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Vol XXX  
No. 3

ISSN 0019-5014

CONFERENCE  
NUMBER

JULY-  
SEPTEMBER  
1975

# INDIAN JOURNAL OF AGRICULTURAL ECONOMICS



INDIAN SOCIETY OF  
AGRICULTURAL ECONOMICS,  
BOMBAY

## CONCLUSIONS

The foregoing analysis suggests two major conclusions. First, the milk production functions revealed positive and significant response of feed to milk production. This indicated that feed was the major and the most significant factor influencing milk yield. Further, production elasticities of feed were found to be elastic for the third and fourth order of lactations, implying thereby that dairy farmers had a greater scope of increasing milk production through manipulation of levels of feed regimes for their cows running in these lactations. The regression coefficients of depreciation on cows and miscellaneous items of expenditure were also found positive and significant, broadly indicating that the higher initial investment in milch stock was important for increasing the milk productivity.

Second, the inequalities in milk production pattern were observed for cows in each order of lactation. This suggests that to obtain precise estimates of supply of milk and cost of milk production in a given region, due weightage be given to milch stock in different lactations and production distribution.

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## GROWTH TRENDS IN BOVINE POPULATION IN HARYANA

R. P. Singh, M. K. Chaudhry and Himmat Singh

Livestock holds the key to prosperity in an agricultural State and it is a major plank in the foundation of Haryana's economy. Bovine wealth plays an important role next to agriculture in the State. According to the 1966 livestock census, the animal husbandry sector contributed about 13 per cent (Rs. 53.8 crores) to the State's income as against 7 per cent for all-India. The State has a highly developed livestock sector and is famous for its well-known breeds of "Haryana Cows" for producing best quality bullocks and 'Murrah' buffaloes for high milk yield in the country. A large number of cattle and buffaloes are exported every year to other States of the country. Haryana has also the rare distinction of exporting its world famous Murrah buffaloes to South-East Asia, U.S.S.R. and Brazil.

The State comprising of 44,222 sq. km. of area has 2.9 million head of cattle and buffaloes which comes to 65.6 per sq. km. as against the all-India average of only 7.62. Thus, Haryana occupies a significant position on the animal husbandry map of India. Therefore, an attempt has been made to study the growth trends in bovine population in Haryana during 1961-66 and 1966-72 inter-census periods. The specific objective of the study was to find out the various trends in growth rates of different categories of cattle and buffalo population and their projections for future planning.

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## MATERIALS AND METHODS

For the purpose of study, secondary data from the livestock census for 1961, 1966 and 1972 published in the Statistical Abstract of Haryana were used. The details of data are given in Appendix 1. The compound growth rates were computed per annum to indicate an increase or decrease in bovine population under different categories of animals during the inter-census periods.

*Analytical Techniques*

The following formula was used to calculate the compound growth rates in bovine population :

$$\frac{P_t}{P_0} = \left[ 1 + \frac{r}{100} \right]^t$$

where,  $P_t$  = population of bovine in the  $t$  th period,

$P_0$  = population of bovine in the base year,

$r$  = growth rate, and

$t$  = time in years.

Projections for 1977 were also computed from the formula given above.

## RESULTS AND DISCUSSIONS

*Bovine Population as a Whole*

The bovine population includes cattle and buffalo population of different age-groups. The compound growth rates worked out for cattle and buffaloes under different categories during the two inter-census periods are presented in Table I. The compound growth rate for bovine population as a whole increased at a rate of 1.30 per cent per annum during 1961-66 and 2.30 per cent during 1966-72. A similar pattern was noted for different categories of animals except for males over 3 years which registered a growth rate of 0.99 during 1961-66 and it came down to 0.70 per cent during 1966-72. The cattle population recorded a negative growth rate of 0.16 per cent during 1961-66 but it went up to 0.90 per cent during 1966-72. In the case of buffaloes the growth rate was 3.10 and 3.80 per cent during 1961-66 and 1966-72 respectively. The higher growth rate in the case of buffaloes was due to the fact that more attention was paid to the buffaloes by the farmers as their milk production was more than the cows. The buffaloes had also comparatively better internal and external markets. Another reason was that the use of male buffaloes as draught animal was in practice in many parts of the State and its working cost per unit was also less than the bullocks. This finding was again supported by the growth rates worked out for males over three years and calves under three years (Table I).

TABLE I--COMPOUND GROWTH RATES FOR DIFFERENT CATEGORIES OF CATTLE AND BUFFALOES IN HARYANA DURING 1961-66 AND 1966-72

(per cent per annum)

Category of animals	Cattle		Buffaloes		Total	
	1961-66	1966-72	1961-66	1966-72	1961-66	1966-72
Males over 3 years ..	0.70	0.20	3.70	9.70	0.99	0.70
Females over 3 years ..	-1.30	4.90	3.00	3.40	1.20	3.70
Calves under 3 years ..	0.37	1.10	3.40	4.00	1.60	2.70
Total .. ..	-0.16	0.90	3.10	3.80	1.30	2.30
Adult males						
Breeding bulls .. ..	1.20	-0.64	-3.64	2.90		
Work animals including others	0.70	0.20	5.20	10.40		
Adult females						
In milk .. ..	-1.50	0.90	4.00	4.80		
Dry .. ..	-0.003	1.40	3.50	0.70		
Not calved .. ..	-8.36	8.90	-8.30	3.10		
Others .. ..	-4.57	15.90	-14.39	17.70		

For a better understanding of the growth pattern, cattle and buffalo population have been classified under different categories.

#### *Adult Males*

Adult males include two important categories, namely, breeding bulls and work animals including others (Table I). The breeding bulls in cattle showed declining growth rates from 1.20 per cent during 1961-66 to -0.64 per cent during 1966-72 while a reverse trend was recorded for the buffaloes. This decline was due to the launching of the Intensive Cross Breeding Programme for cattle development during 1966-72 in the State and compulsorily sterilising unspecified, old and defective bulls. An interesting observation was that in the case of cattle under the category work animals including others, a growth rate of 0.70 per cent was observed during 1961-66 and it came down to 0.20 per cent during 1966-72. This was due to a shift from bullock power to mechanization during 1966-72 and consequently affected the growth rate. The large farmers who purchased tractors did not maintain bullocks for agricultural purposes. The growth rate in respect of male working buffaloes just doubled during the two inter-census periods from 5.20 per cent during 1961-66 to 10.40 per cent during 1966-72. The increase in the growth rate

was explained by the fact that male working buffaloes were given priority as draught animals over bullocks in many parts of the State and particularly in the sugar factory areas. The price of the bullock had also increased fantastically which compelled the farmers to go for he-buffaloes for certain operations.

#### *Adult Females*

Adult females include four categories and the compound growth rates computed for a detailed study of adult females during the inter-census periods are presented in Table I. The compound growth rates calculated for different categories of cattle during 1961-66 had shown negative growth rates, suggesting that during this period not much attention was paid to increase the cattle population. However, a positive trend was observed for different categories during 1966-72. It clearly indicates that the Intensive Cattle Development Programme undertaken during 1966-72 in the State had shown a clear impact on the cattle population. The compound growth rate for the buffaloes in milk had shown a favourable trend for dairy animals which recorded an increase of 4.00 and 4.80 per cent during 1961-66 and 1966-72 respectively. The growth rates for the not calved and other categories had shown negative trends during 1961-66. In the case of other categories, the growth rate increased as high as 17.70 per cent. This uneven trend was due to the fact that the population reported in the livestock census was 5,000 in 1961 and it came down to 2,300 in 1966. It again rose to 10,000 in 1972 (Appendix 1). This fluctuating trend had certainly affected the pattern of growth for the other category. The growth rate for buffaloes in milk was higher than that for cows in milk due to the fact that more attention was paid to keep buffaloes because of its higher milk yield with high fat percentage. On the other hand, the cow's milk had poor market in the locality due to lower fat percentage and religious grounds.

#### *Young Animals*

This category includes two age-group animals, *i.e.*, upto 1 year and 1-3 years. For a detailed study, the young animals have been sub-classified into males and females. The compound growth rates worked out during the inter-census periods are given in Table II. The compound growth rates of young cattle for both male and female sub-classes in the age-group 0-1 year had shown negative growth rates except for the females during 1966-72 where it was 0.60 per cent. This declining trend was due to a high rate of calf mortality in this age-group. As the age advances, the rate of growth had shown positive values except for males during 1961-66, which had shown a negative growth rate of 1.05 per cent. In the case of buffaloes, a positive growth rate was noted for both males and females in the age-groups 0-1 and 1-3 years, except for male in the age-group 1-3 years during 1961-66. These findings again suggested that more care had been taken for buffalo calves than for the young cattle.

TABLE II—COMPOUND GROWTH RATES OF YOUNG ANIMALS DURING 1961-66 AND 1966-72  
(per cent per annum)

Age-group (years)	Cattle				Buffaloes			
	Males		Females		Males		Females	
	1961-66	1966-72	1961-66	1966-72	1961-66	1966-72	1961-66	1966-72
0—1	-1.63	-0.03	-0.41	0.60	3.10	4.30	3.30	3.10
1—3	-1.05	3.00	1.60	1.40	-3.51	8.40	5.20	2.90

### Projection of Bovine Population

The population projection of bovine for the year 1977 under different categories have been computed on the basis of compound growth rates for the years 1966-72. The projected population figures are presented in Table III.

TABLE III—PROJECTIONS OF BOVINE POPULATION FOR HARYANA FOR THE YEAR 1977  
(in hundred)

Category of animals	Projections	
	Cattle	Buffaloes
Males over 3 years .. .. .	10,009	739
Females over 3 years .. .. .	7,474	15,100
Calves under 3 years .. .. .	4,261	7,499
Total .. .. .	21,744	23,338

The total projected population of bovine would be 45,08,200 in 1977. This population will be a most valuable asset for the State particularly when livestock wealth contributes next to agriculture in the State's economy. Therefore, the economic importance of this projected population cannot be over-looked. The projection made for the male group showed that 10,00,900 cattle and 73,900 buffaloes would be available for breeding and draught purposes by 1977. In fact, the present situation of petrol/fuel crisis demands a shift from mechanization to animal power. Therefore, the projected population may serve a useful purpose for the agricultural sector. On the other hand, Haryana bullocks and bulls had already gained a good reputation and they are in demand from the neighbouring States.

In the case of female group, the projected population figures are 7,47,400 and 15,10,000 for cattle and buffaloes respectively. This reflected that the female buffalo population in 1977 would be almost double that of the cows since the Murrah buffaloes had already captured a good market in other

States as well as in foreign countries. Therefore, this may be treated as the most valuable wealth of the State for the economic growth of the rural sector. The cattle population should be more than the projected ones and special attention should be given to improve the quality of this lot under the Intensive Cattle Development Programme which is already in operation in the State. There will not be any problem of milk disposal as the Haryana Dairy Development Corporation had already planned to establish a milk plant in each district which will increase the demand for milk. Therefore, more emphasis should be given to improve the breeding, feeding and management aspects of dairy animals.

The population of calves under three years has been projected as 4,26,100 and 7,49,900 for cattle and buffaloes respectively. This category again required better care, feeding and management in general and veterinary aids in particular to save them from the high rate of mortality which prevails in this age-group.

#### CONCLUSIONS

The compound growth rates for bovine population had increased at a rate of 1.30 per cent per annum during 1961-66 and 2.30 per cent during 1966-72. Almost a similar pattern was found for different categories of animals. Though the cattle population recorded a negative growth rate during 1961-66, this category recorded a positive growth rate during 1966-72 while buffaloes registered a positive growth rate during both the inter-census periods. The difference in the growth rates of cattle and buffaloes was due to the increasing preference of livestock keepers for buffaloes as the latter had recorded more milk production with higher fat percentage than the cows and had captured better internal and external markets. Secondly, the male working buffaloes were also given higher priority as draught animals over bullocks for certain operations particularly in the sugar factory areas. The cattle population under the category work animals and others indicated a lower growth rate during 1966-72 compared to 1961-66 because of steady mechanization of agricultural operations in the State. However, the compound growth rates worked out for cattle and buffaloes in milk had shown a favourable trend for dairy animals.

The projected population for 1977 came to 45,08,200. It would be a most valuable asset for the economic development of the State. The Establishment of a milk plant in each district by the Haryana Dairy Development Corporation and the favourable domestic and international markets for cattle and buffaloes had created further scope to increase and promote the bovine population in the State. Therefore, timely steps should be taken for better breeding, feeding and management aspects to increase the production efficiency of the projected population. This population has a meaningful purpose for the agricultural sector under the present petrol/fuel crisis and to accept the challenge of expected shift from mechanization to animal power.



## APPENDIX I

## BOVINE POPULATION IN HARYANA

*(in hundred)*

Category of animals	Cattle			Buffaloes		
	1961	1966	1972	1961	1966	1972
Males over 3 years (breeding only) ..	50	53	51	47	39	47
Males over 3 years (work and others) ..	8787	9129	9273	240	309	561
Total males over 3 years .. ..	8837	9182	9324	287	348	608
Females over 3 years (in milk) .. ..	3801	3515	3723	4809	5864	7794
Females over 3 years (dry) .. ..	2355	2354	2548	3189	3782	3924
Females over 3 years (not calved) ..	376	243	406	684	443	533
Females over 3 years (others) .. ..	48	38	92	50	23	100
Total females over 3 years .. ..	6580	6150	6769	8732	10112	12351
Calves 0—1 year (males) .. ..	2055	1893	1891	1687	1973	2552
Calves 0—1 year (females) .. ..	1751	1716	1772	2555	3005	3670
Total calves 0—1 year .. ..	3806	3609	3663	4242	4978	6222
Calves 1—3 years (males) .. ..	1497	1419	1693	674	564	929
Calves 1—3 years (females) .. ..	1759	1908	2059	2604	3345	4061
Total calves 1—3 years .. ..	3256	3327	3752	3278	3909	4980
Total calves 0—3 years .. ..	7062	6936	7415	7520	8887	11202
Total population .. ..	15417	15332	16093	9019	10460	12969

Source : Statistical Abstract of Haryana, 1972-73 and 1973-74.