14014** (LxF)	Afjal H Khan, Monipuripara, Dhaka	9386 LxF	LxF	18 lit./1st 100 D
21	22/06/08	**14837** (LxF) x (LxFxFxF)	Aslam Gaji, Dumuria, Khulna	GP-3 LxFxFxF	LxF	10 lit./1st 100 D
22	10/06/08	**14850** (LxF) x (LxFxFxF)	Bablu Mondal, Dumuria, Khulna	GP-3 LxFxFxF	LxF	10 lit./1st 100 D
23	18/06/08	**14835** (LxFxF) x (LxFxFxF)	Moslem Uddin, Dumuria, Khulna	GP-3 LxFxFxF	LxFxF	13 lit./1st 100 D

Continued

24	20/07/08	**14840** (LxFxF) x (LxFxFxF)	Sekandar Ali Gaji, Dumuria, Khulna	GP-3 LxFxFxF	LxFxF	14 lit./1st 100 D
25	11/09/08	**14852** (LxFxF) x (LxFxFxF)	Abdul Halim, Dumuria, Khulna	GP-3 LxFxFxF	LxFxF	12 lit./1st 100 D
26	5/08/08	**14204** (LxFxF)	Md. Rasel, Khustia	JR-1 LxFxF	LxFxF	16 lit./1st 100 D
27	13/08/08	**14301** (LxF) x (LxFxF)	Karnadar Biswas, Faridpur	JR-1 LxFxF	LxF	18 lit./1st 100 D
28	5/01/09	**14305** (LxF) x (LxFxF)	Abul Kashem, Faridpur	D-165 LxFxF	LxF	16 lit./1st 100 D
29	22/04/08	**14402** (LxFxF)	Mira Begum, Jessore	D-165 LxFxF	LxFxF	14 lit./1st 100 D
30	27/02/08	**14405** (LxFxF)	Md. Sagir Hossain, Jessore	D-165 LxFxF	LxFxF	13 lit./1st 100 D
31	16/08/08	**14407** (LxFxF)	Abdul Matin, Jessore	D-165 LxFxF	LxFxF	14 lit./1st 100 D

Continued

32	10/04/08	**14843** (LxF) x (LxFxFxF)	Md. Monirul Sheikh, Khulna	GP-3 LxFxFxF	LxF	10 lit./1st 100 D
33	9/10/08	**14846** (LxFxF) x (LxFxFxF)	Akhter Hossain, Dumuria, Khulna	GP-3 LxFxFxF	LxFxF	16 lit./1st 100 D
34	10/02/08	**14811** (LxFxF) x (LxFxFxF)	Dr. Kalipod, Dumuria, Khulna	GP-3 LxFxFxF	LxFxF	18 lit./1st 100 D
35	10/05/08	**14804** (LxFxF) x (LxFxFxF)	Sheikh Amjad Hossain, Khulna	GP-3 LxFxFxF	LxFxF	20 lit./1st 100 D
36	05/06/09	**14080** (LxF)X (LxFxF)	Rustam Ali Khan, Dhaka	291 LxFxF	LxF	20 lit./1st 100 D
37	07/02/09	**14313** (LxF)X (LxFxF)	Sheikh Fazlul Haque, Rajbari	D-165 LxFxF	LxF	21 lit./1st 100 D
38	02/02/09	**14345** (LxF)X (LxFxF)	Faridpur	5830 LxFxFxF	LxF	22 lit./1st 100 D

Continued

39	04/01/10	**14502** (LxF)X (LxFxF)	Md. Harun-or-Rashid, Bogra	KH-14 (LxF) x (LxFxF)	LxF	22 lit./1st 100 D
40	20/05/09	**14503** (LxF)X (LxFxF)	Sri Nikhil Chandra, Bogra	MJ-01 LxFxF	LxF	18 lit./1st 100 D
41	13/06/09	**14606** (LxF)X (LxFxF)	Md. Hannan, Pabna	D-199 LxFxF	LxF	21 lit./1st 100 D
42	05/06/09	**14609** (LxF)X (LxFxF)	Md. Shahidul Islam, Pabna	1573 LxFxF	LxF	20 lit./1st 100 D
43	07/08/09	**14610** (LxFxF)X (LxFxF)	Md. Amirul Islam, Pabna	D-165 LxFxF	LxFxF	22 lit./1st 100 D

*L = Local breed (Non-descriptive indigenous cattle)

**F = Pure Holstein-Friesian Cattle Breed

Contribution of the on-going Breed-Up Project:

The main vision of the project was to provide the AI industry of the country with breeding bulls of known superior genetic merit so that the national breed development is ensured at positive direction. In this connection a question paramount importance to cattle producers is which bull is right for my production system? Because selecting the right bulls can potentially contribute more to genetic improvement and profitability of a dairy operation than any other management practices. In this context, the elements of consideration are: Breed, Age, Phenotype, Pedigree, Expected Progeny Difference (EPDs), Performance which are being taken into account through this project. However, upon implementation of the talked about project, the following contributions are being apparent:

a. The first change that has resulted in the dairy industry upon implementation of the said project is that now stakeholders (farmers, NGOs, policy makers, researchers, and service

providers) know that government has initiated a long-demanded system for selecting the "**Right**" and "**surely good**" breeding bulls for the dairy producers of Bangladesh.

b. Through training of this project a good number of skilled manpower has been developed to improve and organize the efficiency of selected contract farmers to produce proven bulls.

c. A gradual growth in the number of commercial dairy farms (Table 1) over the years in Bangladesh can be seen as the indirect influence of this project mediated through the awareness built by the project organized "**Progeny Shows**".

Table 5 Growth in the number of commercial dairy farms over the years in Bangladesh (Source: DLS, 2011)

Year	1979-80		1997-98		2000-01		2009-10	
No. of dairy farms	227	2270	29649	296490	32614	316140	79847	98470

d. Through this project meanwhile a total of 4,50,085 doses of frozen semen from its candidate bulls were produced of which 4,38,012 doses have already been disseminated in the field whose positive impact would soon come apparent in the dairy industry of the country.

e. Another indication of success of the on-going project is that there is a pronounced demand of the semen of Breed Up-gradation Project (BUP) in the field appeared through there gathered opinion.

f. A marked positive difference in the dam's average milk yield performance of the candidate bulls compared to AI bulls available in the national AI program has been observed.

g. According to Jabbar (2010), there has already been some improvementin productivity per animal which contributed to long term growth in the dairy sector. And this has happened due to change in the genetic composition of the cattle population brought about by introduction of crossbreeding with exotic semen.

Table 6 Dairy animal population and milk production in Bangadesh, 2001-02 to 2008-09

Year	Production (MMT)	% yearly change	Populations (millions)			
			Cattle	Buffalo	Goat	Sheep
2001-02	1.78	-	22.46	0.97	16.96	2.20
2002-3	1.82	2.2	22.53	1.01	17.69	2.29
2003-04	1.99	9.3	22.60	1.06	18.41	2.38
2004-05	2.14	7.5	22.67	1.11	19.16	2.47
2005-06	2.27	6.1	22.80	1.16	19.94	2.57
2006-07	2.28	0.4	22.87	1.21	20.75	2.68
2007-08	2.65	16.2	22.90	1.26	21.56	2.78
2008-09	2.66	0.4	22.98	1.31	22.40	2.88

Source: Bangladesh Economic Review (2009)

h. With the progress of time of any crossbreeding program a gradual improvement in the performance of crossbred animals is expected. Table 3 below clearly indicates this gradual (linear) change in the performance of Holstein × Local crossbred cows under Bangladesh condition over the last three decades.

Table 7 Daily milk yield (L/d) of reported HF and SL crossbred cows over the last 30 years in Bangladesh

Year	HF×L	SL×L	Reference
1982	7.6	-	Husain and Routledge, 1982
1985	-	7.9±0.52	Husain and Mostafa, 1985
1987	6.64	-	Ahmed and Islam, 1987
1992	5.5±0.1	2.9±0.1	Nahar*et al.*, 1992
1992	5.56	-	Bhuiyan *et al.*, 1992
1994	10.41±0.17	-	Bhuiyan and Sultana, 1994
1998	-	8.25±1.52	Khan and Khatun, 1998
2000	4.1±1.57	-	Ali *et al.*, 2000
2001	7.2±1.07	4.05±0.54	Sultana *et al.*, 2001
2007	5.9±0.14	-	Al-amin and Nahar, 2007
2007	6.0±1.0	4.9±0.95	Faruk *et al.*, 2007
2008	6.3±1.2	5.1±1.0	Alam *et al.*, 2008
2009	8.39±2.10	4.63±0.96	Rokonuzzaman *et al.*, 2009
2009	12.3±3.73	5.16±0.81	Kabir and Islam, 2009
2010	6.65±5.05	-	Bhuiyan *et al.*, 2010
2011	6.49±3.66	-	Shamsuddin and Bhuiyan, 2011
2011	10.07±0.14	3.21±0.36	Khoda, 2011

HF = Holstein Friesian Breed

L= Local Breed

Open Nucleus Breeding System in Bangladesh for Dairy Development

Objective of this Project: Conservation with concomitant improvement of Red Chittagong Cattle (RCC)

I. Establishment of Nucleus Herd of RCC

In August 2005, the Nucleus Herd of the RCC funded by USDA was established at Dairy Farm of the Bangladesh Agricultural University, Mymensingh, Bangladesh. During screening process purity of RCC and higher milk yield (own's or mother's) were the basis of animal selection.

Table 8 Information of RCC Nucleus Herd

Parameter	Animals Number and source
Total size of herd	53
Male	3
Female	50
Sources of animal	Six Upazila of Chittagong district, Bangladesh
Breeding at Nucleus Herd	Pure breeding

II. Formation of RCC Farmer's Society

Table 9 Information of RCC Farmer's Society

Location	Two Upazila of Chittagong district, Bangladesh
No. of farmers in each society	40
Conditions to be a society member	i. Having at least one RCC ii. Willingness to provide information of their animal to Nucleus Herd iii. One selected member will maintain breeding bull iv. Members must obey updated rules and regulation v. Notify before selling of their RCC

III. **Animal Recording System**

Animal recording system at BAU Nucleus Herd:

A. Identification through Neck Tagging
B. Pedigree information
C. Individual performance recording which includes- Date of birth, parity of animal, birth weight, 3 month interval body weight, date of weaning, weaning age, weaning weight, date of puberty, age at first heat, weight at puberty, number of services per conception, age at first calving, post-partum heat period, calving interval, gestation length, lactation length and lactation yield, generation interval, semen volume per ejaculation, pH of semen, sperm concentration of semen, motility of sperm, abnormality of sperm etc.

IV. Design of Open Nucleus Breeding System

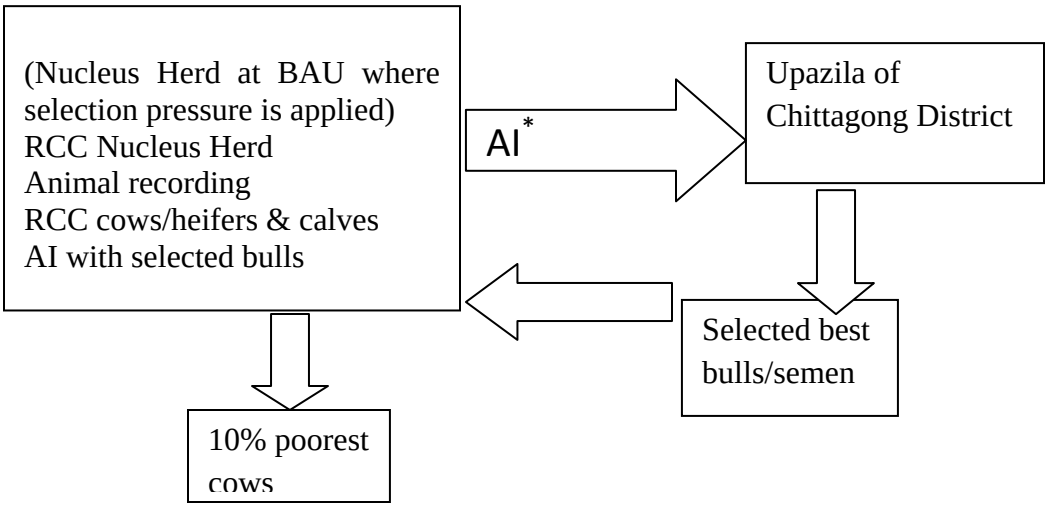

Fig.1 Design of Open Nucleus Breeding System for RCC

* AI = Artificial Insemination

Conclusion

Dairy sector in Bangladesh needs manifolds growth, for which breed development especially production of proven seed bulls through progeny testing to cater national AI program has to sustain and hence need to part it under a permanent government set up. In order to harmonize all these, **a Progeny Testing and National Herd Improvement Program** could be established. Conservation through utilization of an indigenous breed of cattle is a long journey which in turn is costly to realize the ultimate the fruit of the project. Government and NGOs are also maintaining pure RCC bulls which are being used for the production of pure RCC semen that semen are being used to breed RCC cows in the Chittagong area clearly indicating that RCC conservation and development program is very active in this country.

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