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ANALYSIS OF LIVESTOCK DATA AND PROJECTIONS FOR PAKISTAN

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This paper deals with livestock data collected from livestock census 1976 and Agricultural census of 1972 and 1980 conducted in Pakistan. An attempt has been made to study changes in various kinds of livestock populations as well as in the number of households reporting livestock. Some inconsistencies in the livestock figures of different censuses have also been pointed out. The paper provides projected estimates for 1988 and 1996. These estimates have been obtained by using Markov Chain process on the basis of census data for 1972and 1980 censuses.

INTRODUCTION

The major sources of data on livestock situation in Pakistan are agricultural and livestock census,conducted on sampling basis, at decinial interval. It appears that these data have received comparatively little attention by scientists and policy makers. Consequently the analysis and data applications are noticed to be rare in Statistics/Economics literature of Pakistan. Inconsistency among various data sets is another point of concern for various agencies. Perhaps the complications, diversity of information and data collection work in crop and livestock sector have given rise to such inconsistencies. Among several other reasons the difference in the coverage of area, sampling design, methodology adopted for the enumeration and the engagement of staff from different departments for the collection of data might also have resulted in different magnitudes of sampling and non-sampling errors.The concerned offices in agricultural census organisation of Pakistan need to pay special attention to cope with such problems and bring the reliable data for Pakistan. The livestock data on 1972 and 1980 censuses of Agriculture appear to be more comparable than that of livestock census of 1976. An attempt has been made to study various aspects concerning livestock data for Pakistan with the following objectives:

i To study changes in various kinds of livestock populations as well as in the number of households reporting livestock.

ii To estimate per capita availability of milk and meat in Pakistan.

iii To find projection estimates for selected livestock figures for near future.

DATA ANALYSIS

The livestock data from the censuses of agricultural and livestock have been used to find the index number with 1972 as base. This has been done to study the variation among various census figures with the passage of time and to know the possible inconsistencies.

The projection estimates for selected characteristics concerning livestock population and number of reporting households have been carried out by using Markov Chain process on the basis of census data for 1972 and 1980 censuses. There were nine farm size categories in the census reports. These served as states. The movement between farm sizes appeared in the same direction i.e. from larger to lower size. This is mainly due to the division of farms into more segments due to inheritance at the death of a farm owner. Thus the exit was kept after the highest farm size.Markov Chain has been used with the assumptions:

i No probability can be negative

i.e. $P_{ij} \geq 0$ for all i and j. Here P_{ij} is transition probability from size to size j. The transition is expected to occur from a large farm to the next lower category farm and so on.

ii The sum of all the probabilities with in a row must be equal to unity i. e. $\sum_{i=1}^{n} P_{ij} = 1$

projection estimates are obtained by the following formulas:

$$F_j = (P_o)' F_{j-1}$$

$$F_{j+1} = (P_o)'^2 F_{j-1} = (P_o)' F_j$$

Where F_{j-2}, F_{j-1}, F_j, F_{j-1} denote the figures for 1972, 1980, 1988, and 1996 respectively, while $(Po)'$ denotes the transpose of matrix of transition probabilities.

RESULTS AND DISCUSSION

A. Index Numbers: The data on selected parameters have generally shown higher values in 1976 census as compared to 1972 and 1980 census figures. The changes in livestock population, number of households reporting and the population of work animals are discussed in the following paragraphs.

I Livestock Population/Household Reporting: Table 1(A) shows the total number of livestock as well as index numbers by type of animals and poultry birds for the year 1972 (base), 1976 and 1980. The increases in some categories of animals from 1972 to 1976 and declines thereafter, appear unreasonable. A continuous increase in animal population due to rising demands by increased population looks inevitable but the situation depicted by the census data is just contrary to this. Some errors or biases may also be playing their part in the preparation of 1976 estimates.

The number of households reporting different animals as well as their indices, given in Table 1(B) show comparatively higher increases in the number of households reporting sheep, goats, asses and poultry birds from 1972 to 1976 census and decreases thereafter. The households reporting cattlle decreased from 1972 to 1976 census and increased thereafter. The remaining columns appear to show increase although not at the same rate thus inconsistencies appear again. Considering 1972 and 1980 censuses all the other categories of households except the households reporting sheep, camels and mules have lower rate of percentage increase as compared to the rate of increase in population which is nearly 3% per annum.

ii Work Animals: The number of work animals, given in Table 2 has generally shown decrease.This could be due to introduction of farm machinery in the agricultural sector. The maximum decline was noticed in the number of households reporting female buffaloes and cows used for work. The number of male buffaloes used for work showed a sharp decrease from 1972 to 1976 and some increase thereafter. On average the rate of decrease from 1972 to 1980 was little more than 2%.

B) Milch Animal Population in Relation to Human Population: The persual of Table 3 shows relatively smaller increase in animal population as compared to higher increase in the human population in Pakistan. It is obvious from the figures that the number of persons per animal has increased during the period of 1972-1980. In case of buffaloes or cows in milk one can observe a higher increase in the number of persons per cow, buffalo or both. It is not a satisfactory situation as the available milk in already not

meeting the requirments of the existing population in Pakistan.

Table 1. Livestock population/number of households reporting alongwith their Index numbers with 1972 as base

(A) Livestock population by type of animals (000)

Census years	Cattle	Buffaloes	Sheep	Goats	Camels	Asses	Horses	Mules	Poultry
1972 No.	12540	9407	7931	10077	531	1558	355	22	13953
1976 No.	14855	10611	18937	21693	789	2157	439	61	32033
Index No.	118.50	113	239	215	149	138	124	272.5	229.5
1980 No.	14444	10957	11297	15205	696	1859	293	32	30320
Index No.	115	116.50	142	151	131	119	83	142	217
*	+ 1.78	+ 1.93	+ 4.50	+ 5.28	+ 3.43	+ 2.20	– 2.30	+ 4.50	+ 10

(B) Number of households reporting animals (000)

1972 No.	3845	3255	1008	2320	371	1135	309	16	2967
1976 No.	4065	3435	1390	3305	404	1305	315	27	4155
Index No.	160	106.5	138	142.5	109	115	102	183	140
1980 No.	4211	3647	1051	2830	869	1316	256	26	3953
Index No.	109.5	113	104	122	126	116	83	159.5	133
*	+ 1.14	+ 1.54	+0.50	+2.52	+2.93	+1.87	– 2.30	+ 6	+ 3.63

*The value in these rows show increase (+) / decrease (–) per year from 1972

Table 2. Households reporting (HHR) and number of animals used for work (000) (Indices with 1972 as base)

Census Years	Total animals used for work		Bullocks		Cows		Male buffaloes		Female buffaloes		Camels	
	HHR	No.of animals	HHR	No. of animals	HHR	No.of animals	HHR	No.of animals	HHR	No. of animals	HHR	No.of animals
1972 No.	3326	7517	2899	6082	245	404	152	194	188	307	371	531
1976 No.	3178	6936	2777	5586	205	346	135	160	79	121	404	718
Index No.	95.5	92	96	92	84	86	89	82	42	39.6	109	138
1980No.	3090	6609	2743	5538	139	243	129	164	41	61	371	603
Index No.	93	88	94.6	91	56.6	60	85	84	22	20	100	144
*	– 0.9	–1.59	–.69	–1.72	–6.9	–6.18	–2.01	–2.16	–17.2	–18. 2	0	+1.65

The values in these rows show increase (+) /decrease (–) per year from 1972

Table 3. Human and milch animal populations (000) in Pakistan

Census years	Human population	Total		In milk		Number of persons per milch animal (In milk)		
		Cows	Buff-aloes	Cows	Buffa-loes	Cow	Buffaloes	Both
1972	65309	3442	5549	2222 (65%)	3725 (67%)	29.50	17.60	11
1980	82730	4623	6150	3127 (68%)	4442 (72%)	26.77	19	11

C) Projection Estimates

The data for 1972 and 1980 censuses on total number of work animals and number of households reporting animals have been used to find the estimates for the year 1988 and 1996. The data from 1976 livestock census appeared inflated and have therefore been ignored for the projection purposes. The total number of work animals by all households as well as projected estimates for 1988 and 1996 appear in Table 4 which shows an overall decline in the population of work animals at the rate of 1.24% per annum .The declining rate is maximum in case of farms with 20ha or more, which are expected to decline to one-third of 1972 by 1996. The decline for farms with 5 to 20 ha farms which shows a decline of is expected to be nearly 60% during the same period. Also the number of farms with 3-5ha may decline by nearly 30%during the period of 1972 to 1996. The number of work animals in households with no farm or small farms i.e. up to three hectares is expected to increase with maximum rate for farms with 1-2ha.

The total number of households reporting the above work animals also expected to show general decline from 1972 to 1996. The maximum rate of decline is noted in categories of farms with 5 or more ha. The other categories showing declines in the number of households reporting work animals were non-farm, less than 0.5ha and 3 to 5 ha farm households. The number of households reporting work animals increased in farms with size between 0.5 to 3 ha.

Table 4. Estimates of total number of work animals by all households for 1988 and 1996

Farm size (Hectares)	1972	%	1980	%	1988	%	1996	%
Non – farm	423280	5.6	445227	6.7	469000	7.8	498064	8.9
<0.5	46374	0.6	50431	0.8	60655	1.0	74474	1.3
. 5–1	239527	3.2	314212	4.8	391981	6.5	472075	8.5
1–2	676224	9.0	751277	11.4	323465	13.7	887075	15.9
2–3	963102	12.8	1008618	15.3	1020464	17.0	1007503	18.1
3–5	1822743	24.0	1613675	24.4	1427043	23.8	1260836	22.6
5–10	1943381	25.8	1472678	22.3	1115983	18.6	845682	15.2
10–20	931902	12.4	651410	9.8	482535	8.0	363186	6.5
20–60	388985	5.2	249187	3.8	174187	3.0	129029	2.3
60 >	81970	1.1	52191	0.8	36482	0.6	27024	0.5
	7517494	100	6608906	100	6001795	100	5564948	100

Table 5. Projection estimates of the total number of households reporting work animals for 1988 and 1996

Farm size (Hectares)	1972	%	1980	%	1988	%	1996	
Non– farm	244894	7.4	222022	7.2	201285	6.9	182485	6.6
<.5	30097	0.9	31104	1.0	29244	1.0	26798	1.0
. 5–1	141066	4.2	181992	5.9	226094	7.8	271393	9.8
1–2	389808	10.8	405771	13.1	453842	15.6	502130	18.1
2–3	478444	14.4	511600	16.6	531924	18.3	514554	19.5
3–5	842182	25.3	771175	24.9	703147	24.0	638776	23.0
5–10	785769	23.6	632262	20.5	508718	17.4	409314	14.7
10–20	317896	9.5	242488	7.8	191388	6.6	152615	5.5
20–60	133673	3.4	80227	2.6	61980	2.1	43177	1.6
60>	15750	0.5	11393	0.4	8801	0.3	6946	0.2
	3325579	100	3090034	100	2916423	100	2775188	100

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