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SCENARIO AND STRATEGIES FOR SUSTAINABLE BUFFALO PRODUCTION IN EASTERN REGION OF INDIA

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ABSTRACT

Rearing buffaloes is one of the important activities in low input livestock management system of Eastern region of India. The region possesses almost 20% of total buffalo population of the country though the population is declining in many states. Bihar and Jharkhand are the only states in which growth in buffalo population is witnessed. Most of the buffaloes in the Eastern region belong to riverine type. Performance of the buffaloes in terms of milk production traits, though varying, it is significant in many pockets in the region. Various strategies which comprise field, farm and laboratory activities have been discussed in this paper in order to improve the productivity of buffaloes *vis-à-vis* livelihood status of poor and needy farmers.

Keywords: *Bubalus bubalis*, buffaloes, Eastern India, performance

INTRODUCTION

The Eastern region of India, comprising Bihar, Jharkhand, West Bengal, Chhattisgarh and Odisha along with Assam and Eastern Uttar Pradesh, is resource rich and developing. However, the region is plagued by huge growth rate in human population, low per capita income, and low literacy rate. This region alone accounts for 33.62% of total human population in India. The average per capita income of this region ranged from Rs. 24,681 = in Bihar to 55,864 = in West Bengal for the year 2011 to 2012 while the literacy rate ranged in between 61.8% in Bihar and 76.3% in West Bengal. Below par developments in many sectors forces many in the Eastern region to depend on low input livestock production systems. Livestock rearing in the region has been transforming from being a subsidiary activity of few years ago to a good business entity in many places. Moreover, escalating cost of land in the recent past makes it unaffordable to most of the farmers to engage themselves in agriculture. Hence, the slogan of 'Livestock for Livelihood' is getting enunciated everywhere. However, rearing livestock also needs support in terms of inputs which varies from species to species. The socio-economic background of Eastern region of India at many places could only be able to support the existence of farmers' life and hardly provide anything excess for offering necessary input to rearing animals continuously and completely. Hence, it becomes essential for the planners to choose and promote a suitable species which could thrive with low input

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and maintenance system. Buffaloes, being resistant to many infectious and non-infectious diseases, could be considered as more suitable dairy animals for any farming systems in our country, especially in Eastern Region of India. However, there are also few hiccups in managing buffaloes for high productivity. Keeping the importance of rearing buffaloes in the Eastern region, this paper discusses the population, breeds, and strains, and production status of buffaloes, impediments in buffalo farming, and future prospects and possible strategies to improve the productivity of buffaloes in Eastern region of India.

Buffalo population in Eastern India

State-wise population of buffaloes in Eastern region is given in Table 1. The region accounts for 21.6 and 18.3% of total buffaloes in India as per Livestock Census 2003 and 2007 respectively (Basic Animal Husbandry and Fisheries Statistics, 2013).

Though the region registers marginal decrease in buffalo population from 2003 to 2007, it still has perceptible share of buffaloes in India (Figure 1).

Among the States, Bihar and Eastern Uttar Pradesh have more dense population of buffaloes when compared with other States in the Eastern region. One of the reasons for higher concentration of buffaloes in this States might be due to huge availability of non-leguminous fodders such as sorghum and maize for giving bulkiness to rumen. Bihar is also the third largest maize producing state contributing around 10% to national production (Agricultural Statistics at a Glance, 2013).

Buffalo breeds and strains

The species of buffalo have most probably originated in India. The present-day domesticated buffaloes are the descendants of Bosarni found in wild state even today in the North-Eastern parts of India specially Assam and the surrounding areas. Among the two types of buffaloes, swamp, and river, most of the animals are of riverine type though swamp type is also found in certain parts in the North-eastern region of the country including Assam. The buffalo is the main milk producer in the Eastern region. The registered and unregistered buffalo breeds available in this region are as follows:

Parlakhemundi

There are three subtypes, only one subtype, Desi is found in the plains of Ganjam and Koraput districts of Odisha. These animals are used both for draught and milk purpose. The average daily milk yield is about 4 to 6 kg.

Sambalpuri / Kimedi / Gawdoo

The home tract of the breed is around Bilaspur district of Chhattisgarh. These animals are also reared in Sambalpur of Odisha. Lactation yield was reported to be 2270 to 2720 kg with lactation length of 340 to 370 days. Littlewood (1936); Narayana Reddi (1939) were the first authors to report on the presence of this buffalo population.

Kalahandi / Peddakimedi

These buffaloes are found in Eastern hilly parts of bordering areas of Odisha and Andhra Pradesh. They are known for its heat tolerant characteristics due to its light colour. Dash *et al.* (2005) reported some economic traits of these buffaloes (Table 2) which indicates that these buffaloes are small in size with low in milk yield.

Assamese / Mangoor

These buffaloes are found in Assam.

Jerangi

The home tract of this breed is Jerangi hills of Ganjam district of Odisha. The average daily milk yield has been reported at 2.05 kg (Mishra, 1988).

Kujang

These animals are found in Cuttack district of Odisha. The average daily milk yield has been reported at 3.06 kg with lactation length of 300 days (Dash and Mishra, 1990).

Manda

These buffaloes are seen in Odisha. The average daily milk yield has been reported as1.97 kg (Mishra, 1988).

Swamp

These are found in some places of Assam. The fat percentage of swamp buffalo has been reported at 8.48% with 9.91% SNF (Das, 1998).

Diara buffalo

Although there is no descript breed of buffaloes native to Bihar State, continuous grading up of local buffaloes with Murrah and other potent germplasm, in combination with natural selection operative since long, has resulted into evolution of a "True Breeding" buffalo population having complete adaptation to the "Zero-management-System" prevalent in Diara areas of North and South Gangetic plains of the state. This, so locally called Diara/Desila buffalo, needs immediate characterization at both phenotypic and DNA levels to formulate suitable breeding strategy for their propagation and sustainable utilization (Singh and Mondal, 2005).

Performance of buffaloes in the Eastern region

Milk production of buffaloes in the Eastern region

Performance of buffaloes in the eastern region varies across the different agro-climatic regions and States. The average daily milk yield of buffalo across the state (Table 3) varies depending on feed resources, feeding and management practices. Moreover, government policies also play a role in production as well as marketing of the milk and milk products.

Das (2006a) reported the economic traits of swamp buffalo of Assam (Table 4). According to the author, the lactation milk yield (kg), lactation length (days), peak yield (kg), days to attain peak yield (days), dry period (days) and inter-calving period (days) of swamp buffalo were 505.95, 283.43, 4.08, 57.89, 224.58 and 507.80, respectively. Das (2006b) also reported the age at 1st calving, 1st lactation milk yield, 1st lactation length, 1st lactation peak yield and days to attain peak yield of swamp buffaloes as 59.03±0.42 months, 509.64±4.20 kg, 282.87±1.78 days, 4.09±0.04 kg and 58.28±0.93 days, respectively.

Draught power from buffaloes

In addition to cattle, buffaloes do also play a significant role in providing draught power to the rural farmers, especially in the eastern region of India. The area of land being subjected to ploughing by draught animals is estimated to be 100 million hectares which forms 60% of total cultivable area. Around 90% of land holdings are distributed among marginal and semi-medium farmers for whom using tillers and tractors for agricultural farm operation is difficult. They totally depend on farm animals for agricultural operations. The

population of draught animals for field operations in India are given in Table 5.

However, the total population for work purpose in both cattle and buffaloes are diminishing rapidly.

Strategies for making inroads in buffalo productivity in the Eastern region

Though buffaloes occupy inevitable position in the farming systems in the Eastern region, little efforts have been made to upgrade the genetic potential of buffaloes. There are two traits namely milk production and fertility have to be given importance on priority basis for genetic improvement. Recent advances in application of molecular biology in animal reproduction could also make rapid changes in genetic upliftment of buffaloes. The following technologies could be applied separately or by coupling one or other together based on requirements in order to achieve improvement in buffalo productivity in the Eastern region:

1. Expanding the coverage of artificial insemination in buffaloes
2. Progeny testing of buffalo bulls
3. Open nucleus breeding system
4. Marker assisted selection

Expanding the coverage of Artificial Insemination

Generally, the number of breed able populations of dairy animals covered under artificial insemination is low in the Eastern region. The more distressing aspect is coverage of breed able buffalo population under artificial insemination. Only 17.64% total artificial insemination is performed in Eastern region (NDDB website). Besides if AI performed in buffaloes are accounted, the figure will not be encouraging. It was in the Eastern region of India at Allahabad, Uttar Pradesh, where first buffalo calf was born from artificial insemination. The initial pace on artificial breeding was not maintained which led to the fall in artificial insemination coverage.

The slow impetus on artificial breeding of buffaloes in this region is also contributed by the absence of large semen station which could supply quality semen doses to cover entire breed able buffalo population.The semen doses used for artificial insemination in Eastern region comes mostly from the semen stations located in other regions of the country. The quality of semen doses in terms of its genetic superiority and fertilizing capacity has never been evaluated before carrying out artificial insemination. These factors are vital for improving the productivity of buffaloes in the Eastern region as the genetic gain through artificial insemination could only be achieved through selection of genetically superior bulls for semen production. Hence, the present AI network in the Eastern region needs to be strengthened in reach and quality of the services. A big semen station which could supply the entire breed able population of buffaloes also needs to be established.Another aspect needs to be addressed in buffalo breeding is traits considered for selection of buffalo bulls. At present, wherever the buffalo bulls are selected, the selection is mostly based on dam's milk yield. It would be more appropriate if due weightage is given to age at 1st calving of dams in bull selection. One of the huge differences between cattle and buffalo rearing is that cattle calves sexually matures far earlier than the buffalo calves of similar ages.

Progeny testing of buffalo bulls

Progeny testing is the ultimate tool for judging the genetic potential of bulls and making genetic improvement in sex limited traits like

milk production and age at first calving. The semen collected from the bulls are distributed to different locations and inseminated in the dams of different productivity. The daughters born out of these inseminations were evaluated for their production parameters like milk yield and butter fat percentage. Based on the performance of daughters, the sires are ranked. Though the procedure helps in estimating accurate breeding values of the bulls, it takes long time and demands accurate data recording.

In India, Indian Council of Agricultural Research (ICAR) initiated progeny testing under All India Research Project on Buffaloes in 1970. National Dairy Development Board (NDDB), in Gujarat, also is undertaking progeny testing programme in collaboration with different milk federations across the country.

Recently, Central Institute of Research on Buffaloes (CIRB), Hisar under ICAR has extended its network centres by incorporating ICAR Research Complex for Eastern Region, Patna for progeny testing of Murrah buffalo bulls.

The productivity of buffaloes in Eastern region could be assured for improvement once all the breed able buffalo populations are covered under progeny tested semen doses with superior daughter average.

Open Nucleus Breeding System (ONBS)

Probably this would be a most relevant methodology for making inroads in improving the productivity in developing nations due to the reasons that the bulls under this system could be evaluated in 3-to-4-years period of time and this system also needs less recording when compared to the field progeny testing scheme. However, ONBS needs lots of investment on infrastructure and animal components. There should be a large nucleus farm where elite herd of sire and dam buffaloes would be maintained. The elite dams will be selected based on milk yield, fat percentage and other economic traits of interest. These elite dams will be super ovulated and inseminated by using the semen of genetically superior sires. The embryos formed from this insemination would be collected from the elite dams and transferred into surrogate mothers. The calves born from embryo transfer would be reared in the farm till they become adult and give birth to young one. Recording will be carried out in these calves and the sires of these calves will be selected based on the performance of these daughters which are generally full sisters and half-sisters.

The semen from genetically superior bulls will also be distributed in the farmers' field. The milk recording will be carried out in the field and the superior dams will be earmarked. These superior dams will be transferred to the nucleus farms regularly and the inferior dams in the nucleus farms will be culled. Continuous genetic upgradation will be carried out in the nucleus farms and superior germplasm in the farm will be transferred to the fields continuously. As this system also involves superovulation of dams, this is also called as Multiple Ovulation and Embryo Transfer (MOET) technology.

Marker assisted selection

The advent of molecular biology in the recent years has created many possibilities to incorporate molecular markers in the selection programme. Most of the production traits in cattle and buffaloes are expressed late in life, and hence the animals could only be selected for these traits at later stage. However, incorporation of these markers helps in selecting the animals at very early age and thereby helps in reducing the time interval

Table 1. Buffalo population (in million) in Eastern India.

States/ India	2003	2007	Average annual growth (%)
Assam	0.68	0.5	-6.62
Bihar	5.74	6.69	4.14
Eastern U.P.	9.31	7.06	-6.04
Chhattisgarh	1.6	1.6	0.00
Jharkhand	1.34	1.51	3.17
Odisha	1.39	1.19	-3.60
West Bengal	1.09	0.76	-7.57
Eastern Region	21.15	19.31	-2.17
All India	97.92	105.34	1.89
Share in India (%)	21.60	18.33	-3.78

Source: Basic Animal Husbandry and Fisheries Statistics, 2013.
Government of Uttar Pradesh.

Table 2. Some economic traits of Kalahandi buffaloes.

Traits	Mean Value
Adult body weight - Male (kg)	345.15±8.39
Adult body weight - Female (kg)	330.48±6.70
Age at sexual maturity (days)	1148.24±7.25
Age at 1st calving (days)	1528.05±7.40
Calving interval (days)	526.89±3.35
Daily milk yield (litres)	2.64±0.07
Dry period (days)	218.59±3.97

Table 3. Average daily milk yield per animal (kg/day) state wise 2010-2011.

State	Average yield per animal in milk (kg/day)
Assam	2.22
Bihar	3.92
Jharkhand	5.75
Chhattisgarh	4.88
Orissa	2.91
West Bengal	4.78
All India	4.58

Dept. of Animal Husbandry Dairying and Fisheries (2012).

Table 4. Performances of swamp buffaloes in Assam.

Traits	Average	Source
Lactation milk yield (kg)	505.95±3.14	Das (2006a)
Lactation length (days)	283.43±1.44	
Peak yield (kg)	4.08±0.03	
Days to attain peak yield (days)	57.89±0.68	
Dry period (days)	224.58±2.17	
Inter calving period (days)	507.80±2.39	
Age at 1st calving (months)	59.03±0.42	Das (2006b)
1st lactation milk yield (kg)	509.63±4.20	
1st lactation length (days)	282.87±1.78	
1st lactation peak yield (kg)	4.09±0.04	
Day to attain 1st peak yield (days)	58.28±0.93	
Service period (days)	181.75±2.39	
Gestation period (days)	325.85±0.42	
Birth weight (kg)	32.06±0.10	

Table 5. Population of cattle and buffaloes in India for field operations (in million).

Animal	Sex	Year					Annual growth
		1961-1962	1971-1972	1981-1982	1986-1987	1991-1992	
Buffalo	Male	7.61	7.32	6.56	6.25	5.94	-0.20
	Female	0.37	0.33	0.68	0.84	1.03	
Cattle	Male	72.56	61.05	63.78	61.10	58.53	-20
	Female	2.07	2.04	1.95	1.91	1.87	

Source: Singh (1998) as reported in "Data book on mechanization and agro processing since independence.

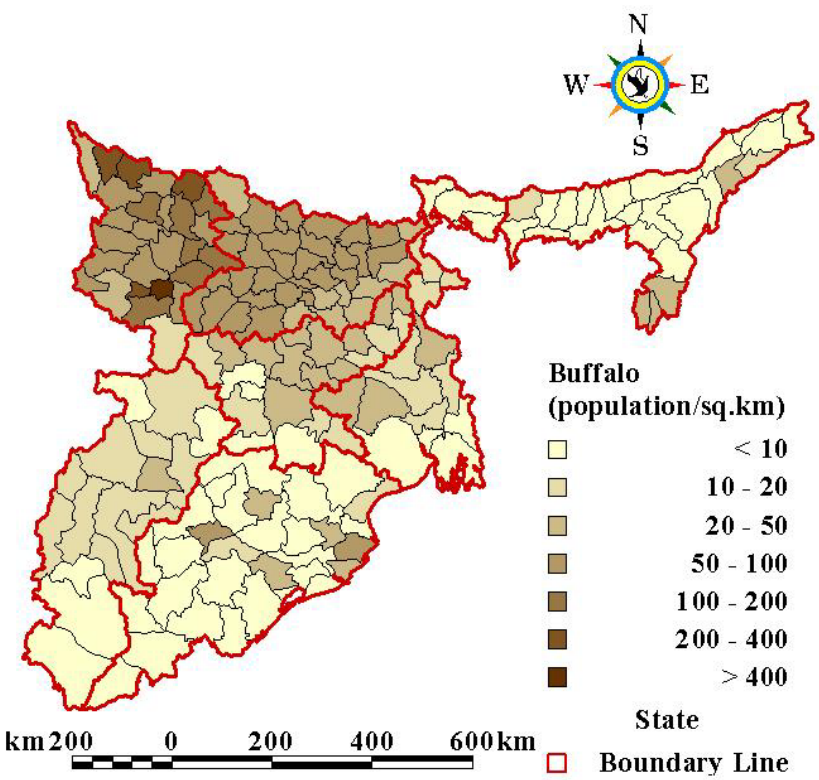

Figure 1. Density (number of buffaloes/sq. km of geographical area) of buffalo population in Eastern India (statewise).

and increases accuracy in selection programme. Though it has been established direct linkage between some production traits and markers, it has been suggested that marker assisted selection could be a supportive tool rather than a sole factor for selection of animals.

Generally, any successful breeding programme to make improvement in buffalo herds needs large investment, commitment, and patience. It all depends how the four determinants of genetic progress including intensity of selection, accuracy of selection, generation interval and genetic standard deviations are applied on four paths such as sire to sire, dam to sire, sire to dam and dam to dam. The breeders and administers should make a breeding plan and work cohesively which could suit socio-economic conditions prevailing in the Eastern region.

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