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India's Trade Performance in Livestock and Livestock Products

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I

INTRODUCTION

The livestock sector plays a dynamic role in the development process of India. It provides food, income and employment and for low income producers, the sector also serves as a store of wealth, provides draught power and organic fertiliser for crop production and as a means of transport. Consumption of livestock products in India though starting from a very low base, is growing rapidly.

The opening up of the Indian economy in 1991 brought about major changes in the livestock economy. The market-oriented economic policies of the country were reinforced with the signing of Uruguay Round of Agreement (URA) in 1994 which led to the establishment of World Trade Organisation (WTO). These developments have been associated with often much heated debate regarding their benefits and costs in respect of livestock trade. It is therefore appropriate to explore India's livestock trade potential in the context of these significant developments. The paper documents the trends, dimensions, performance and determinants of India's trade in livestock and livestock products and also examines the constraints impeding their export prospects.

II

DATA AND METHODOLOGY

The study is based on time series data pertaining to the period 1980-2004. The data on value of exports/imports for India, producer prices and average unit value of export prices were collected from FAOSTAT database.

To study the changing composition of exports/imports of different livestock products, per cent share of their triennium averages were worked out to account for fluctuations in exports and imports. To measure the diversity of exports/imports of different livestock products, the Simpson index of diversity was used.

$$\text{Simpson Index} = 1 - \sum A_i^2 / A^2$$

Where, A_i = Value of export/import of i-th livestock product,

A = Value of export/import of total livestock products.

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The value of the index varies from 0 to 1. A value of 1 indicates total diversification, whereas a value of zero indicates perfect concentration of trade towards a particular product in the particular triennium.

Variability in export/import of livestock products was analysed through coefficient of variations. Compound growth rates were estimated using the exponential regression model to examine the changes in exports and imports. The growth rates were calculated for two periods, viz., pre-WTO (1980-94) and post-WTO periods (1995-2004) separately to assess the implications of WTO on livestock trade.

To analyse the effect of growth in export on the variability in trade, a simple linear regression equation was fitted with coefficient of variation of export of i-th livestock product as the dependent variable and corresponding growth rate of the same products as the independent variable. A total of eight livestock products were included in the analysis. The regression equation was fitted for both pre-WTO and post-WTO periods.

In order to examine the determinants of exports of livestock products, international prices of livestock products and feed grains and domestic producer prices were regressed on the value of export of selected livestock products. The analysis was carried out for the period 1995-2004. A total of fifteen equations were fitted (three each for export of five selected livestock products).

The present study also measures the comparative advantage of India's livestock sector exports based on the observed pattern of trade. The export performance ratio (EPR), as suggested by Balassa (1965) was used to measure the revealed comparative advantage. The EPR of the i-th livestock product (EPR_i) can be expressed as:

$$EPR_i = (E_i/CE)/(W_i/WE)$$

Where, E_i = Export of i-th livestock product from India,

CE = Aggregate export of livestock products from India in a triennium,

W_i = Total world export of i-th livestock product,

WE = Total world export of all livestock products in a triennium.

A value of EPR greater than unity implies that India has comparative advantage in the exports of livestock products and vice versa.

III

RESULTS AND DISCUSSIONS

Trends in Export and Import of Livestock Products

Table 1 and 2 presents respectively, export and import values of various livestock products during the period 1980-2004. The results are based on comparison among the triennium 1980-82, 1983-85, 1986-88, 1989-91, 1992-94, 1996-98, 1999-2001 and 2002-04. The outputs of livestock sector are grouped under live animals, meat and meat preparations, animal fats, milk equivalent, hides and skin, eggs, hairs and

wool and offals. The two sub-periods, viz. 1980-82 to 1992-94 and 1996-98 to 2002-04 could be construed as pre-WTO and post-WTO periods, respectively.

Table 1 reveals that export trade of India in meat and meat preparations, milk products and eggs has gone up considerably in value terms during the period 1980-2004. The export of live animals grew until 1986-88 and thereafter declined gradually. There were wide fluctuations in the export of hides and skin, animal fats and offals during the reference period. Meat and meat preparations contributed the greatest share of export earnings from livestock sector throughout the period. The share of meat and meat preparation contributed about 82 per cent of livestock sector export in 1980-82. This share has shown a declining trend in recent times, and in 2002-04, it stood at 72 per cent. Milk products and eggs constituted around 1.5 and 3.6 per cent to total value of livestock products export in 1980-82, respectively. However, in the post-WTO period, the exports of these products received huge boost and in 2002-04, milk equivalent and eggs constituted 14 and 10 per cent of livestock sector export, respectively. The percentage contribution of hides and skin, animal fats and offals to total livestock products export have remained insignificant throughout this period. The Indian leather industry has been growing consistently and to encourage Indian leather exports, a ban has been imposed on exports of raw hides and skin (Kumar *et al.*, 2001). The share of live animals and hairs and wool to livestock sector export have declined sharply in the post-WTO period. Overall, the annual export of livestock sector registered a remarkable increase from US\$ 91 million in 1980-82 to US\$ 472 million in 2002-04.

TABLE 1. EXPORTS (VALUE) OF LIVESTOCK AND LIVESTOCK PRODUCTS FROM INDIA

(US\$ 1000)

Commodities (1)	Average value of commodity							
	1980-82 (2)	1983-85 (3)	1986-88 (4)	1989-91 (5)	1992-94 (6)	1996-98 (7)	1999-2001 (8)	2002-04 (9)
Live animals	8,895 (9.79)	14,037 (15.65)	12,549 (14.72)	7,503 (7.68)	5,959 (4.59)	1,145 (0.48)	1,873 (0.57)	3,658 (0.77)
Meat and meat preparations	75,244 (82.11)	69,548 (77.55)	65,042 (76.32)	80,796 (83.54)	1,11,634 (85.99)	1,98,658 (83.37)	2,58,436 (78.07)	3,42,002 (72.42)
Animal fats	5 (0.01)	1988 (2.22)	8 (0.01)	5 (0.01)	0 (-)	135 (0.06)	616 (0.19)	4,873 (1.03)
Hides and skin	399 (0.44)	119 (0.13)	27 (0.03)	413 (0.43)	514 (0.40)	245 (0.10)	684 (0.21)	3,179 (0.67)
Milk equivalent	1,414 (1.56)	2,149 (2.40)	2,468 (2.90)	2,493 (2.58)	6,478 (4.99)	10,183 (4.27)	44,909 (13.57)	64,845 (13.73)
Eggs	3,293 (3.62)	444 (0.50)	388 (0.50)	1,787 (1.85)	3,688 (2.84)	23,883 (10.02)	22,571 (6.82)	48,858 (10.35)
Hairs and wool	1,612 (1.77)	1,391 (1.55)	4,289 (5.03)	2,496 (2.58)	1,322 (1.02)	3,832 (1.61)	1,650 (0.50)	3,933 (0.83)
Offals	0 (-)	0 (-)	453 (0.53)	1096 (1.13)	228 (0.18)	212 (0.09)	295 (0.09)	872 (0.18)
Livestock and livestock product exports	90,862 (100)	89,676 (100)	85,224 (100)	96,589 (100)	1,29,823 (100)	2,38,293 (100)	3,31,034 (100)	4,72,220 (100)
Simpson Index	0.30	0.37	0.39	0.29	0.26	0.29	0.37	0.45

Figures in parentheses indicate percentage of total value of export of livestock and livestock products.

Regarding the imports of livestock products, milk and milk products constituted the major share of livestock sector import (64 per cent) in 1980-82 (Table 2). This share declined steadily over the period and stood at around 7 per cent in 2002-04. The imports of hair and wool, which constituted around 21 per cent of total value of livestock products import in 1980-82, increased remarkably and reached its peak in 2002-04 (72 per cent). Imports of hides and skin increased since the early nineties and in 2002-04, it accounted for 21 per cent of livestock sector import. This increase in imports of hairs and wool and hides and skin could be attributed to the rapid growth of India's leather and wool industry. Imports of meat and meat preparations, eggs and offals have been insignificant throughout the last two decades. Imports of animal fats have registered a drastic decline from US\$ 38 million (15 per cent) in 1980-82 to a meager US\$ 1 million (0.4 per cent) in 2002-04. Import of live animals showed a rising trend till 1986-88 and thereafter declined. The import of livestock products declined from US\$ 262 million in 1980-82 to US\$ 176 million in 1992-94. However, in recent years, livestock products imports showed an increasing trend and stood at US\$ 256 million in triennium ending (T.E) 2002-04.

TABLE 2. IMPORTS (VALUE) OF LIVESTOCK AND LIVESTOCK PRODUCTS TO INDIA

Commodities (1)	Average value of commodity (US\$ 1000)							
	1980-82 (2)	1983-85 (3)	1986-88 (4)	1989-91 (5)	1992-94 (6)	1996-98 (7)	1999-2001 (8)	2002-04 (9)
Live animals	703 (0.27)	3133 (1.93)	7408 (3.68)	4147 (2.69)	1836 (1.04)	644 (0.29)	372 (0.18)	802 (0.31)
Meat and meat preparations	302 (0.12)	82 (0.05)	81 (0.04)	3 #	143 (0.08)	40 (0.02)	267 (0.13)	446 (0.17)
Animal fats	38290 (14.64)	16873 (10.39)	181 (0.09)	186 (0.12)	293 (0.17)	542 (0.24)	891 (0.43)	1116 (0.43)
Hides and skin	1008 (0.38)	1312 (0.814)	9577 (4.76)	26167 (16.99)	34351 (19.52)	52727 (23.68)	59142 (28.83)	52995 (20.63)
Milk equivalent	166656 (63.73)	73330 (45.16)	74994 (37.26)	15756 (10.23)	11446 (6.50)	6956 (3.12)	20218 (9.86)	17706 (6.89)
Eggs	27 (0.01)	31 (0.02)	5 #	0 (-)	3 #	14 (0.01)	64 (0.03)	701 (0.27)
Hairs and wool	54542 (20.86)	67600 (41.64)	109052 (54.17)	107714 (69.96)	127916 (72.68)	161780 (72.64)	124169 (60.53)	184172 (71.71)
Offals	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	6 #	8 #	0 (-)
Livestock and livestock product imports	261528	162361	201298	153973	175988	222709	205131	256822
Simpson Index	0.53	0.61	0.56	0.47	0.46	0.42	0.54	0.44

Figures in parentheses indicate percentage of total value of import of livestock and livestock products.

indicates negligible share.

Trade Diversification

Export and import diversification as measured by Simpson index are also presented in Tables 1 and 2. Moderate diversity among exporting livestock products appeared to have occurred till 1986-88. However, moderate concentration seems to have occurred since then till T.E 1998 as export of livestock products got concentrated mainly towards meat and meat preparations. In the recent past, diversity among exports was noticed again as exports of milk and milk products and eggs picked up considerably since the late nineties.

The import diversification indices have kept fluctuating during the period and varied from 0.4 in T.E 1998 to 0.6 in T.E 1985. Imports showed moderate diversity till T.E 1986-88. Moderate concentration in imports was noticed thereafter till T.E 1998. The imports then got diversified in T.E 2001, but again got relatively concentrated by T.E 2004. The import diversification indices have been in general higher than those for exports of livestock products. It thus becomes evident that exports of livestock products were mainly concentrated towards fewer commodities, while imports was relatively more diversified across different livestock products.

Trends in Net Exports

Table 3 reveals the trends in net exports of livestock and livestock products during the reference period. With the passage of time, the status of India changed from a net importer of livestock products to a surplus nation with high export potential. It is noteworthy that this transformation occurred after the inception of WTO provisions. Within the livestock sector, India has always been a net exporter of meat and meat preparations and eggs and the net export of these products increased substantially during early nineties, the post-liberalisation phase. The net exports of live animals showed a steady decline till T.E 1998, after which this trend reversed and net export registered an increasing trend. India has always been a net importer of hides and skin and hairs and wool. The net imports of hides and skins increased drastically since the early eighties and this increase became more prominent during mid-nineties. The net imports of animal fats, on the other hand registered a sharp decline since mid-eighties and India became a net-exporter in the T.E 2004. The impact of globalisation and liberalisation was most prominent in case of milk and milk products, amongst all livestock products. India relied heavily on import of dairy products to meet the domestic demand until early nineties. However, with the opening of Indian economy, subsequent globalisation and achievement of self-sufficiency in milk production due to Operation Flood Programme, India's dependence on imports of milk products reduced drastically and India became a net exporter of milk and milk products in the post-WTO era.

TABLE 3. NET EXPORTS (VALUE) OF LIVESTOCK AND LIVESTOCK PRODUCTS FROM INDIA

Commodities (1)	Average value of commodity									(US\$ 1000)
	1980-82 (2)	1983-85 (3)	1986-88 (4)	1989-91 (5)	1992-94 (6)	1996-98 (7)	1999-2001 (8)	2002-04 (9)		
Live animals	8,192	10,904	5,141	3,456	4,123	501	1,501	2,856		
Meat and meat preparations	74,942	69,466	64,961	80,793	1,11,491	1,98,618	2,58,169	3,41,556		
Animal fats	-38285	-14885	-173	-186	-293	-407	-275	3,757		
Hides and skin	-609	-1193	-9550	-25754	-33837	-52482	-58458	-49816		
Milk equivalent	-165242	-71181	-72526	-13263	-4968	3,227	24,691	47,139		
Eggs	3,266	413	383	1,787	3,685	23,869	22,507	48,157		
Hairs and wool	-52930	-66209	-104763	-105218	-126594	-157948	-122519	-180239		
Offals	0	0	453	1,096	228	206	287	872		
Livestock and livestock product export	-170666	-72685	-116074	-57384	-46165	15,584	1,25,903	2,15,398		
Total agricultural export	10,50,555	5,26,802	6,52,681	18,78,979	1,64,7125	27,04,465	13,51,741	16,84,312		
Total merchandise export	-6187957	-5797609	-5723112	-4057550	-2062660	-7217684	-8890710	-15086468		

Share of Livestock Sector to India's Agricultural and Merchandise Trade

Table 4 depicts the contribution of livestock sector exports/imports to total export/imports of agricultural and merchandise sector. The share of exports from livestock sector in total agricultural exports declined from the mid-eighties till T.E 1991. This trend was reversed since then and increased continuously to reach its peak (7 per cent) in T.E 2004. This result points towards increasing importance of livestock sector as a source of foreign exchange compared to other agricultural commodities. Although the share of total livestock sector in total merchandise trade declined continuously from the early eighties till T.E 1994, it has registered an increasing trend since then till T.E 2004.

TABLE 4. SHARE OF LIVESTOCK AND LIVESTOCK PRODUCT TO TOTAL AGRICULTURAL AND MERCHANDISE TRADE

Percentage share/Year (1)	<i>(per cent)</i>							
	1980-82 (2)	1983-85 (3)	1986-88 (4)	1989-91 (5)	1992-94 (6)	1996-98 (7)	1999-2001 (8)	2002-04 (9)
	Export							
Agricultural export	3.63	3.92	3.57	3.35	4.06	4.24	6.70	7.40
Total Merchandise export	1.06	0.97	0.70	0.54	0.56	0.69	0.78	0.77
	Import							
Agricultural export	14.41	5.51	5.89	5.70	3.61	2.50	2.33	1.64
Total Merchandise export	1.41	0.64	0.55	0.25	0.22	0.17	0.16	0.10

The share of livestock sector to agricultural and merchandise imports declined continuously during the period 1980-2004 (14 per cent in 1980-82 to 1.6 per cent in 2002-04). This implies that India has achieved self-sufficiency in livestock sector as her dependence on imports is declining in comparison to other agricultural products.

India's Share in World Trade of Livestock Products

Table 5 and 6 reveal India's share in world export and import of different livestock products, respectively. India's share in world livestock exports has been meager. This share, however, has registered an increasing trend since T.E 1994 and reached its peak in T.E 2004 (0.4 per cent). The share of milk and milk products remained negligible, but increased considerably after T.E 1998 to 0.2 per cent in T.E 2004. The share of meat and meat preparations showed a declining trend till T.E 1994, but this trend reversed since then and reached its peak (0.6 per cent) in 2002-04. The most drastic increase in India's share in world export - post-WTO – was observed in the case of egg export. There was a quantum jump in India's share from 0.3 per cent in T.E 1994 to 3 per cent in T.E 2004. The share of India in world hides

and skin and animal fats exports has all along been negligible, although India's share in animal fats export increased substantially in the last triennium. India's share in world export of live animals has shown a declining trend since T.E. 1985.

TABLE 5. INDIA'S SHARE IN WORLD EXPORTS (VALUE) OF LIVESTOCK AND LIVESTOCK PRODUCTS

Commodities (1)	Average value of commodity							
	1980-82 (2)	1983-85 (3)	1986-88 (4)	1989-91 (5)	1992-94 (6)	1996-98 (7)	1999-2001 (8)	2002-04 (9)
Live animals	0.14	0.25	0.17	0.09	0.06	0.01	0.02	0.04
Meat and meat preparations	0.36	0.38	0.26	0.24	0.28	0.43	0.58	0.62
Animal fats	#	0.17	#	#	-	0.01	0.06	0.34
Hides and skin	0.01	#	#	0.01	0.01	#	0.01	0.04
Milk equivalent	0.01	0.03	0.02	0.01	0.03	0.04	0.17	0.20
Eggs	0.30	0.05	0.04	0.14	0.30	1.61	1.79	3.00
Hairs and wool	0.04	0.03	0.07	0.04	0.03	0.09	0.05	0.11
Offals	-	-	0.05	0.10	0.02	0.01	0.02	0.04
Livestock and livestock product export	0.17	0.19	0.13	0.12	0.15	0.24	0.35	0.41
Total agricultural export	1.10	1.07	0.90	0.89	0.88	1.23	1.19	1.21
Total merchandise export	0.43	0.48	0.47	0.52	0.59	0.63	0.70	0.80

indicates negligible share.

TABLE 6. INDIA'S SHARE IN WORLD IMPORTS (VALUE) OF LIVESTOCK AND LIVESTOCK PRODUCTS

Commodities (1)	Average value of commodity							
	1980-82 (2)	1983-85 (3)	1986-88 (4)	1989-91 (5)	1992-94 (6)	1996-98 (7)	1999-2001 (8)	2002-04 (9)
Live animals	0.01	0.05	0.10	0.05	0.02	0.01	#	0.01
Meat and meat preparations	#	#	#	#	#	#	#	#
Animal fats	2.84	1.59	0.02	0.02	0.03	0.04	0.07	0.08
Hides and skin	0.02	0.03	0.13	0.40	0.58	0.74	0.99	0.79
Milk equivalent	1.21	0.59	0.44	0.07	0.05	0.03	0.08	0.05
Eggs	#	#	#	#	#	#	#	0.04
Hairs and wool	1.11	1.40	1.58	1.62	2.61	3.58	3.54	5.07
Offals	-	-	-	-	-	#	#	-
Livestock and livestock product import	0.47	0.32	0.29	0.18	0.17	0.23	0.22	0.23
Total agricultural import	0.58	0.75	0.58	0.28	0.40	0.61	0.82	0.85
Total merchandise import	0.74	0.76	0.68	0.62	0.63	0.76	0.82	0.97

indicates negligible share.

India's share in world import of meat and meat preparations, eggs and live animals remained negligible. The share of hides and skin registered remarkable increase since the early nineties and stood at 0.8 per cent in T.E 2004. There has been a sharp decline in India's share in world import of milk products and animal fats as

their shares declined from 1.2 and 2.8 per cent in T.E 1982 to almost negligible level (0.05 and 0.08 per cent) in T.E 2004, respectively. India's share in world hairs and wool import, on the other hand registered a sharp increase from 1 per cent in T.E 1982 to 5 per cent in T.E 2004.

Thus it becomes evident that India has only marginal presence in world livestock trade and hence is not in a position to significantly influence the world market situation either in prices or in supplies. However, given India's high production level of most livestock products, there is potential for India to capture a significant share of world trade in livestock products, once the anomalies associated with the implementation of WTO provisions - especially in regard to export and domestic subsidies - are ironed out and India gears up on the quality front.

Growth Trends in Livestock Sector Trade

The estimated annual compound growth rates of exports of different livestock products are given in Table 7. Exports of animal fats registered the highest growth rates (37 per cent) during the period 1980-2004, followed by eggs (22 per cent), milk and milk products (19 per cent), hides and skin (11 per cent), meat and meat preparations (8 per cent) and hairs and wool (3.5 per cent). Live animals, on the other hand, witnessed negative growth (-10 per cent) during this period. Although animal fats experienced highest export growth rates, it is noteworthy that this growth occurred from a very low base and was mainly on account of a quantum jump in export in the last triennium. The growth rates of other livestock products are robust

TABLE 7. GROWTH RATES IN EXPORTS AND IMPORTS OF LIVESTOCK AND LIVESTOCK FOOD PRODUCTS

Livestock products (1)	Growth rates					
	Exports			Imports		
	1980-1994 (2)	1995-2004 (3)	1980-2004 (4)	1980-1994 (5)	1995-2004 (6)	1980-2004 (7)
Live animals	-5.13**	6.96	-9.87*	9.19	-1.47	-6.26**
Meat and meat preparations	3.42*	8.49*	8.23*	-38.74**	73.43***	3.40
Animal fats	-26.69	69.84*	36.94*	-48.01*	9.89*	-8.85***
Hides and skin	6.16	44.95*	11.28*	42.33*	0.80	23.21*
Milk equivalent	10.25*	30.94*	19.08*	-27.04*	9.22	-12.41*
Eggs	4.98	19.43*	22.24*	-64.92 ^c	132.45*	17.27
Hairs and wool	-0.18	6.74	3.49***	7.38*	1.03	4.95*
Offals	-38.21 ^a	26.04*	0.19 ^b	-	46.67 ^d	-

a - Growth rates are calculated for the period 1987-1994.

b - Growth rates are calculated for the period 1987-2004.

c - Growth rates are calculated for the period 1980-1986.

d - Growth rates are calculated for the period 1996-2001.

** and * Significant at 5 and 1 per cent level of significance.

and present a better picture of the trends in exports during the reference period. A comparison of export growth rates in pre and post-WTO phases revealed that growth of exports of all livestock products accentuated in the post-WTO period. All livestock products registered significant export growth rates post-WTO except live animals and hairs and wool. Animal fats which witnessed negative growth (though non-significant) in pre-WTO phase, registered the highest growth rate (70 per cent) post WTO. However, animal fats export has remained highly volatile and hence the impact of WTO on export of this item should be inferred with caution. Hides and skins and eggs export which witnessed non-significant growth pre-WTO, registered impressive growth rates of 45 and 19 per cent in post-WTO period. Growth rates of exports of milk and milk products and meat and meat preparations almost trebled during post-WTO period.

Among different items of import, hides and skins registered highest growth (23 per cent) during the period 1980-2004, followed by eggs (17 per cent), hairs and wool (5 per cent) and meat and meat preparations (3 per cent). Imports of live animals and milk and milk products showed negative rate of growth. Meat and meat preparations, animal fats, milk and milk products and eggs, which witnessed negative growth rate in pre-WTO period, registered positive growth during post-WTO phase. This change in import growth rates was most striking in the case of eggs, followed by meat and meat preparations. The growth rates of import of hides and skins decreased drastically in post-WTO phase. This may be attributed to the various measures taken to enhance the domestic availability of raw hides and skins.

Variability in Livestock Sector Trade

Table 8 reveals the Coefficient of Variation of exports and imports of different livestock products for two sub-periods, i.e. pre and post-WTO periods. Animal fats export exhibited the maximum variability among all livestock products in both the sub-periods. Meat and meat preparations, followed by live animal exports on the other hand exhibited the lowest variability. Hairs and wool and offals exports registered high variations in the pre-WTO period, but their fluctuations declined in the period after the inception of WTO. The export variations of eggs also declined post-WTO. There were not much changes in variability of exports of meat and meat preparations and milk and milk products in the two sub-periods.

In case of imports, animal fats and meat and meat preparations registered maximum variability in pre-WTO phase. However, the variability in imports of animal fats registered a sharp decline post-WTO. Hides and skins import also registered a sharp decline in variability in WTO regime. Hairs and wool imports registered the lowest variability in both the sub-periods. For meat and meat preparations and milk and mil products, the variations in import declined in post-WTO phase, while it increased marginally for egg export.

TABLE 8. VARIABILITY IN EXPORTS AND IMPORTS OF LIVESTOCK AND LIVESTOCK FOOD PRODUCTS

Livestock products (1)	<i>(per cent)</i> Coefficient of Variation					
	Exports			Imports		
	1980-1994 (2)	1995-2004 (3)	1980-2004 (4)	1980-1994 (5)	1995-2004 (6)	1980-2004 (7)
Live animals	41.10	88.24	69.70	81.86	40.86	110.48
Meat and meat preparations	24.24	29.28	66.98	182.79	96.94	135.76
Animal fats	342.68	233.55	295.12	182.37	32.33	233.10
Hides and skin	88.44	124.00	159.88	107.16	12.50	77.48
Milk equivalent	92.80	91.03	161.47	93.93	76.41	119.10
Eggs	96.30	56.40	132.63	136.46	158.80	249.50
Hairs and wool	106.73	45.29	79.03	32.44	19.20	36.97
Offals	172.68	85.14	135.51	-	137.56	245.12

Impact of Export Growth on Variability

Table 7 had revealed that most of the livestock products registered significantly higher export growth rates in post-WTO period compared to pre-WTO phase. One issue that requires attention is whether these higher growth rates have been associated with higher variability in exports of livestock products. To address the issue, the growth rates of eight livestock products were regressed on their coefficient of variations. A statistically significant positive regression coefficient would imply that the growth rate in export of livestock products in general increased the variability in exports and vice versa.

The results of the above analysis are presented in Table 9. It can be seen that the regression coefficients were statistically significant for both the periods, but was negative in pre-WTO period while being positive in the post-WTO period. This implies that those livestock products which showed higher export growth rates in the post-WTO period also exhibited increased variability. In contrast, the negative coefficient of growth rates in the pre-WTO period indicates that increased export has led to reduced variability in export of livestock products.

TABLE 9. IMPACT OF GROWTH RATES ON VARIABILITY IN EXPORTS OF LIVESTOCK PRODUCTS

Independent variable: Growth rates of different livestock products (1)	Dependent variable: Coefficient of variation of export of livestock and livestock products		
	1980-94 (2)	1995-2004 (2)	1980-2004 (3)
Reg. Coeff.	-3.980**	2.688*	3.655*
R ²	0.478	0.859	0.690

** and * Significant at 5 and 1 per cent level of significance.

Comparative Advantage of India's Livestock Products Export

The values of export performance ratios (EPR) reveal that India enjoyed comparative advantage in the export of meat and meat preparations and eggs during the period 1980-2004 (Table 10). However, while the EPR in case of meat and meat preparations has consistently declined since the early eighties (from 2.07 in 1980-82 to 1.5 in 2002-04), that for eggs has shown a remarkable increase since early nineties and reached its peak (7) in T.E 2004. This indicates that eggs export offers India significant comparative advantage in regard to earning valuable foreign exchange. Although the EPR of live animals export was more than unity till T.E 1988, India lost the comparative advantage in this item thereafter, more so in the post-WTO phase. India has all along lacked comparative advantage in the exports of hides and skin, animal fats, hairs and wool, offals and milk and milk products. However, the EPR's of animal fats and milk and milk products in the T.E 2004 registered a sharp rise than the previous triennium, which indicates that India has the potential to have comparative advantage in world export of these two commodities.

TABLE 10. EXPORT PERFORMANCE RATIO

Commodities (1)	Average value of commodity							
	1980-82 (2)	1983-85 (3)	1986-88 (4)	1989-91 (5)	1992-94 (6)	1996-98 (7)	1999-2001 (8)	2002-04 (9)
Live animals	0.83	1.32	1.32	0.72	0.43	0.05	0.06	0.09
Meat and meat preparations	2.07	1.98	1.95	1.95	1.89	1.81	1.64	1.50
Animal fats	#	0.88	0.01	#	0	0.07	0.18	0.83
Hides and skin	0.05	0.01	0.003	0.05	0.06	0.01	0.03	0.11
Milk equivalent	0.06	0.10	0.11	0.10	0.18	0.15	0.48	0.47
Eggs	1.71	0.28	0.31	1.19	2.00	6.67	4.86	7.36
Hairs and wool	0.21	0.18	0.54	0.33	0.19	0.36	0.15	0.26
Offals	0	0	0.38	0.79	0.13	0.05	0.05	0.11

indicates negligible values of EPR.

Export Function

To determine the factors affecting the values of livestock products export from India, a multiple linear type regression model was fitted to the data of the last eleven years (1994-2004) and the results of the analysis are presented in Table 11.

The three independent variables explained maximum variations in the case of bovine meat export (0.64 to 0.71 per cent). The explanatory variables also accounted for relatively more variations in the export of pig meat (0.41 to 0.69 per cent) and eggs (0.44 to 0.48 per cent). Compared to these products, the variations explained by the independent variables were relatively less for exports of chicken meat (0.12 to 0.45 per cent) and skimmed milk (0.17 to 0.18 per cent).

TABLE 11. REGRESSION COEFFICIENTS OF EXPORT FUNCTION FOR LIVESTOCK PRODUCTS

Livestock products (1)	International prices (2)	Domestic price (3)	World prices of grains (Maize) (4)	R ² (5)	'F' value (6)
Bovine meat	-22.13	-836.37**	1175.91	0.64	4.13*
	151.81**	-807.55**	-13.65	0.71	5.70*
	83.47***	-1015.76*	1330.58	0.71	5.71*
Chicken meat	-5.49***	-0.65	69.77**	0.45	1.94
	-0.08	-1.29	57.65***	0.26	0.83
	-5.09	0.51	0.95	0.12	0.31
Eggs	39.82	-92.00	421.73	0.44	1.87
	14.23***	-141.75***	-2.92**	0.44	1.83
	-10.94	-80.92	5.73	0.48	2.16***
Skimmed milk	25.81	-84.48	-69.18	0.17	0.41
	25.64	51.39	-0.92	0.18	0.43
	25.98	-17.70	-7.21	0.17	0.40
Pig meat	0.79***	-4.05	-3.92	0.41	1.59
	0.58***	-4.53	0.34*	0.69	5.18**
	0.49	0.66	-0.77***	0.53	2.61***

***, ** and * Significant at 10, 5 and 1 per cent level of significance.

The values of coefficients of international prices were negative for chicken meat export, the coefficient being significant for one equation. This inverse relationship between world prices and India's export of chicken meat implies that we are not in a position to reap the benefits of increase in world prices of chicken meat, probably due to lack of price-competitiveness. The estimated coefficients of world prices were observed to be significant and positive in two equations of bovine meat export and one equation of eggs export function. This indicates that India has the potential to take advantage of increase in world prices by enhancing the export of these two commodities. Positive relationship between India's export and world prices were also observed for skimmed milk export. The coefficients were however, not significant and hence cannot lead to firm conclusions. Nevertheless, these results provide some clues about the prospect of export of India's dairy products that if trade related distortions are removed due to effective WTO regulations, prices of dairy products will increase which in turn may enhance the export of dairy products from India.

The negative relationship between the producer prices and the exports of all livestock products is quite acceptable in the sense that increase in domestic price of livestock products would reduce their exports.

The price of feed grains did not have any significant effect on the exports of bovine meat as the estimated values of coefficients were non-significant. This is expected as, grain is not generally fed to cattle to enhance their meat productivity, but given to milch cattle to enhance milk production. The analysis revealed that Indian export of milk is inversely related with world prices of feed grains. Although, the coefficients were non-significant, but still the results point towards potential vulnerability of Indian export as a result of increased world feed grain prices. Although, the poultry sector is heavily dependent upon grains, the positive and non-significant coefficients of world prices of feed grains reveal that increase in world prices of feed grains may not affect India's export prospects of poultry products. This

might be due to efforts made by the commercial poultry sector in the country to ensure domestic availability of feed grains.

IV

CONCLUSIONS

The following conclusions can be drawn from the analysis:

1. Meat and meat preparations have been the major source of export earnings among all livestock products. However, in recent past, the shares of eggs and milk and milk products in total livestock sector export have gone up considerably.
2. Hairs and wool constituted the major item of import, followed by hides and skins.
3. India experienced a drastic turnaround in the post-WTO phase when her status changed from being a net importer of livestock products to a surplus nation with high export potential. At present India is a net exporter of all livestock products, except hides and skins and hairs and wool. This is due to state policy of encouraging the export of processed leather and wool products rather than their primary equivalents.
4. The share of livestock sector to total agricultural export - although small – has shown increasing trend in the recent past, which implies better growth in export earnings from livestock products than those from other agricultural commodities. Furthermore, livestock sector's share in agricultural imports has gone down drastically in the last two decades, pointing towards India's potential in achieving self-sufficiency in meeting domestic demand.
5. India has all along been a minor player in international trade of livestock products, which is not in congruence with the larger share of India's output to that of the world.
6. WTO seems to have favourably impacted on trade performance of livestock sector, as all livestock products registered higher growth rates post-WTO, compared to the pre-WTO period. However, livestock products which witnessed higher growth rates in this period, also exhibited increased variability in exports.
7. India enjoys comparative advantage in meat and meat preparations and eggs export. Although, this comparative advantage declined over time for meat and meat preparations export, that for eggs registered a substantially increasing trend in the early nineties.
8. India is not in a position to take advantage of increase in world prices of chicken meat, probably due to lack of price-competitiveness. On the other hand, India has the potential to take advantage of increase in world prices by enhancing the export of bovine meat, eggs and milk products. India's dairy sector is potentially more vulnerable to increase in world feed grain prices as compared to her poultry sector.

V

POLICY SUGGESTIONS

The rates of growth in the values of livestock products exports were significantly higher in post-WTO period, indicating that the WTO regime has provided favourable environment for enhancing India's potential in livestock sector trade. However, there is scope to reduce the variability in exports of livestock products from India. India has got a comparative advantage in international trade in meat and meat preparations and eggs. However, the real challenge for Indian meat export would be from SPS and animals welfare issues. In this regard, harmonisation of SPS measures at a level below the international standards would bring in benefits to developing countries like India. As for setting international standards under SPS agreements, the WTO and international standard setting organisations need to facilitate developing country participation by modifying their procedures and providing technical, scientific and legal assistance. India is not in a position to take advantage of increase in world prices of some livestock products like chicken meat, probably due to lack of price-competitiveness on account of processing inefficiencies. Furthermore, India's main competitors, viz., EU, U.S.A. and Australia have got higher plant efficiency and produce products of superior quality. To make livestock products like chicken meat internationally competitive, domestic processing efficiency has to be improved substantially. As India's dairy sector has shown potential vulnerability towards increase in world feed grains prices, there is need to make available the requisite feed grains domestically.

The livestock sector remains the most highly regulated and distorted sector in the developed countries as the Uruguay Round Agreement (URA) has not yet led to significant changes in the livestock policies, which still remain protective. If WTO commitments on subsidy reduction are sincerely fulfilled, world prices of livestock products will increase which would in turn improve the export prospects of livestock products like dairy products from India. The extent to which India grabs the opportunities opened up after URA, depends upon how successfully implementation of the provisions of WTO agreements are carried out and for this India has to take the lead in WTO trade negotiations. As India at present does not provide any subsidies to livestock sector, India's commitments to Agreement on Agriculture, will not require change in her current policies. India can negotiate strongly in the WTO with the developed countries to reduce or dismantle their support to the livestock sector to gain access in their markets.

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