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Growth of Livestock Production in Pakistan: An Analysis

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1. INTRODUCTION

Agriculture is the backbone and single largest sector of Pakistan's economy as its contribution to Gross Domestic Product (GDP) exceeded 25.3 percent during 1997-98. Crops, livestock, fishing and forestry sub-sectors being its main components, only crop and livestock sub-sectors are of critical importance. They accounted for 59.6 and 36.2 percent of the sector's output respectively. Because of the ongoing process of structural transformation, agriculture's share in the national economy is shrinking. From 39 percent of GDP in 1969-70 it has fallen to its current levels [Pakistan (1999a)]. The livestock sub-sector however has not followed suit. It has risen from 27.3 percent in 1969-70 to 36.2 percent in 1997-98. This trend in fact would be more pronounced if the national accounts did not underestimate the sub-sector's components such as farm yard manure, dung cakes for household fuels and animal draft power.

Apart from its contributions to national income, the livestock sub-sector is an active employer of thousands of landless poor and subsistence and semi-subsistence small farming families. Being a household activity, women are a special beneficiary of employment in the sub-sector. It is a major source of nourishment like milk, butter oil, eggs and meat and adds immensely to the health, nutrition and well being of rural as well as urban people. While animal fat and butter oil supplies are helpful in containing vegetable oil imports, many products of livestock origin such as wool and wool products, leather and leather made-ups and animal casings are exported and contribute significantly to hard earned foreign exchange [Ahmad, Ahmad and Chaudhry (1996)].

It follows from the above that the livestock sub-sector is likely to maintain its position as the dominant sub-sector of Pakistan's agricultural sector or even that of the national economy for quite sometime in the future. Despite the rising and critical importance of the sub-sector, there, however, is no corresponding emphasis on analysing its achievements, problems and future prospects and likely policies to brighten these up. In view of this limitation, the present paper makes a limited attempt to study the growth process of the livestock sub-sector. Towards this end,

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Authors' Note: The responsibility for any errors of omission, commission, or the ideas expressed in this paper lies entirely with the authors.

Section 2 following the present introductory section, reports on growth trend of various products of livestock sector between 1972-73 and 1996-97 on the basis of different sub-periods. In Section 3, factor productivity analysis is undertaken for explaining the growth process in terms of factor inputs and technological breakthroughs in the sector. The final Section 4 presents a summary of major findings and makes policy recommendations.

2. GROWTH TREND OF LIVESTOCK PRODUCTS

The livestock sub-sector in Pakistan comprises a variety of animals like camels, horses, mules, donkeys, buffaloes, cows, goats, sheep and poultry birds. Being an intermediate stock of capital, the main function of the animals is to transform roughages, feed and fodder inputs into livestock products which for the present purpose have a more direct relevance than the number of animals itself. It may be noted that wool, hair, hides, skins, eggs, poultry meat, mutton, beef and milk are some of the more important livestock products[1] in terms of value added and form the crux of the following analysis of trend growth rates. In order to put things in their proper perspective, the following Table 1 reports on intertemporal growth rates of gross values of each product at 1979-80 prices. To avoid year to year output fluctuations, these growth rates were based on the three year averages centred at the beginning and end years of each period. For the interested readers, the yearly data of gross values is included in Appendix Table A.

It is clear from Table 1 that the growth of livestock production varied considerably from time to time. For example, the annual growth rate with slight acceleration over the years hardly exceeded 3.0 percent during most of the 1970s. It continued to accelerate throughout the Eighties and reached the highest levels of 4.50 and 5.74 percent per annum during the first and second halves of the Eighties respectively. The growth rates, however slipped down to 5.66 percent during the early 1990s and further to 4.88 percent between 1994-95 and 1996-97.

The trend in livestock production was mainly shaped by output trends in wool, skins, poultry, mutton and beef. By contrast, milk, hides and hair production continued to witness consistently accelerating growth rates throughout the entire period under consideration. Deceleration in growth rates since 1989-90 and actual decline in output since 1994-95 in the case of mutton, skins and wool are particularly noteworthy and can be attributed to falling and negative growth rates of sheep during the respective two periods [Pakistan (1999a)]. The general decline in the growth rates of livestock production and most of livestock products may have been induced by the deepening recession and poor performance of the national economy in recent years [Pakistan (1999a)]. In the late 1990s, restrictions on meals at marriage ceremonies further reduced

[1]Apart from these products, animals are also a source of other products like farm yard manure, dung cakes, draft power, bones, blood, horns and hoofs but have been excluded from the present analysis for lack of time series data on their quantities and prices.

Table 1

Annual Growth Rates of Gross Values of Livestock Products Since 1972-73 to Date*

Animal Products	Annual Growth Rate (Percent) of Gross Values for the Period						
	1972-73 to 1974-75	1974-75 to 1979-80	1979-80 to 1984-85	1984-85 to 1989-90	1989-90 to 1994-95	1994-95 to 1996-97	1972-73 to 1996-97
Wool	8.34	5.53	3.96	0.80	0.30	–0.10	1.94
Hair	9.11	6.16	4.92	3.50	8.32	19.43	7.08
Hides	1.53	1.73	1.98	1.57	2.31	4.73	2.10
Skins	8.89	4.35	2.67	1.75	2.45	–3.38	2.76
Eggs	17.35	16.67	12.45	3.79	5.30	0.24	0.26
Poultry Meat	22.12	11.27	16.49	9.07	14.85	3.43	12.80
Mutton	8.52	5.78	5.42	6.29	4.07	–10.98	4.17
Beef	1.14	3.20	4.97	6.47	6.40	0.75	4.11
Milk	1.72	2.08	4.01	5.93	6.29	8.64	6.66
All Products	2.92	3.03	4.50	5.74	5.66	4.88	4.58

Source: [Appendix Table A].

*Annual growth rates based on three year averages centred at the beginning and end years of the period concerned.

chicken and animal slaughtering with adverse effects on the growth of chicken meat, mutton and skins.

3. EXPLAINING PRODUCTIVITY TRENDS

The trends in growth can be explained in the light of contributions of various factors of production such as land, labour, capital and technological process. It may, however, be noted at the outset that because of complementarities of inputs and embodiment of technological change, precise calculation of the input contribution is neither possible nor is tried here [Nadiri (1970)]. What is intended is to look at the contributions made by the number of animals, inputs such as feeds, fodder and roughages and progress of technology (inherently reflected in our estimates of total or aggregate factor productivity). Using fairly standard methodology, the following Table 2 provides a birds eye view of productivity trends in the livestock sub-sector with specific emphasis on growth rates of total production, number of animals, aggregate inputs and total factor productivity.

Table 2 points to a number of conclusions. Looking at the total period under consideration, nearly 57 percent of the total increase in livestock production is attributable to increasing number of animals over time. The quantitative improvements in roughages, fodder and animal feeds in aggregate accounted for another 21 percent of total increase in livestock production. This leaves an unexplained residual of 22 percent which can be assumed as a contribution of technological progress to Pakistan's livestock sub-sector.

It should, however, be noted that growth rates of animals, aggregate inputs and hence those of partial (per animal) and total factor productivities (aggregate) have varied

Table 2

Annual Growth Rates of Partial and Total Factor Productivities of Livestock Sub-sector Since 1972-73 to 1997-98*

Time Period	Annual Growth Rates (Percent) of:				
	Livestock Production	Animal Numbers	Total Inputs	Productivity	
				Per Animal	Aggregate
1972-73 to 1974-75	2.92	3.33	–0.73	–0.41	0.32
1974-75 to 1979-80	3.03	2.01	1.63	1.02	–0.61
1979-80 to 1984-85	4.50	2.72	0.97	1.78	0.81
1984-85 to 1989-90	5.74	3.17	1.61	2.57	0.96
1989-90 to 1994-95	5.66	2.43	0.21	3.23	3.02
1994-95 to 1997-98	4.88	2.58	1.08	2.30	1.22
1972-73 to 1997-98	4.58	2.64	0.95	1.94	0.99

Source: [Appendix Tables A, B and C].

* Annual Growth rates based on three year averages centred at the beginning and end years of the period concerned.

considerably from time to time. For example, the annual growth rate of number of animals which was in excess of 3.3 percent during the early Seventies, had fallen to a mere 2.0 percent in the second half of the Seventies. It continued to accelerate throughout the Eighties to lie at 3.17 percent in the latter part of the decade. In the first and second halves of 1990s, the respective growth rates were 2.43 and 2.58 percent per annum.

Despite the up and down movement of the animal growth rate, the productivity per animal has witnessed accelerating growth rates only until the mid-Nineties. The negative productivity during 1972-73 to 1974-75 peaked to 3.2 percent during the early 1990s, decelerating to 2.3 percent in the subsequent period of 1994-95 to 1997-98.

The growth of aggregate inputs, although considerably lower, followed the pattern of annual growth rates of number of animals. Of the seven periods under consideration, only two had an annual growth rate exceeding 1.6 percent but the remaining five periods were conspicuously marked by less than 1.00 percent annual growth.

To the extent that trends in aggregate productivity are dampened by trends in aggregate inputs, the growth rates of the former should be expected to be lower than those of partial productivity or productivity per animal. This seems to be reflected by calculations reported in Table 2. Like the partial productivity, the growth of technological change peaked at 3.0 percent during 1989-90 to 1994-95. With the exception of this period, the contribution of technological progress to livestock production was either negative or had hardly exceeded 1.0 percent per annum.

In spite of the low contribution of technological progress to production in livestock sub-sector relative to the crop production sub-sector, the former sector witnessed higher growth rates than the latter sector [Chaudhry, Chaudhry and Qasim (1996)]. The underlying reason seems to be the relative price situation in the two sub-sectors. The producer prices in the case of major agricultural commodities are controlled by the government which permits only limited increases to avoid antagonism of

consumers and industrialists. On the other hand, the government has followed a policy of indiscriminate increase in the prices of key agricultural inputs with a view to eliminating all kinds of input subsidies under the World Bank pressures. As a result, the profitability of major agricultural crops has consistently been on the decline [Ahmad and Chaudhry (1987) and Afzal *et al.* (1992)]. Given this situation, farmers apparently have responded only half-heartedly resulting in staggered output increases. By contrast, livestock sector was neither controlled by government nor it faced a grim price situation. In fact, the high income elasticity of demand in the neighbourhood of 0.80 [Gotsch and Timmer (1967)] and exceeding 1.0 in the case of certain products [Burney and Akmal (1991) and Akmal (1994)] ensured high demand conditions and rapidly rising prices for all times to come. As a result farmers were positively induced to make all out efforts to benefit from market signals.

4. SUMMARY AND POLICY OPTIONS

One of the major objectives of this paper has been to review the growth performance of Pakistan's livestock sub-sector. While the long term growth rate of livestock production has been good, it has exhibited considerable variation from product to product and period to period. Poultry production exhibited high growth rates until 1984-85. They turned negative during 1994-95 to 1997-98. Also, there was hardly any growth in beef production in the latter period. Improved feed that could contribute significantly to dairy and poultry production, remains limited. Progress in livestock sub-sector has been mainly the result of growing number of animals rather than rising productivity per animal.

The analysis of this paper underlines the importance of technology in the livestock sub-sector especially the use of artificial insemination. For this purpose all necessary infrastructure especially refrigeration must be placed at the disposal of insemination centres which need to be widely spread throughout the country side.

Secondly, livestock holders must be provided with adequate incentives by ensuring a fair share in consumer prices not only to induce them to adopt the latest technologies but also to reward their efforts. Livestock extension services can be particularly helpful in convincing the farmers to adopt modern husbandry practices. By way of ensuring fair prices to farmers, animal sales, on live-weight basis, as in the case of poultry, should be encouraged in livestock markets.

Thirdly, most of the livestock feed markets are still in their infancy and suffer from inadequate competition. They are typically characterised by monopoly positions of one kind or another and lack any quality control. There may thus be the need to ensure adequate supply of quality and balanced animal feed through imposition of penalties for illicit trade practices.

Finally, the low productivity of animals can also be attributed to widespread incidence of animal diseases and lack of animal husbandry services apart from poor feed quality [Iqbal (1994) and Iqbal and Ahmad (1999)]. The provision of these services to each and every corner of the rural areas is an absolute need.

Appendix Table A

*Gross Value (Rs 000) of Livestock Sector Output at 1979-80 Prices**

Period	Gross Value (Rs 000) of									
	Wool	Hairs	Hides	Skins	Eggs	Milk	Beef	Mutton	Poultry	Total Output
1971-72	320710	10029	425485	763420	291500	24336000	2307820	3346720	20300	31821984
1972-73	352636	10721	425485	814625	347500	24644880	2327830	3604160	27550	32555386
1973-74	378757	11758	435380	903070	405500	25097280	2361180	3942050	34800	33569775
1974-75	410683	12796	445275	977550	453500	25499760	2381190	4263850	39150	34483753
1975-76	445511	14179	445275	1061340	579500	26045760	2414540	4633920	49300	35689325
1976-77	467278	14870	455170	1098580	721500	26594880	2501250	4875270	53650	36782449
1977-78	489046	15562	465065	1135820	778500	27156480	2594630	5132710	59450	37827263
1978-79	513716	16600	474960	1173060	902500	27730560	2694680	5390150	63800	38960026
1979-80	538386	17291	484855	1214955	1047000	28314000	2788060	5663680	71050	40139277
1980-81	564507	18329	484855	1252195	1159500	28913040	2894780	5953300	75400	41315906
1981-82	590628	19020	494750	1298745	1332000	29521440	2988160	6259010	82650	42586404
1982-83	619652	20058	514540	1340640	1600000	30145440	3094880	6564720	108750	44008680
1983-84	654480	21441	524435	1387190	1809500	31955040	3254960	7015240	124700	46746986
1984-85	692210	22824	534330	1433740	2049500	33870720	3421710	7514030	143550	49682615
1985-86	616749	22133	534330	1331330	1730000	37602240	4002000	7610570	182700	53632052
1986-87	632712	23170	544225	1377880	1900000	39527280	4202100	8157630	194300	56559298
1987-88	648675	24208	554120	1424430	2070000	41555280	4408870	8720780	223300	59629663
1988-89	664638	25245	564015	1475635	2150000	43689360	4628980	9348290	249400	62795563
1989-90	680601	26283	573910	1531495	2335000	45935760	4875770	9991890	227650	66178359
1990-91	698015	27320	583805	1522185	2245000	48300720	5102550	10699850	218950	69398395
1991-92	715429	28703	593700	1578045	2457000	50793600	5356010	11472170	245050	73239708
1992-93	732843	28012	603595	1675800	2582000	53414400	5629480	12276670	384250	77327050
1993-94	750257	31124	613490	1759590	2870000	56178720	5916290	13145530	429200	81694202
1994-95	770574	32508	623385	1829415	2963500	59236320	6209770	14078750	446600	86190821
1995-96	552898	53949	692650	1522185	2878500	71666400	5989660	9444830	514750	93315821
1996-97	555800	56024	702545	1605975	3007500	73569600	6129730	9686180	561150	95874504
1997-98	558702	57753	722335	1643215	2868500	75550800	6269800	9927530	411800	98010435
1998-99	561605	59828	742125	1689765	2969000	77613120	6423210	10184970	430650	100674272

* The data regarding livestock products have been obtained from Pakistan (1999a) valued at average wholesale prices of fair average quality for the year 1979-80. The prices are Rs 580.47/40kg, 138.33/40kg and 98.95 each for wool, hair and hides, respectively; price for skin is weighted average and the weights are shares of sheep and goat numbers in 1979-80 – Rs 46.55 = 61.25*0.46 (sheep) + 34.03* 0.54 (goat); prices of milk, beef, mutton, chicken meat and eggs respectively are Rs 3.12/litre, 6.67/kg, 16.09/kg, 10.45/kg (=15.60/kg live*0.67) and 0.50/each [Pakistan (1981)].

Appendix Table B

*Gross Value (Rs 000) of Livestock Feeds at 1979-80 Prices**

Period	Gross Value (Rs 000) of Contents of Feed and Total							
	Wheat	Bajra	Jawar	Maize	Barley	Cotton Seed	Pulses & Guar Seed	Feed Total
1971-72	201601	390645	24925	218832	80698	660593	261596	1838891
1972-73	217753	329878	24126	219142	85399	655921	266019	1798239
1973-74	223225	380879	30197	238077	109687	615743	310883	1908691
1974-75	224512	288643	21250	231869	107337	592384	279921	1745916
1975-76	254299	334219	22448	249251	101852	480261	329049	1771379
1976-77	267553	337474	20851	237146	97152	406447	330597	1697219
1977-78	244818	345070	22688	254838	94801	537257	290757	1790230
1978-79	291137	343985	20132	248010	101069	441952	304121	1750406
1979-80	317676	300580	19892	271600	92451	680214	213384	1895796
1980-81	335759	232217	18374	301088	137892	668067	218155	1911552
1981-82	330755	295154	17975	288672	123790	698901	225011	1980258
1982-83	363234	238728	17735	311952	144944	769913	274171	2120675
1983-84	318407	277792	17735	314746	109687	462508	303426	1804302
1984-85	342430	308176	18374	319091	103419	941835	309208	2342533
1985-86	407387	279962	17495	313194	104986	1128707	316001	2567732
1986-87	351588	252834	18853	344854	104986	1223077	332745	2628939
1987-88	370871	146492	14460	349821	87750	1371640	223178	2564211
1988-89	421900	218110	19812	373722	96368	1332397	337200	2799509
1989-90	418886	221366	20931	365962	102636	1360428	339759	2829967
1990-91	426172	212685	19093	367824	111254	1529547	314674	2981249
1991-92	458914	150832	17975	373411	109687	2037839	280647	3429306
1992-93	472754	111768	19013	367514	123790	1438914	242577	2776330
1993-94	445132	149747	16936	376515	114388	1278204	251012	2631936
1994-95	497479	247409	21010	409107	128491	1381918	310314	2995728
1995-96	494699	175790	20371	398243	136326	1683717	347247	3256393
1996-97	487208	158428	17495	390794	117522	1489370	314453	2975270
1997-98	546986	228961	18853	388310	117522	1460405	366930	3127968

* Reported values represent 2 percent of wheat, 50 percent of Bajra, 5 percent of Jawar, 20 percent of Maize, 48 percent of Barley, 28 percent of Cotton seed [Pakistan (1999a)] and 15 percent of Pulses and Guar seed of total production [Pakistan (1999 and various issues)] and these percentages are computed from the FAO food balance sheets downloaded from the internet. The prices to value these feed contents respectively are average whole prices for the year 1979-80: Rs 58.52, 63.91, 86.81, 62.08, 65.29, 66.74 and 84.25 per 40kg for Wheat, Jawar, Bajra, Maize, Barley, Cotton seed and Gram, respectively [Pakistan (1981)].

Appendix Table C

*Gross Value (Rs 000) of Livestock Roughages, Feed and Fodder at 1979-80 Prices and Total Number of Animal Units**

Period	Gross Value (Rs 000) of				
	Roughage	Feed	Fodder	Total Inputs	Animal Units
1971-72	1540503	1838891	9074775	12454168	35362
1972-73	1636467	1798239	9042773	12477479	36276
1973-74	1708161	1908691	9010884	12627736	37175
1974-75	1676978	1745916	8979107	12402001	38201
1975-76	1907534	1771379	8306267	11985180	40794
1976-77	2019365	1697219	8721246	12437830	40135
1977-78	1936873	1790230	8889039	12616143	40949
1978-79	2216897	1750406	9357059	13324362	41768
1979-80	2348806	1895796	9078379	13322981	42781
1980-81	2457161	1911552	9108035	13476749	43791
1981-82	2504313	1980258	9137545	13622115	44562
1982-83	2654673	2120675	9167151	13942498	45686
1983-84	2411594	1804302	9196852	13412748	46768
1984-85	2521877	2342533	9226650	14091060	48037
1985-86	2776142	2567732	9256317	14600190	51982
1986-87	2584863	2628939	9062837	14276640	53113
1987-88	2665047	2564211	8893043	14122301	54481
1988-89	2950176	2799509	9403094	15152779	55870
1989-90	2928975	2829967	9304686	15063629	57402
1990-91	2976808	2981249	9428780	15386837	58284
1991-92	3163063	3429306	8767948	15360317	59671
1992-93	3211012	2776330	8853012	14840354	60951
1993-94	3243049	2631936	8818987	14693972	62743
1994-95	3446838	2995728	9128554	15571119	64580
1995-96	3504313	3256393	9057500	15818206	66076
1996-97	3500633	2975270	8844406	15320309	67752
1997-98	3884118	3127968	8937142	15949228	69674

* Total inputs include total feed, fodder, and roughages. The fodder data is compiled from two sources: 1971-72 to 1973-74 interpolated on the basis of Agricultural Census data 1970-71 [Pakistan (1975)]; 1980-81 to1984-85 again interpolated based on the Agriculture Census data [Pakistan (1983a)]; and the data for all other years is obtained from the files of the Ministry of Food, Agriculture and Livestock, Islamabad. The fodder is valued using cost of production per acre of Maize for grain purpose, i.e., Rs 1350/acre in 1980-81 [Pakistan (1983)]. The number of animals represents cow equivalent number calculated by equating one buffalo to 1.5 cows, and one cow to 5 goats and sheep and 120 poultry birds [USAID (1973)].

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Comments

The study is focused on a very important sector of Pakistan's economy i.e., Growth of Livestock Production: An Analysis.

The paper reviews the growth performance of Pakistan's livestock sub-sector from 1970-71 to 1997-98 (28 Years). The authors have used Total Factor Productivity (TFP) analysis for explaining the growth process in terms of factor inputs and technological breakthrough.

I have some observations on using TFP. As an index for measuring sustainability it does have some drawbacks:

- Data requirements are quite demanding. Detailed data for a number of years are required to form a significant trend that can be very expensive to obtain.
- Some of the computational procedures are quite demanding and it is not clear which index from the number of possible indexes i.e., Laspeyres, Paasche, Fisher, and Divisia one should choose.
- The index number problem would still remain when considering the prices to be used as weights, they must reflect their long-term economic value which is difficult to calculate (Iynam and Herdt).
- It is not obvious that one can obtain the correct data or even define the data correctly.
- It is difficult to identify turning points in the TFP index when projected into future.

Partial Productivity Analysis measures the ratio of total output to a single input. Partial Productivity measures can be a good performance measure input (labour/Feed for example) is the dominant input in production and the input mix of the other input do not change over time.

In brief, this study is a significant contribution to the literature, which provides the bases for a development policy. However, it could be more useful by including the following points.

What are the overall conclusions? Give more in depth analysis at your findings. You need to do more analysis and interpretation of results, not just description. The conclusion needs expansion to include implication.

I complement the authors for attempting a paper on a subject, which is very important for policy formulation.

This paper is a good attempt and I hope that next time the authors would come up with its better and complete version.

Muhammad Abdul Quddus

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