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Impact of dairy production technologies on productive and reproductive performance of dairy animals in Haryana

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ABSTRACT

Management of productive and reproductive performance of livestock is vital to successful dairying, which is influenced by several parameters, viz. age at first calving, service period, calving interval, lactation length, lactation milk yield etc. These parameters are largely influenced by management in scientific manner from proper housing, feeding to preventive health measure is required to ensure proper health of the animal leaving the genetic traits. This study was conducted in adopted villages of NDRI and surrounding non-adopted villages in Karnal district of Haryana. Purpose was to analyse and compare the performance of animals in these villages and thus analyse the effect of long term project intervention by NDRI to introduce improved management practices among dairy farmers in this area. Data of 498 cattle and 488 buffalo were collected at monthly interval for two years starting from 2013 from 12 villages. Study revealed that except in case of lactation length of cross breed and buffalo, adopted villages had outperformed non-adopted villages. But still in both adopted and non-adopted villages' performance need to be improved a lot to reach the desirable level of performance which should be somehow closer to the performance of these animals in model unit maintained by NDRI, Karnal.

Key words: Adopted villages, Dairy animals, Impact, Productive parameters, Reproductive parameters

Livestock production is the integral part of Indian agricultural system and also plays a key role in the national economy and in socio-economic development of country. Among livestock's, dairy is one of the most important enterprise. India has approximately 190.90 million cattle, 108.70 million buffalo, more than 135.17 million goats and 60.07 million sheep (DAH&D 2015). Milk production in the country has increased continuously from the independence year. A number of initiatives undertaken by government helped in improving the productivity of milk over the period (132.4 million-tonnes in 2012–13 with average growth rate 4.51% in last planning period). Overall economic return from individual animal depends upon various performance and reproductive traits besides milk production (Panja and Tarapder 2011, Tanwar *et al*. 2013). Management of production and reproduction is of utmost importance for successful dairying. Leaving the effect of genetic traits of an animal on production and reproduction performance, management in scientific manner is required to ensure proper health of the animals that promote their productivity. But research evidences are available that farmers in India are unable to follow the rapidly changing improved technologies which are essential to improve productive and reproductive performance of animals and thus maintain self-sufficiency in milk production (Tanwar *et al*. 2013). NDRI, Karnal adopted project intervention for integrated milk and crop production for increased productivity, employment and farm income in surrounding villages following Operational Research Project in June 1975 (Mathur and Singh 2012). The NDRI established a network of Dairy Vikas Kendras (DVKs) in the adopted villages. In this context, a study was undertaken by the institute itself to assess the farm level impact of this long term effort and comparison between productive and reproductive performance of dairy animals among adopted and non-adopted villages was one of the dimensions of impact evaluation.

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MATERIALS AND METHODS

Sampling, data collection and variables: An ex-post-facto research design and a two stage stratified random sampling technique was adopted for analyzing the impact of dairy production technologies. Study was confined to Karnal district only. Firstly, villages were classified into adopted and non-adopted villages. Non-adopted villages were supposed to be used as control of the experiment. A total of 12 villages were selected for data collection among which six were adopted village of NDRI and rest six were non-adopted and selected randomly from each stratum

Table 1. Selected villages for study

Technologies transferred by organising various programme in 63 villages	Selected villages Adopted	Non-adopted (Control)	Total
Animal health camps, on farm trials, participatory research, group discussion, Sangosthi, calf rallies, gramin melas, campaigns, demonstrations, trainings etc.	6 (Gorgarh, Rindal, Samora, Subhri, Ranwar, Manglaura)	6 (Deepo, Gumto, Kutail, Bazidpur, Nagla, Janni)	12
Respondents (having the dairy animals from last 10 years)	75	75	150

(Table 1). A total of 150 farm households (selected randomly) who were involved in animal rearing since last 10 years were interviewed; 75 from adopted villages and 75 from non-adopted villages.

RESULTS AND DISCUSSION

Herd composition: In Karnal district especially in the study area around NDRI, farmers mostly have a mix of non-descript cow; Haryana and Sahiwal breed in their possession. Whereas the entire crossbreed in the study area both in adopted as well as non-adopted villages were Karan Fries, a cross of Holstein Friesian and Tharparkar. In case of buffalo, the farmers were having either sole breed or graded Murrah in the study area. Thus in study area, 9.84% herd was indigenous cow (Haryana/Sahiwal), 40.67% was Karan Fries cow and 49.49% was Buffalo of Murrah breed (Table 2).

Table 2. Herd composition in study area

Village	Indigenous cow		Cross breed cow		Buffalo		Total	
	F	%	F	%	F	%	F	%
Adopted	32	3.25	184	18.66	268	27.18	484	49.09
Non-adopted	65	6.59	217	22.01	220	22.31	502	50.91
Total	97	9.84	401	40.67	488	49.49	986	100

Reproductive performance

Age at first calving (month): The age at which the heifer becomes a cow is her age at first calving, which usually depends on the rearing pattern and the desired generation interval (Singh *et al.* 2012). It is affected by herd, year and season of birth (Rehman *et al*. 2008). It was observed that in adopted villages, average age of first calving in case of indigenous cows was much lower as compared to non-adopted villages. In case of cross breed cows and buffalo, it was only slightly lower in adopted villages (Table 3). Thus for all type of dairy animals, the performance in adopted villages was much better than non-adopted villages. It was due to better breeding, feeding and management practices specially promoted by NDRI and DVKs. Rehman *et al.* (2008) concluded age of first calving in Sahiwal cow may vary from 44.23 months to 50.33 months. So adopted villages achieved a much lower age of first calving for Sahiwal cattle. In case of cross breed (Karan Fries), age at first calving as propounded by NDRI was 34.2 months which was better than both adopted and non-adopted village but may be attributed to highly efficient and scientific management in research station which is quite impossible to achieve in village condition. Thiruvenkandam *et al.* (2010) estimated lower age of first calving (39.88 ± 0.84 months) in case of Murrah buffalo, even lower compared to the 44.63±3.11 months in adopted villages.

Calving interval (days): Calving interval is the interval between two consecutive calving. It is always desirable to keep calving interval lower so that animal remain productive for longer period. Calving interval varied across different herd during different years. It is probably the best index of a cattle herd's reproductive efficiency (Dayyani *et al.* 2013). It was found that average calving interval in adopted villages was much lower than non-adopted villages. Raja (2010) reported calving interval of Sahiwal cow in India varied from 445±5.9 days to 454±2.8 days thus similar to non-adopted villages. Tanwar *et al.* (2013) reported less length of calving interval of Murrah buffalo in co-operative member families than non-members. Ananda *et al.* (2012) reported calving interval of indigenous and crossbreed cow as 405±1.50 and 408±12 days, respectively. In case of Karan Fries, standard calving interval is 402 days as recommended by NDRI.

Service period (days): The average service period in adopted villages was much lower than non-adopted villages

Table 3. Reproductive performance of dairy animals

Reproductive parameter	Indigenous cow (97)		CB cow (401)		Buffalo (488)	
	Adopted (32)	Non-adopted (65)	Adopted (184)	Non-adopted (217)	Adopted (268)	Non-adopted (220)
Age at first calving (month)	40.40±2.32	44.61±3.70	35.46±3.54	36.50±4.06	44.63±3.11	46.80±4.94
Calving interval (days)	403.33±16.39	425.91±23.49	391.57±25.20	418.82±48.26	406.71±19.20	456.65±42.87
Service period (days)	123.33±16.39	135.91±23.49	121.57±25.20	159.41±48.26	116.71±19.20	156.65±42.87

for all type of dairy animals (Table 3). According to standard maintained by NDRI; service period of Sahiwal, Karan Fries and Murrah buffalo should be 107, 123 and 113 days, respectively. Thus in non-adopted villages, service period was much distant than the desirable. From the study of Kathiravan *et al*. (2009), Manoj (2009), Raja (2010) it can be concluded that service period in Sahiwal cows may vary from 134±5.34 days to 229±0.4 days. Though service period varies slightly according to calving season with lower service period in case of spring calving heifers (Rehman *et al.* 2008); still in adopted villages service period of Sahiwal was reduced sufficiently due to NDRI promoted scientific management.

Productive performance

Lactation milk yield (litre): It is the total milk obtained from an animal during lactation period. In adopted villages, lactation milk yield was 2000.00±616.44 lit, 3,252.38 ±1141.72 lit and 2,443.14±423.91 lit for indigenous, crossbred and buffalo respectively; much higher than non-adopted villages (Table 4).

Peak yield: Peak yield in adopted villages was higher than non-adopted villages. Tanwar *et al*. (2013) also supported the fact by reporting higher milk yield for member families of co-preparative (yield of Muurah buffalo, 1,936.09±9.56 lit) than non-members (yield, 1645.91±13.57). Reported yield of sahiwal cattel in India varied from 1,834.8±36.8 kg to 2,177.8±40.8 kg (Monalisa *et al*. 2010). Standard yield of Karan Fries is 3,585 litres in NDRI farm. So in surrounding region of NDRI, the yield of Sahiwal is similar to reported yield by other studies.

Lactation length (days): It is the milk producing period after calving. In case of lactation length of cross breed (319.15±41.03 days) and buffalo (317.18±35.57 days), non-adopted villages outperformed adopted villages [304.46±29.73 and 310.15±36.75 days for crossbreed and buffalo, respectively] (Table 4). Only in case of indigenous cow, average lactation length in adopted villages (300.00±12.99 days) was higher than non-adopted villages (294.91±35.75). The result obtained in case of buffalo and cross breed cow is contradictory to the findings of other studies that reported better performance of dairy animals in member or adopted villages (Tanwar *et al.* 2013). Meena *et al.* (2015) reported lactation length of buffalo, cross breed and indigenous cow as 276±14, 274±16 and 294±18 days, respectively in their study in Uttar Pradesh which was much lower than even non-adopted villages.

Dry period (days): It is the time between halting of milk removal (milk stasis) and the subsequent calving. Non-lactating period prior to an impending parturition optimize milk production in the subsequent lactation. Dry period is one of the important factors contributing to economic return and mostly controlled by management practices (Panja and Tarapder 2011). It could be concluded from the result that for all type of dairy animal's, dry period was much lower in adopted villages than non-adopted villages (Table 4). Tanwar *et al.* (2013) reported less length of dry period of buffalo in members' families than non-members. Kumar *et al.* (2011) found much higher dry period for buffalo in their studies. Rehman and Khan (2012) reported that dry period of Sahiwal cattle varied from 148 to 245 days in Punjab province of Pakistan.Thus in study area also, dry period was similar to other studies with a shorter dry period in adopted villages than non-adopted villages. In case of KF cow, standard first dry period under scientific management condition of NDRI reported as 64.47±1.46 days (Panja and Tarapder 2011) which was not observed in study area. Thus given the dry period can be reduced with better management still the farmers of adopted villages also need to be improved a lot in terms of adoption of scientific management practices.

Impact on animal productive parameters: To depict a clearer picture of improvement due to NDRI intervention in the adopted villages throughout past two decades, the current data was compared to the baseline data on various productive and reproductive parameters. Table 5 showed that in case of local breeds, there was highest decrease in age at first calving (17.55%). The days in milk decreased in case of local cow (8.25%) whereas in both cross breed and buffalo, there was only slight increase. In case of dry days and inter calving period, it was observed that they decreased greatly with highest decrease in local breeds. The average daily milk yield showed an increasing trend with highest increase in local breeds.

Table 4. Productive performance of dairy cattle

Productive parameters	Indigenous cow (97)		CB cow (401)		Buffalo (488)	
	Adopted) (32	Non-adopted (65)	Adopted (184)	Non-adopted (217)	Adopted (268)	Non-adopted (220)
Peak yield (litre)	10.00±3.08	8.43±1.78	16.26±5.71	13.59±4.27	12.22±2.12	10.91±1.56
Lactation milk yield (litre)	2000.00±616.44	1686.96±355.87	3252.38±1141.72	2717.65±853.42	2443.14±423.91	2182.61±312.20
Average daily milk yield (litre)	6.56±2.02	5.53±1.17	10.66±3.74	8.91±2.80	8.01±1.39	7.16±1.02
Lactation length (days)	300.00±12.99	294.91±35.75	304.46±29.73	319.15±41.03	310.15±36.75	317.18±35.57
Dry period (days)	93.33±10.00	111.00±22.05	87.11±12.18	99.68±26.18	95.68±28.58	138.16±23.34

Table 5. Comparative data of animal productive parameters in adopted villages

Parameter	Local cow			CB cow			Buffalo		
	1995-96	2014	% change	1995-96	2014	% change	1995-96	2014	% change
Age at first calving (months)	49	40.40	17.55	37	35.46	4.16	48	44.63	7.02
Days in milk	327	300	8.25*	300	304	1.33	309	310	0.32
Dry period (days)	179	111	37.98	115	87.11	24.25	137	95.68	30.16
Inter-calving period (days)	506	393.33	22.26	415	391.57	5.64	446	406.71	8.80
Avg. daily milk yield	4.51	6.56	45.45	8.38	10.66	27.20	6.51	8.01	23.04

*Decreased.

Thus except the days in milk parameter, local breeds (mostly Sahiwal) showed the highest performance improvement in all parameters compared to cross breed and buffalo. This may be because of the drive to improve the genetic quality of indigenous cows through selective breeding along with adoption of better management practices by farmers. Thus it can be concluded that NDRI promoted dairy animals' improvement programme did not have uniform impact on all category of farmers and on all types of dairy animals in the study area but overall performance of dairy animals improved significantly as confirmed by t test.

It may be concluded that in adopted villages, dairy animals showed a better performance than non-adopted villages in terms of productive and reproductive performance. This is largely due to the transfer and adoption of new technologies in dairy production system and provision of regular artificial insemination services and health care facilities at the doorsteps of the farmers and dairy and crop production advisory services under one roof for the rapid increase in income and productivity supported by NDRI as visualized under Transfer of Technology drive. Even non-adopted villages dairy animals showed improvement over the base line performance. This can be partially attributed to the spill over effect of adoption of improved technologies in the adopted villages on surrounding non-adopted villages. Thus highly intensive project approach at most possible proximity of farm family will be very influential to bring rapid development not only in dairy sector but also overall agriculture sector. Along with the effect the experiences gained in the project will be very useful for developing suitable strategies for improvement of dairy animals' performance in other areas of nation.

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