

INTER-CENSAL ESTIMATES OF LIVESTOCK NUMBERS*

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1. INTRODUCTION

Indian economy has been and in the foreseeable future it will continue to be primarily agriculture-oriented and livestock plays an important part in agriculture. As the country develops attention will have to be turned more and more to livestock development. In the formulation of plans for the development of livestock economy working out estimates/projections of livestock numbers for the relevant years is the first step. Information on livestock numbers in different categories in various years is also a basic pre-requisite for the assessment of the contribution of livestock sector to national income. Since the available information on livestock numbers is obtained through censuses held quinquennially, and carrying out the census more frequently is prohibitively costly and laborious, apart from its possibly not being worthwhile on account of the non-sampling errors involved, the question as to how best reliable estimates of livestock numbers pertaining to inter census years can be obtained without undue time and expense assumes importance. The paper examines the possibility of utilising the available livestock census data as also the sample survey technique for providing a solution of this problem.

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2. THE BASIC CENSUS DATA

The nature and quality of the livestock census data available upto now and the procedure adopted to assemble them for the purpose of the present study are briefly described in this section.

2.1. *Nature of the census data*

CENSUSES IN THE PRE-INDEPENDENCE ERA

The first livestock census was held in 1919-1920 and until Independence it was held almost quinquennially throughout British India excepting in the Central Provinces and Berar where they were held annually. Of the many erstwhile Princely Indian States only a few participated in the census right from the very inception. Bengal, Bihar and Orissa did not participate in the fourth census (1935), and U.P. and Orissa in the fifth census (1940). Whereas the sixth census was generally conducted in all the Provinces and Administrations in British India, U.P. however conducted this census in 1944 and Bengal in 1946. All the native States which did participate in the livestock census held it almost simultaneously with the British Provinces. It is surmised that the coverage varied from 59 per cent of the total geographical area of the undivided India in 1919-20 to about 95 per cent in 1945 census.

The period of enumeration was four months from December to April for the first two censuses, and it was one month, *viz.* January for the subsequent ones held before Independence.

CENSUSES IN 1951 AND THEREAFTER

The seventh quinquennial livestock census due in January 1950 was postponed with a view to combining this census with the F.A.O. Agricultural Census. Subsequently, however, when the latter was postponed (and was held afterwards on a sample basis) the livestock census was held in May 1951, or later in all the States of the Indian Union excepting in Orissa and Manipur where this census could not be held at all. Ajmer and PEPSU, West Bengal, Rajasthan and Travancore-Cochin conducted this census in June 1951, September 1951, February 1952 and August 1952, respectively. The eighth census was held generally in all the re-organised States and Union Territories of the country in March-April 1956, the reference date being 15th April 1956. West Bengal, Orissa and Manipur however

held this census in 1957, the reference dates being 15th April 1956, 15th April 1957 and 15th December 1957, respectively. The ninth and tenth censuses were conducted in all the States and the Union Territories of the country in March-April 1961 and 1966 with April 15 as the reference date.

AGE-SEX CATEGORISATION OF BOVINES

In the first four censuses data on bovines were collected separately for cattle under the heads: (i) Bulls, (ii) Bullocks (iii) Cows and (iv) Young stock, and for buffaloes under the heads: (i) Male buffaloes, (ii) Female buffaloes and, (iii) Young stock. In the 1940 census some improvements in the classification of stock were introduced besides separate enumeration for rural and urban areas.

In the 1951 census and the subsequent ones all bovine stock of age above three years were considered adults and those with age three years or below as young stock. For the purpose of 1951 census adult males of cattle and buffaloes were classified into (i) Breeding bulls (ii) Working bullocks and (iii) Others, adult females into (i) In milk, (ii) Dry, (iii) Not calved even once, (iv) Used for work and (v) Others, and young stock were classified sex-wise into (i) Under one year and (ii) One to three years. Additional changes introduced in the 1956 census were (i) tabulation of stock separately for rural and urban areas (which had been discontinued in 1951), and (ii) verification of the reported data by a sample check. For 1961 census the same proforma as in 1956 census was used, with the exception in respect of adult males where the sub-head 'used for work' was further sub-divided into (i) castrated and (ii) uncastrated. Some more minor changes were introduced in the classification of stock in the 1966 census.

It may be pertinent to point out that the sub-division of breeding females into (i) 'in milk' and (ii) 'dry' does not seem to be very useful. Because of the seasonality of calvings, the proportion of animals in milk recorded at one point of time in a year cannot be taken as valid for all the seasons and as such has no practical utility. A proper estimate of the number of animals in milk in different seasons can only be obtained through properly designed surveys conducted throughout the year. For the purpose of census the classification of breeding females into (i) milch stock (those in milk and dry put together) and (ii) not calved even once would suffice,

QUALITY OF CENSUS DATA

In regard to the quality of data collected through livestock censuses mention may be made of the sample surveys conducted by the Institute of Agricultural Research Statistics during 1951-56. It was found from these surveys that the livestock census gives reliable information for broad categories of livestock at the district level. (I.C.A.R. Research Series, No. 25). According to the independent sample check on 1956 livestock census conducted by the Directorate of National Sample Survey the percentage differences observed in all-India survey figures for cattle and buffaloes over the corresponding census figures varied from 4 to 5 per cent (Indian Livestock Census 1956, Vol. I—Summary Tables).

ADJUSTMENT FOR VARIATION IN COVERAGE

Even though the livestock censuses have been conducted almost quinquennially since 1920 onwards, the coverage of the censuses was not satisfactory until the 1956 census and varied widely from census to census. Besides, owing to territorial redistribution of Provinces by the British prior to Independence and subsequent reorganisations of the country which took place in 1950 and 1956, many States and districts within States have undergone drastic changes in their geographical content during the period from 1920 to 1961. In the circumstances the study of the problem of estimation of inter-censal livestock numbers with the help of livestock census data has to be based on the information pertaining to areas which remained undisturbed during the period under reference. Furthermore such areas should preferably be chunks of contiguous areas as large as possible so as to minimise distortions in trend due to migration. In the region south of the Vindhya and Satpura ranges lies the chunk comprising the area covered by the present States of Andhra Pradesh, Madras, Kerala and sixteen districts each in Mysore and Maharashtra*, which remained almost undisturbed and for which livestock data are available throughout the period. However, in the region north of the Vindhya and Satpura ranges, which comprises the remaining part of the country, there is no such large chunk having the characteristics mentioned above. Since practically every State underwent some reorganisation after Independence and for none of

*Belgaum, Bijapur and Dharwar districts of Mysore, and Thana, Dhulia, Greater Bombay, Kolaba, Poona, Ratnagiri, Satara, Sangli, Kolhapur and Sholapur of Maharashtra could not be taken due to the merger of neighbouring Indian States which did not previously participate in the livestock censuses.

the States in the North complete data are available, the study has to be confined in this region to the data relating to districts whose geographical content is undisturbed during the period under reference. The procedure adopted to decide as to what extent a given district has undergone changes in its territorial content, and the limitations of the data collected from such districts as remained almost intact are described in the following sub-section.

2.2. *Collection of requisite data*

Direct information on the changes which occurred during 1920-61 in the geographical content of the districts in the country is not readily available anywhere and the task of extracting the information from State Gazettes, even if conceptually possible, is impracticable. Consequently indirect means of classification of all the districts with reference to the extent of disturbances in their territorial content had to be adopted. Details of this study have been presented by Avadhani and Amble (1969). To mention briefly data given in the Table A.II, "Variation in the population during the past fifty/sixty years", of Part II-A Tables of the human population decennial censuses from 1921 to 1961 for each and every district in the country were used for this study. In this Table, in order to afford a correct basis of comparison of human population, the figures recorded at previous population censuses have been adjusted for territorial changes, if any, and tabulated along with the current census count. Making use of corresponding figures in the same Table for human censuses from 1921 to 1961, an index of the maximum extent of territorial disturbance of a district during the period was built up. This index was used to classify the districts of the country as in 1961 according to the extent of territorial changes.

To ensure better coverage all districts in the North for which the index of maximum territorial disturbance did not exceed 5 per cent have been considered for the present study. Of these districts numbering 108, livestock data were not available for two or more successive quinquennial censuses, for 13 districts of which 2 belong to Assam, 1 to Gujarat, 3 to Punjab (undivided) and 7 to Uttar Pradesh. Since there was no other district in Gujarat with the extent of maximum territorial disturbance not exceeding 5 per cent, the State had to be excluded from the present study. Further, for all districts in Bihar and West Bengal for 1935, Madhya Pradesh and Punjab for 1925, and Uttar Pradesh for 1940 for which census was not taken, substitutions by linear interpolation between the next later and previous counts had to be made.

From the foregoing discussion it is clear that of the information available from 1920-61 only that in respect of the broad categories of adult males, females and young stock of both the cattle and buffaloes pertaining to the chunk in the South and the selected districts in the North could be utilised for the present study. Requisite data were collected from Agricultural Statistics of India Vol. 1 and 2, (1920-40), Indian Agricultural Statistics, Vol. 1 and 2 (1945) and Indian Livestock Census, Vol. 2 (1961). Since district-wise detailed data obtained in the 1966 census are not published yet, this census could not be considered for the study under consideration.

3. APPROACH FOR THE ESTIMATION OF INTER-CENSAL LIVESTOCK NUMBERS

At the outset it may be noted that the estimation of livestock numbers referring to inter-census years can be carried out with the help of the available census data either by fitting trends or by using appropriate interpolation formula.

3.1. Use of Trend Curves

Details regarding fitting of trends to various categories of cattle and buffaloes separately in the South and the North have been presented by Avadhani, Gopalan and Amble (1968). Only relevant points are briefly mentioned here. To get approximations to the true trend components 3-period moving average technique was used and then the simplest polynomial curve which explained about 90 or more per cent of variation was chosen to be the trend in the growth of the given category. To facilitate ready reference the trend curves so obtained for various categories of cattle and buffaloes in the South and the North are shown separately in Table 1.

3.2. Use of Interpolation Formulae

A simple and suitable interpolation formula for use would be Newton's formula. If $[x_0, f(x_0)], \dots, [x_n, f(x_n)]$ are observations such that $x_i - x_{i-1} = h$ for all $i=1, \dots, n$ and $f(x)$ is a polynomial of degree n , Newton's formula is given by

$$f(x) = f(x_0) + u \Delta f(x_0) + \dots + \frac{u(u-1)\dots(u-n+1)}{n!} \Delta^n f(x_0)$$

where

$$\frac{x-x_0}{h} = u,$$

and $\Delta^r f(x_0)$ denotes the r th order finite difference pertaining to the point $[x_0, f(x_0)]$. The formula provides the value of $f(x)$ at x , which may not necessarily fall within the given range of x 's. The formula can thus be used for extrapolation in situations where the degree of the polynomial is known beforehand and the trend is assumed to continue for the short period the prediction is desired to be made. A practical procedure for the use of the method would be to plot the moving averages against time, judge the nature of the trend curve by the eye and use the interpolation formula of the appropriate order.

3.3. *Comparison between two methods*

Utilising this formula with reference to the 3-period moving averages centered at 1926 to 1956 together with the degree of the trend curve the numbers of different categories of cattle and buffaloes in the South and the North relating to 1952 to 1955 were computed and were compared with those obtained from the trends. The two sets of estimates agreed closely even numerically as was expected from the theoretical point of view. Hence both procedures are equally valid for the estimation of inter-censal numbers and obviously interpolation method is somewhat simpler. However, estimation through the trends has the added advantage of having a measure of reliability which is reflected by the goodness of fit of the trend to the given data. Also, the interpolation formula which is dependent on the polynomial functional relationship requires prior knowledge of the degree of the polynomial as otherwise it is likely to give erroneous figures. The choice of an appropriate interpolation formula would also seem to be more difficult in situations in which the trends are not polynomial. On the whole therefore the balance seems to rest in favour of the trend curve method.

4. LIMITATIONS OF INTER-CENSAL ESTIMATES BASED ON LIVESTOCK CENSUS DATA

In the first place inter-censal estimates based on mathematical or statistical manipulation of census data would be subject to all the shortcomings attributable to the non-sampling errors to which the census data are subject. The distortion would be all the greater if the magnitude and direction of non-sampling errors varied from census to census.

Even if the census data were fairly accurate the estimates of inter-censal numbers calculated by the procedure described in the

preceding section at best provide the corresponding trend values which do not take into account the effects of annual fluctuations arising as a result of natural causes such as drought, floods, diseases, etc. For proper utilisation of these estimates it is necessary to have reliable measures of annual environmental effects on livestock numbers, which may not be possible to secure with ease.

It is essential, however, to initiate steps to collect at least basic information useful to permit a subjective adjustment for seasonal conditions in the first instance if not objective corrections. (The attempts necessary for the latter are discussed in a later section.) Even as season and crop reports are put out by the Agricultural Departments, it is necessary to institute in the States, a system of reporting, say at quarterly intervals, by District Animal Husbandry Officers of the conditions relating to season, climate, conditions of grazing, situation with regard to availability of animal feeds and fodder, level of their prices, conditions relating to diseases, if any, in livestock and poultry, etc. Such reports would also help in the interpretation of deviations observed even in the census estimates. It is no secret that during the compilation of 1966 livestock census figures, it was found extremely difficult to explain unexpected deviations in some cases in the absence of any background information. It is only when such information cannot account for the deviations that attention should be directed to sources of non-sampling errors.

5. SAMPLE SURVEY FOR THE ESTIMATION OF INTER-CENSAL LIVESTOCK NUMBERS

5.1. *Livestock Number Surveys*

Sample survey technique offers a direct approach as an alternative to the mathematical method based on census data. If properly adopted it not only reflects appropriately the conditions of season, feed, diseases etc., which characterised the year of survey but provides estimates within desired limits of precision at a reasonable cost.

With a view to determining the feasibility and usefulness of sampling methods in rationalising the methods of supervision on the work of primary enumeration during census years in order to ensure reliability of the census results and for estimating the numbers of major categories of livestock during inter-census years, the Institute of Agricultural Research Statistics conducted a pilot survey

in 1951 in the district Etawah in U.P., and another survey in 1953 under different conditions in the district of Wardha in the former State of Madhya Pradesh. The results of these surveys were utilised for extending the survey on a state-wide scale in the former Bombay State during 1954. These investigations showed that random sampling can be utilised usefully and successfully for estimating livestock numbers (I.C.A.R. Research Series No. 25).

A study of the data collected in these surveys also indicated that the stratification by size of villages (size being defined by the total number of households in the villages) is most effective in reducing the sampling variance (ibid).

In a study made in Etawah district for a suitable auxiliary variable which could improve the efficiency of the estimate by following the ratio method of estimation, it was found that the total number of households as auxiliary information is most useful. Next to that was the agricultural area (ibid).

From the analysis of the Bombay survey it was concluded that selection of about 70 taluks and 12 villages per taluk and 6 clusters of 5 households each per selected village, which accounts for less than 1 per cent of the total number of households in the state would be the most appropriate design to be adopted in any State-wide survey for estimating bovine numbers and would provide estimates with sampling errors of the order of 2 per cent. The sampling fraction had to be increased if estimates were to be obtained for important categories of livestock separately.

It is amply clear from the foregoing findings of the I.A.R.S. that the sampling plan devised is not only suitable for providing rationalised supervision over the work of primary enumerating staff during census operations so that independent estimates of livestock numbers can be obtained much more quickly than the census data but also for estimation of livestock numbers in intercensal years.

5.2. *Livestock Products Surveys*

The estimation of livestock numbers is, however, not an end in itself and estimation of livestock products is equally important. The Institute of Agricultural Research Statistics has developed over the last decade sampling techniques for estimating livestock products such as milk, sheep and wool, poultry, etc., in the course of which a series of pilot surveys covering a whole State or an equivalent large tract

has been carried out. These surveys each based on an appropriate probability sampling design are characterised by (i) an adequately large and representative sample, (ii) the survey being carried out over the entire year so as to cover all the seasons and (iii) the work being supervised by not only statistical staff but by field officer trained in animal husbandry. To secure the sampling frame for the selection of the sample for estimating the livestock products in each season, the households in the selected villages are enumerated completely for the livestock contained in them. These surveys thus automatically provide data for estimating livestock numbers in the years in which they are conducted. About a dozen such surveys have been so far conducted on bovines alone. The estimates of milch cows and buffaloes obtained from these surveys are given for illustration in Table 2. It will be seen that the estimates have been secured with sampling errors varying generally between 2 to 6 per cent.

5.3. *Comparison of estimates*

To examine the possible variations in the estimates of number of stock obtained from the trend, and survey methods as compared with the census count, the respective estimates of milch cows and buffaloes relating to Maharashtra and Tamil Nadu in 1966 are presented in Table 3. The three-fold comparison could be made only in these two States because of the limitations that such a comparison required (a) a survey to be conducted in a census year in a State or tract, and (b) the state or the tract to possess the characteristics of having (i) a sufficient number of districts, or groups of districts free from large territorial changes during the period 1920-61, and also (ii) livestock census data for such districts/groups of districts. However, in the case of Kerala, and Punjab & Haryana survey estimates could be compared with the trend estimates. These figures are also presented in Table 3.

It may be noted that since reference period for the livestock census was a single date or a month in the earlier censuses, the figures obtained from the trend and census relate strictly speaking to this period only and would not refer to an average for the whole year. The survey figures, on the other hand, being the estimates worked out on the basis of the data obtained from the livestock products surveys conducted over a whole year, provide the estimates of the average numbers of livestock during the year of survey. Obviously, the survey estimates take into account the annual fluctuations on the

numbers of stock during the year of the survey. (This would be particularly of significance in the case of poultry).

It is seen from Table 3 that in the case of milch cows for both Maharashtra and Tamil Nadu the estimates obtained from the trend and census counts agree well as would be expected but differ from that of the survey markedly. But the estimates of milch buffaloes as per the trend and survey methods and the census counts differ substantially. This conclusion drawn is generally borne out by the trend and survey estimates of milch stock for Kerala and Punjab & Haryana.

It would not be proper to generalise on the basis of a few comparisons but one may be permitted to hazard the view that the census and trend estimates suffer possibly both other non-sampling errors and the distortions due to environmental factors mentioned earlier, which results in their differing from the survey estimates.

5.4. *Integrated Surveys for Livestock Products*

More recently the I.A.R.S. has initiated pilot surveys for developing an integrated plan for estimation of all the principal livestock products. The plan envisages conducting in each State a major survey in any given year for obtaining estimate for the production of a specified product (say milk) for the State as a whole with sufficient precision, while at the same time samples on a smaller scale would be canvassed in the same State to secure indices of changes in output of other products (say eggs, meat etc.) from year to year. Next year another product would be taken up for the major survey and so on. In this plan it is envisaged that all the households in each selected village, whether in the sample for the major survey or others, would be completely enumerated for all livestock. It is clear that whatever be the final sampling design which will be ultimately recommended for the integrated plan, once the plan is adopted by a State for implementation (as a few States such as Maharashtra are already planning to do), annual data on livestock numbers, based on objective and well designed sample surveys will become available. All that needs then to be done is to ensure that these data are quickly processed and estimates made available to interested agencies such as C.S.O., Planning Commission, etc.

Once such data become available regularly it would also be possible to look into any modifications needed in the design to

ensure rotational sampling in an optimal manner and the corresponding estimation procedures which would take into account not only the data for the given year but also those for previous years to provide estimates with greater precision.

Once the integrated plan is adopted, the State Animal Husbandry Departments should also ensure that the District Seasonal and Animal Condition Reports discussed earlier (Section 4) not only flow in regularly but that the information reported therein in respect of various factors is quantified to the maximum extent possible. Where measurements or counts cannot be had, resort will have to be taken to scoring and grading. Once this is done it should be possible to attempt a study of the influence of various factors on livestock numbers. It is only through such studies that a stage may perhaps be reached when it would be possible to attempt objective adjustments for annual fluctuations to trend estimates in case in any year survey estimate is either not available or is late in forthcoming.

6. CONCLUSIONS

From what has been discussed in the preceding sections, the following conclusions emerge :—

- (i) Inter-censal estimates are essential both for assessing the contribution of livestock sector to national income and for purposes of planning for livestock development.
- (ii) In the absence of direct information on inter-censal livestock numbers through sample surveys (as for example for the past period when surveys were not carried out in many States during many years) the census data can be utilised, with appropriate precautions and adjustments, for securing inter-censal estimates (a) through the method of fitting trend curves or (b) through the use of appropriate inter-population formulae. The former method should be preferred to the latter as the trend curve approach can also provide an idea of a measure of reliability reflected by the goodness of fit of the curve and as the choice of the appropriate inter-polation formula may be difficult in situations in which the trends are not polynomial.
- (iii) The sample survey technique has been demonstrated to be a practicable approach to securing intercensal estimates with required degree of precision at a reasonable cost.

The survey technique provides estimates which may suffer much less from non-sampling errors than the trend estimates based on census data and what is extremely important, would also reflect directly the effects of environmental changes occurring due to disturbances in weather, grazing condition, availability of feeds, incidence of diseases etc., whereas the estimates based on census data would only lead to expected values from which in a particular year the actual value may deviate considerably. This is borne out by the few comparisons which could be made between the trend estimates and the corresponding survey estimates as obtained in I.A.R.S. surveys. The survey technique also offers a convenient procedure for rationalised supervision over the census, capable of providing independent estimates.

- (iv) It is not necessary to undertake surveys exclusively for estimating livestock numbers. The sample surveys for estimation of livestock products require complete enumeration of households for livestock in the selected villages to secure a sampling frame. The data collected in the process can be utilised for obtaining inter-censal estimates. The precision of such estimates in the surveys carried out by the I.A.R.S. so far has ranged generally from 2 to 6 per cent. In case it is desired to secure in any year in any State estimates with greater precision this can be very well done by augmenting the sample size with a supplementary sample of villages which would only be enumerated and not studied for livestock products.
- (v) The plan for intergrated surveys on principal livestock products being developed by the I.A.R.S. provides for the enumeration of all the households in the selected villages for all principal livestock and poultry. The integrated survey can thus lead to providing estimates of livestock numbers in successive years for any State in which the integrated plan is adopted.

Steps should be taken to ensure that the relevant data are processed quickly and the inter-censal estimates of livestock numbers made available to the interested agencies such as, C.S.O., Planning Commission etc. without undue loss of time.

- (vi) It is desirable to ensure that the District Animal Husbandry Officers in different States prepare and transmit quarterly reports on the conditions of season, grazing, availability of feeds and fodder for livestock, diseases, etc. An attempt should be made to quantify the items on which information is provided in these reports. Such information studied in conjunction with estimates of livestock numbers from annual surveys would throw light on the influence of various factors of environment on livestock numbers and may lead to adjustment for annual variations for trend estimates in case surveys are not carried out in a particular year. The trend estimates themselves would then be based on available annual survey estimates.

SUMMARY

In the absence of survey data the feasibility of working out inter-censal estimates of livestock numbers with the available quinquennial census data has been examined by fitting trends and using interpolation formulae. The trend approach was found to be more suitable. The limitations of the estimates thus obtained from the census data have been brought out. The role of sample surveys in this connection has been discussed, the information available on inter-censal livestock numbers from the livestock products surveys during the last decade has been reviewed and concrete suggestions for further course of action have been offered.

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TABLE 1

Equation of Trends for Different Categories of Bovines

<i>Sl. No.</i>	<i>Categories</i>	<i>Southern Region</i> ¹	<i>Northern Region</i> ²	<i>All India</i> ³
CATTLE				
1.	Adult males	$Y=23.2661-1.4205t+0.2166t^2$	$Y=38.8517-1.8051t+0.3336t^2$	$Y=62.1178-3.2256t+0.5502t^2$
2.	Adult females	$Y=14.1441+0.7307t$	$Y=31.9798-2.3290t+0.3371t^2$	$Y=46.1239-1.6083t+0.3371t^2$
3.	Young stock	$Y=11.0446+0.5659t$	$Y=28.3677-1.3607t+0.2439t^2$	$Y=39.4123-0.7948t+0.2439t^2$
BUFFALOES				
4.	Adult males	$Y=2.6568-0.2545t+0.0341t^2$	$Y=3.8547-0.1808t+0.0397t^2$	$Y=6.5115-0.4353t+0.0738t^2$
5.	Adult females	$Y=5.5496+0.2917t$	$Y=12.8832-0.1654t+0.0716t^2$	$Y=18.4328+0.1263t+0.0716t^2$
6.	Young stock	$Y=3.2460+1.2966t-0.3063t^2$ $+0.0231t^3$	$Y=7.3903+2.8200t-0.7463t^2$ $+0.0624t^3$	$Y=10.6363+4.1166t-1.0526t^2$ $+0.0855t^3$

Scale Y : in million and t varies over 5 years units with $t=0$ at 1921.

1. Consisting of Andhra Pradesh, Kerala, Maharashtra, Madras, Mysore, Orissa and the three districts; Surat, Broach, and Dangs of Gujarat State as in 1961.
2. Comprising the remaining part of the Country as in 1961.
3. All India as in 1961 which excludes Goa, Daman, Diu, Dadra and Nagar Haveli.

TABLE 2

Sample Surveys for the Estimation of Livestock Products : Percentage Sampling Errors of Estimates of Milch Animals.

Sl No.	States	Year of the survey	Cows	Buffaloes
1.	Andhra Pradesh	1966-67	6.1	4.5
2.	Bihar	1966-67	6.1	7.2
3.	Gujarat	1963-64	3.4	2.3
4.	Kerala	1964-65	2.1	5.8
5.	Madhya Pradesh	1966-67	6.0	5.2
6.	Madras	1965-66	4.0	4.9
7.	Maharashtra	1964-65	5.8	6.6
8.	Mysore	1965-66	5.0	5.0
9.	Punjab and Haryana	1961-62 1966-67	2.8 1.6	1.8 2.4
10.	Eastern Uttar Pradesh	1962-63	6.3	5.1

TABLE 3

Estimates of Milch Animals (in million) obtained by Different Methods and Census Counts (where available)

State	Year	Stock	Census Count	Estimates according to	
				Trend	Survey
Maharashtra	1966	Cows	3.914	3.958	4.700(5.5)*
		Buffaloes	1.501	2.584	1.911(6.6)
Tamil Nadu	1966	Cows	2.462	2.475	2.020(4.0)
		Buffaloes	1.056	.961	0.870(4.9)
Kerala	1965	Cows	—	.922	.850(2.1)
		Buffaloes	—	.130	.103(5.8)
Punjab & Haryana	1962	Cows	—	1.731	1.513(2.8)
		Buffaloes	—	2.068	2.109(1.8)
	1967	Cows	—	1.939	1.551(1.6)
		Buffaloes	—	2.154	2.206(2.4)

*Figures in brackets denote percentage standard errors.