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Export of milk and milk products from India- Performance, competitiveness and determinants

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Abstract

In India, the share of the livestock sector to agricultural Gross Domestic products (AgGDP) exhibited a consistently rising trend in three decades. The impressive growth trends in the livestock subsector were attributed to effective liberalization policy that was initiated in early 1990's. The liberalisation of Indian economy eased export trade by removing quantitative restrictions on trade, reduced export taxes, direct participation of the private sector to invest in marketing and organising of farmers into cooperatives. The performance of India's milk and milk products in the world's livestock export value showed an increasing trend. The total foreign earnings from export of milk and milk products increased from an average of US\$1.41 thousand in TE 1992 to US\$ 6.38 thousand in TE 1994. The post WTO period experienced a huge increase in the foreign earnings from export of milk and milk products as export revenue rose consistently from US\$ 5.16 thousand to US\$ 130.30 thousand in TE 2014. During the post – WTO period, the export of all dairy products increased in absolute and percentage terms however, skimmed milk powder registered higher share followed by whole milk powder, cheese, whey dried, butter and whole fresh cow milk. Milk exports were significantly influenced by the exchange rate, GDP of importing country and institutional credit while world milk production had negative impact. In milk and milk products, India exhibited little export competitiveness for dry milk exports. However, the NPC's for butter were above unity during pre and post WTO period indicating that India lacked a competitive advantage in export of butter. To strengthen export supply capacity and competitiveness, India needs to improve value addition to its livestock exports by subsidizing its exports through increased public and private expenditure on processing plants, cold chains and refrigerated trucks.. Also strict adherence with various sanitary and phyto-sanitary requirements should be followed to increase market access to developed countries where India could earn high value per quantity of exports.

Keywords: competitiveness, exports, growth, livestock, milk products

Introduction

Livestock sector in India contributes about 4.1 percent to the Gross Domestic Product and 27.4 percent (2011-12 prices) to the agricultural Gross Domestic Product in 2017-18. Over the last two decades livestock sector has grown at an annual rate of 5.6 percent, which is higher than the growth in the agricultural sector (3.3 percent). This suggests that livestock emerges as an engine of agricultural growth. It is also considered as one of the potential sector for export earnings. Livestock sector plays multi-faceted roles in socio-economic development. The importance of livestock goes beyond its food production function (Birthal *et al.*, 2002) [2]. It provides draught power and organic manure to crop sector, and hides, skins, bones, blood and fibers to the industrial sector. Livestock sector also makes significant contributions towards conservation of environment. Livestock sector supplements income from crop production and other sources, and absorbs income shocks due to crop failure. It generates a continuous stream of income and employment, reducing seasonality in livelihood patterns particularly of the poor. The major share of livestock output comes from milk group, which has contributed 62.2 percent in the total value of livestock sector in 1980-81. This share has increased to the extent of 66.22 percent in 2017-18 due to various policy interventions for development of dairy sector in the country. Milk output in India increased from 74 million tonnes in 1998-99 to 187.75 million tonnes in 2018-19, asserting India as the largest milk producer in the world.

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Milk production registered an annual growth of 6.5 percent in the year 2018-19. Milk production is continuously increasing since the initiation of Operation Flood in the early seventies on account of improvement in productivity and creation of market linkages between rural producers and urban consumers through the network of dairy cooperatives. As far as global trade is concerned, India is a minor contributor to world livestock exports, even though it is one of the top producers of different livestock products in the world. The globalization of dairy industry has led to paradigm shift of international dairy markets from being supply driven to demand driven. The global demand for dairy products has been rising and this presented an opportunity for India to increase its exports, given the comparative advantage in livestock output resulting from relatively lower labour costs and diverse agro-climatic conditions. In the light of enormous opportunities and challenges facing the dairy sector in India, the present study was carried out with the following specific objectives:

- (i) To examine the region-wise performance of milk output in India
- (ii) To analyze the factors affecting milk output at national level
- (iii) To examine the performance, determinants and competitiveness in the export of milk and milk products from India

Data and Methodology

The study was based on the secondary data compiled from

various published sources. Data on milk output, livestock population and yield, veterinary institutions and milk processing were compiled from the Basic Animal Husbandry Statistics published by the Department of Animal Husbandry, Dairying and Fisheries of the Ministry of Agriculture, and Farmers' Welfare, Government of India. Time series data on export and value of the major milk and milk products from India were collected from various sources such Food and Agriculture Organization database of United Nations and United Nations Comtrade database etc. To account for the impact of livestock liberalization policy reforms initiated by Government of India in 1991, the study period (1980-81 to 2013-14) was bifurcated into the pre-WTO (1980-81 to 1994-95) and post-WTO (1995-96 to 2013-14) period. For the purpose of fulfilling the specific objectives of the study, data were analyzed using Tabular analysis, Growth analysis, Nominal Protection coefficients and Multiple linear regression analysis.

Results and Discussion

Performance of milk output in India

The region wise and breed-wise contribution of milk output for pre-WTO (1980-81 to 1994-95), post-WTO (1995-96 to 2013-14) and overall period (1980-81 to 2013-14) was analyzed and is presented in Table 1.

Table 1: Region-wise average bovine milk output in India: 1980-2014 (Thousand Tonnes)

Regions	Indigenous			Crossbred			Buffaloes			Total Milk		
	Pre-WTO period	Post-WTO period	Overall	Pre-WTO period	Post-WTO period	Overall	Pre-WTO period	Post-WTO period	Overall	Pre-WTO period	Post-WTO period	Overall
Northern	3500 (19.9)	4300 (19.8)	3945 (19.9)	3460 (28.6)	9880 (23.9)	6670 (25.0)	19500 (40.4)	28781.8 (44.9)	24610 (43.2)	26855.6 (33.8)	42072.7 (34.1)	35230 (34.0)
Southern	3722.2 (21.1)	3172.7 (14.6)	3425 (17.3)	4900 (40.6)	17370 (42.1)	11140 (41.8)	9644.4 (19.9)	10972.7 (17.1)	10380 (18.2)	18822.2 (23.7)	29954.5 (24.3)	24945 (24.1)
Western	6511.1 (36.9)	8909.1 (41.1)	7830 (39.5)	2160 (17.9)	8250 (20.0)	5210 (19.5)	17044.4 (35.3)	20745.5 (32.4)	19085 (33.5)	25955.6 (32.7)	37163.6 (30.1)	32120 (31.0)
Eastern	3855.5 (21.9)	5263.6 (24.3)	4630 (23.3)	1560 (12.9)	5720 (13.8)	7280 (13.7)	2066.7 (4.3)	3590.9 (5.6)	2905 (5.1)	7655.6 (9.7)	14054.5 (11.4)	11180 (10.8)
India	17611.1 (100)	21663.6 (100)	19840 (100)	12080 (100)	41240 (100)	21720 (100)	48266.7 (100)	64118.2 (100)	56985 (100)	79300 (100)	123263.6 (100)	103480 (100)

Note: Figures in parentheses are percentage to total.

Pre-WTO period (1980-81 to 1994-94); Post-WTO (1995-96 to 2013-14); Overall period (1980-81 to 2013-14)

Composition of milk output

During the overall period ((1980-81 to 2013-14), about 55 percent of the total milk output in India was produced by buffaloes, 36 percent by crossbred cattle while indigenous cattle contributed only 19 percent. At the all India level, the average milk output increased from 79,300 thousand tones during pre-WTO period (1980-81 to 1994-95) to 123263.6 thousand tones during post-WTO period (1995-96 to 2013-14). The impressive increase in milk output between the two periods was also observed at regional level, as all regions exhibited increased milk production during post-WTO period. The northern region contributed the highest share to total milk output in India while the eastern region contributed the least share during the overall period. The milk share of the northern region increased from 33.8 percent during pre WTO period to 34.1 percent in post-WTO period while in the eastern region the milk share increased from 9.7 percent to 11.4 percent during the same period. The high concentration of buffalo population and increased crop residue availability for feed resources present in the irrigated northern region of India

favours buffalo rearing hence leads to greater milk output. The low concentration of buffaloes in the eastern region could be due to high humidity caused by high rainfall and the less preference of the male buffaloes for agricultural operations in the rice based cropping system of the eastern region.

The contribution of the western region to total milk production was higher than that of the southern region in absolute and percentage terms. In absolute terms, average milk output from western region increased from 25,955.6 thousand tones during pre-WTO period (1980-81 to 1994-95) to 37163.6 thousand tones during post-WTO period (1995-96 to 2013-14) while average milk output from southern increased from 18,822.2 to 29,954.5 thousand tonnes during the same period. Similar observations were made by Selvakumar (1996)^[5] for Tamil Nadu state and BIRTHAL *et al.* (2006)^[2] for India.

(a) Share of Indigenous milk output

The contribution of indigenous cattle to total milk output in absolute terms was lower than that of crossbred cattle and

buffaloes during the overall period. At the all India level, the average indigenous milk output for the overall period (1980-81 to 2013-14) was 19,840 thousand tonnes against 21,720 and 56,985 thousand tones for crossbred cattle and buffaloes respectively. All regions experienced an upsurge in indigenous cattle milk output during post –WTO period (1996-96 to 2013-14) in both absolute and percentage terms. The favorable share of indigenous milk output could have resulted from effective implementation of breed improvement programme in cattle to increase the productivity of indigenous cattle. The western region registered the highest contribution to indigenous milk output while the Southern region registered the lowest share during the overall period. The share of indigenous cattle milk output in the western region increased from 36.9 percent during the pre-WTO period to 41.1 percent in the post –WTO period while in the southern region it plummeted from 21.1 to 14.6 during the same period. The share of the indigenous cattle milk output in the eastern region rose from 21.9 to 24.3 percent. The impressive share of indigenous cattle milk in western region could have emanated from several factors namely, a high indigenous cattle population in the region kept mainly for draught power, lower recurrent operational costs of indigenous cattle and rapid development of dairy cooperatives in the western region.

(b) Share of crossbred milk output

The contribution of crossbred cattle milk output was lower than that of buffalo milk at all India level during the overall period (Table 1) During the overall period (1980-81 to 2013-14), the average crossbred milk output was 21,720 thousand tonnes however, crossbred milk output increased rapidly during post WTO period (1995-96 to 2013-14) across all the regions. The impressive progress in crossbred cattle milk output was due to improvement in access to markets by dairy farmers through dairy cooperatives. The southern region followed by the northern region registered the highest and second highest shares of crossbred cattle milk output while the eastern region recorded the lowest share to crossbred cattle milk output. The share of crossbred cattle milk production in the southern region increased from 40.6 percent during pre WTO period to 42.1 percent during post WTO period whereas in the eastern region, it marginally increased from 12.9 to 13.8 percent during pre WTO and post WTO periods respectively. The share of crossbred cattle milk output in the northern region plunged from 28.6 percent during pre-WTO period to 23.9 percent during post WTO period. The observed decline in crossbred milk production could have resulted from limited adoption of crossbreds in some states largely due to (i) extreme climatic conditions mainly temperature, (ii) high capital investments to acquire the crossbred cattle and (iii) greater susceptibility to diseases of crossbreds.

(c) Share of buffalo milk output

Milk output in India during the overall period was found to be largely dominated by buffalo milk (Table 1) At all India level, the average milk output increased from 48,266.7 thousand tones during pre-WTO period (1980-81 to 1994-95) to 64,118.2 thousand tones in post –WTO period (1995-96 to 2013-14). The observed trend in the share of buffalo milk results from the farmers' desire across regions of India to keep buffaloes because of their high milk productivity and higher price reward from buffalo milk due to its greater consumer preference. Also buffalo have great capacity in transforming low quality feeds into milk resulting into high

milk output per animal (Vaidyanathan, 1978) [6]

The northern region contributed the largest share to buffalo milk while the eastern region contributed least share to buffalo milk output. The share of buffalo milk in northern region rose from 40.4 percent during pre-WTO period to 44.9 percent during post WTO period while in eastern region it dismally increased from 4.28 to 5.60 percent during the same period. The poor composition of buffalo milk output in the eastern region is indicative of the inadequacy if fodder resources in that region to enable profitable buffalo rearing. The western region recorded the second highest share to buffalo milk output in India however, between pre-WTO period and post WTO period, the share of buffalo milk plunged slightly from 35.3 to 32.4 percent. Just like indigenous and crossbred cattle milk output, buffalo milk production exhibited rapid increase during post- WTO period.

Determinants of milk output in India

A perusal of Table 2 reveals that milk output was positively and significantly influenced by number of artificial insemination, number of veterinary institutions, number of dairy cooperatives, and gross irrigated area under food grains. A unit increase in the number of artificial insemination would increase milk output by 0.25 tonnes. The observation corroborates the strong influence of crossbreds in improving milk yield in India. The number of crossbred cows has increased impressively at an annual rate of 6.70 percent during the period 1993-94 to 2010-12 at the all India level. The findings are similar to that of Birthal *et al.* (1999) [2] and Kumar *et al.* (2013) [3]. A unit increase in gross irrigated area under food grain would significantly increase milk output by 2.02 tonnes. The coefficient pertaining to the variable number of dairy cooperatives was found significant at 5 percent indicating the influence of improving milk output through providing better facilities for quality storage, marketing, processing and related services to the dairy farmers. The impact of number of veterinary institution on milk output was also found to be positive and significant. On the other hand, the influence of number of disease attack on milk output was negative but non-significant indicating that concerted efforts should be undertaken to enhance preventive measures to reduce disease attacks.

Table 2: Factors determining milk output in India

Variables	Parameter Estimate	t-statistics	p-value
Intercept	4.09(1.16)	3.53	0.01
Number of artificial inseminations(000s)	0.25**(0.06)	3.81	0.01
Number of disease attack (000s)	-0.01(0.02)	0.55	0.59
Total institutional agricultural credit (Rs. Crores)	0.01(0.01)	0.90	0.39
Number of veterinary institutions(000s)	0.34*(0.16)	2.18	0.06
Number of dairy cooperatives(000s)	0.24*(0.11)	2.15	0.06
Gross irrigated area under food grains(000 ha)	2.02*(0.98)	2.06	0.07
R ² (%)	78.6		

Note: ***, **, * Significant at 1, 5 and 10 percent respectively. Figures in parentheses indicate standard errors.

Export of milk and milk products

The product wise share of dairy exports from India in 2014 revealed that skimmed powder (61%) dominated dairy

exports followed by whole milk powder (7%), cheese (4%), whey (3%) and butter (2%). The share of the skimmed milk powder (SMP) depicted an increasing trend while those of whole milk powder (WMP) exhibited a declining trend during the study period. During the pre-WTO period (TE 1982 to TE 1994) the export share of SMP rapidly increased from 4.41 percent; representing 0.09 thousand tonnes in TE 1982 to 74.3 percent representing 2.63 thousand tonnes in TE 1994. On the other hand, the export share of whole milk powder (WMP) dwindled from 54.2 percent in TE 1982 to 20.1 percent in TE 1994. The contribution of other milk products such as whey, butter and cheese in the total milk exports was marginal during the pre-WTO period (Table 3).

During the post-WTO period (TE 1997 to TE 2014) the export of all dairy products increased in both absolute and percentage terms however, skimmed milk powder registered

higher share than whole milk powder. The export share of SMP increased from 73.8 percent representing 1.65 thousand tonnes in TE 1997, peaked at 81.6 percent in TE 2003 before declining to 61.0 percent in TE 2014 while those of whole milk powder increased marginally from 0.29 thousand representing 13.2 percent in TE 1997 to 2.62 thousand tonnes representing 6.68 percent in TE 2014.

The export of cheese was found to be higher than that of butter in both percentage and absolute terms during the post WTO period (TE 1997 to TE 2014). Cheese exports increased from 0.03 thousand tonnes in TE 1982 representing 1.78 percent to 1.63 thousand tonnes representing 4.17 percent by TE 2014 while butter exports increased from 0.03 to 0.72 thousand tonnes during the post WTO period (TE 1997 to TE 2014). The export of whey and other dairy products exhibited marginal but increasing shares in post WTO period.

Table 3: Average annual quantity and composition of milk exports, 1980-2014

TE	Whole Milk Powder (WMP)	Skimmed Milk Powder (SMP)	Butter	Cheese	Whole Fresh Cow Milk	Whey Dried	Others'	Total Milk and Milk Preparations
Pre-WTO								
1982	0.11 (42.3)	0.09 (34.6)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.06 (23.1)	0.26 (100)
1985	0.10 (31.3)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.10 (31.3)	0.00 (0.00)	0.11 (34.4)	0.32 (100)
1988	0.24 (40.6)	0.18 (30.5)	0.00 (0.00)	0.06 (10.7)	0.06 (10.7)	0.00 (0.00)	0.05 (8.47)	0.59 (100)
1991	0.53 (50.9)	0.39 (37.9)	0.01 (0.96)	0.01 (0.96)	0.02 (1.92)	0.00 (0.00)	0.08 (7.69)	1.04 (100)
1994	0.71 (20.1)	2.63 (74.3)	0.00 (0.00)	0.00 (0.00)	0.09 (2.65)	0.00 (0.00)	0.09 (2.82)	3.54 (100)
Pre-WTO Average (1980-1994)	0.34	0.66	0.00	0.01	0.06	0.00	0.08	1.14
Post-WTO								
1997	0.29 (13.2)	1.65 (73.8)	0.03 (1.21)	0.03 (1.78)	0.05 (2.36)	0.10 (4.63)	0.07 (3.02)	2.23 (100)
2000	0.72 (13.4)	3.95 (73.9)	0.01 (0.20)	0.04 (0.68)	0.25 (4.70)	0.09 (1.71)	0.29 (5.41)	5.34 (100)
2003	1.43 (9.61)	12.14 (81.6)	0.12 (0.72)	0.30 (2.03)	0.36 (2.43)	0.08 (0.59)	0.45 (3.02)	14.90 (100)
2006	7.49 (15.1)	35.90 (72.4)	0.29 (0.60)	0.64 (1.28)	0.40 (0.81)	1.46 (2.95)	3.38 (6.86)	49.50 (100)
2009	4.15 (8.81)	29.30 (62.1)	1.20 (2.55)	1.35 (2.87)	0.34 (0.71)	2.12 (4.50)	8.71 (18.5)	47.10 (100)
2012	1.08 (3.47)	18.50 (59.4)	0.25 (0.79)	1.92 (6.15)	0.16 (0.52)	0.55 (1.78)	8.69 (27.89)	31.20 (100)
2014	2.62 (6.68)	23.90 (61.0)	0.72 (1.85)	1.63 (4.17)	0.25 (0.64)	1.34 (3.41)	8.69 (22.2)	39.20 (100)
Post-WTO Average(1997-2014)	2.54	17.91	0.37	0.84	0.26	0.82	4.33	27.07

Average earnings from export of milk and milk products

The export revenue from the export of dairy products is presented in Table 4. The study findings revealed that the total dairy export revenue rose from an average US\$ 14.10 thousand in TE 1982 to 63.70 thousand by TE 1994 and the share of skimmed milk powder (SMP) was higher than whole milk powder (WMP) during the study period (TE 1982 to TE 2014). During the pre-WTO period (TE 1982 to TE 1994), the export share of whole milk powder (WMP) and butter revealed a decreasing trend while skimmed milk powder (SMP) exhibited a rising trend. In absolute terms, the export revenue from whole milk powder increased from US\$ 3.40 thousand in TE 1982 to 10.50 thousand in TE 1994 while export earnings from butter rose from US\$ 9.90 thousand to 16.00 thousand during the same period.

However, the share of whole milk powder in total dairy revenue declined from 23.7 percent in TE 1982 to 16.7 percent in TE 1994 while those of butter declined from 70.1

percent to 26.1 percent during the same period. On the other hand, the export revenue from skimmed milk powder registered impressive growth in percentage and absolute terms. The SMP export revenue rose from US\$ 0.23 thousand in TE 1982 representing 1.65 percent to 35.3 thousand in TE 2014 contributing 55.2 percent of the total dairy products revenue. The processed cheese products gradually improved its share from whole fresh cow milk and whey were meager during the pre-WTO period.

The post-WTO period registered tremendous increase in the export earnings from all dairy products. The total dairy export revenue from an average of US\$ 51.60 thousand in TE 1997 peaked at 1,725.30 thousand in 2009 before slumping consistently to 692.30 thousand by TE 2014. Among the dairy exports, skimmed milk powder (SMP) dominated dairy export revenue, followed by cheese, butter, whole milk powder and whole fresh cow milk. The export revenue from skimmed milk powder rose from US\$ 27.8 thousand in TE 1997,

peaked at 944.00 thousand in TE 2009 but declined to 485.00 thousand in TE 2014 while that of whole milk powder (WMP) increased from US\$ 5.20 thousand, peaked at 167.00 thousand in TE 2007 and fell to 26.90 thousand by TE 2014. On the other hand, cheese revenue expanded rapidly from

US\$1.10 thousand in TE 1997 to 105.0 thousand in TE 2014 while export earnings from butter grew significantly from US\$ 15.40 thousand to 414.0 thousand, before slumping to 30.70 thousand in TE 2014.

Table 4: Average annual earnings from export of milk and milk products from India, 1980-2014 (Thousand US dollars)

TE	Whole Milk Powder (WMP)	Skimmed Milk Powder (SMP)	Butter	Cheese	Whole Fresh Cow Milk	Whey Dried	Others'	Total Milk and Milk Preparations
Pre-WTO								
1982	3.40 (23.7)	0.23 (1.65)	9.90 (70.1)	0.00 (0.00)	0.00 (0.01)	0.00 (0.00)	0.63 (4.49)	14.10 (100)
1985	0.20 (0.15)	0.00 (0.00)	16.30 (75.8)	0.06 (0.29)	0.00 (0.00)	0.05 (0.25)	1.90 (8.92)	21.50 (100)
1988	5.60 (22.9)	4.60 (18.7)	12.70 (52.1)	0.50 (2.11)	0.01 (0.00)	0.00 (0.00)	1.04 (4.29)	24.40 (100)
1991	8.70 (35.4)	5.80 (23.9)	9.20 (37.7)	0.30 (1.08)	0.00 (0.00)	0.00 (0.00)	0.50 (1.87)	24.50 (100)
1994	10.50 (16.4)	35.30 (55.2)	16.60 (26.1)	0.08 (0.12)	0.00 (0.00)	0.00 (0.00)	1.40 (2.23)	63.80 (100)
Pre-WTO Average (1980-1994)	6.28	9.19	12.94	0.19	0.00	0.01	1.09	29.66
Post-WTO								
1997	5.20 (10.1)	27.80 (54.0)	15.40 (29.8)	1.10 (2.18)	0.00 (0.00)	0.10 (2.12)	0.90 (1.72)	51.60 (100)
2000	12.30 (9.66)	65.20 (51.2)	40.20 (31.6)	1.30 (1.04)	0.00 (0.00)	0.95 (0.75)	7.40 (5.81)	127.40 (100)
2003	26.50 (8.98)	192.00 (65.2)	53.50 (18.1)	8.30 (2.79)	0.00 (0.00)	0.98 (0.33)	13.40 (4.53)	294.80 (100)
2006	167.00 (15.3)	717.00 (65.7)	127.00 (11.6)	22.70 (2.09)	10.50 (0.97)	22.00 (2.01)	21.80 (1.99)	1091.40 (100)
2009	156.00 (9.02)	944.00 (54.7)	383.00 (22.2)	125.00 (7.27)	39.70 (2.29)	43.10 (2.50)	32.80 (1.89)	1725.30 (100)
2012	38.70 (3.33)	536.00 (46.1)	414.00 (35.7)	107.00 (9.27)	42.20 (3.63)	11.50 (0.99)	9.60 (0.82)	1160.50 (100)
2014	26.90 (4.65)	485.00 (83.9)	30.70 (0.53)	105.00 (1.81)	42.50 (0.73)	1.00 (0.02)	0.50 (0.01)	692.30 (100)
Post-WTO Average (1997-2014)	61.80	423.90	152.00	52.90	19.30	11.50	12.30	734.80

Growth in export of milk and milk products

The growth trends in the export of milk and milk products were analyzed on both value and quantity terms for a period from 1980 to 2014 and are presented in Table 5. The growth trends were studied for the pre-WTO (1980-81 to 1994-94) and post -WTO (1995-96 to 2013-14) and overall period (1980-81 to 2013-14). All milk products registered double digit growth rates during the study period, the growth of livestock exports were have accentuated considerably during the post WTO period. The export growth of dairy products

increased from 16.10 percent in pre-WTO period to 20.30 percent in post -WTO period. The growth in the export value of total milk products was impressive during the study period (19.50 %) however; the highest growth for all dairy products was recorded during post WTO. During the overall period, cheese and skimmed milk powder (SMP) registered the highest growth of 33.20 percent and 28.00 percent respectively while whole milk condensed (10.90%) registered the lowest.

Table 5: Growth of export quantity and value of milk and milk products from India (Percent per annum)

Milk and milk products	Pre-WTO period	Post-WTO period	Overall	Pre-WTO period	Post-WTO period	Overall
	Export quantity			Export value		
(i) Whole milk powder	16.60*	15.30*	14.40*	10.00*	25.50*	14.80*
(ii) Skimmed milk powder	16.70*	19.50*	24.90*	38.90*	28.30*	28.00*
(iii) Butter	17.60*	25.70*	16.10*	1.51 ^{NS}	27.20*	13.90*
(iv) Cheese	-47.30*	43.90*	29.70*	-3.71 ^{NS}	44.50*	33.20*
(v) Whole fresh cow milk	-28.50*	9.17 ^{NS}	-10.90*	-9.84*	7.86 ^{NS}	10.90*
Total Milk Products	16.10*	20.30*	19.90*	11.4*	28.60*	19.50*

Pre -WTO period (1980-81 to 1994-94); Post -WTO (1995-96 to 2013-14); Overall period (1980-81 to 2013-14).

*, Significant at 5 percent level; NS-non significant

Export competitiveness of milk and milk products

The export competitiveness of India's dairy products was analyzed by computation of Nominal Protection Coefficients (NPC's) (Kumar 2010, Rakotoarisoa and Gulati 2006) ^[3] The values of NPC for different dairy products for the period

1980-2014 are presented in Table 6. During the pre-WTO period, the NPC's for dairy products increased from 1.47 in TE 1982 to 1.97 by 1988 however, by TE 1994, NPC values had drastically declined to 0.68. The post liberalization period registered lower but increasing NPC's compared to the pre-

WTO period. The NPC value of dairy products declined to 0.65 in TE 1997 to 0.59 by TE 2009 however marginal increases in NPC's was observed in TE 2012. Among the dairy products, the NPC's for butter were very high for all trienniums under the study indicating that India lacked a competitive advantage in export of butter. In case of WMP and SMP, the NPC's were above unity during pre-WTO period however, during the post WTO period the NPC's were lower than unity. It was observed that dairy products registered lower NPC's in the post – WTO period.

The higher values of NPC's in the pre-WTO period were due to the large excessive domestic support by developed nations which distorted international export prices. Also in the domestic market was protected and there were export restrictions as milk and milk products were put under the category of sensitive items (Rakotoarisoa and Gulati 2006). Therefore with the signing of Uruguay treaty in 1994, most countries adopted the free trade policy which led to a subsequent reduction in their domestic subsidies and an accompanying gradual rise in international export prices hence the NPC's values started falling in the post WTO period.

Factors determining milk and milk products' exports

The factors determining dairy exports were analyzed for the period from 2003-2014. For milk exports (Table 7), the exchange rate, GDP of importing country and institutional credit positively influenced milk exports while world milk

production negatively impacted milk exports from India. India's milk exports would increase by 0.05, 0.03 and 2.56 tonnes for a unit increase in exchange rate, GDP of importing country and institutional credit. However, a unit increase in world milk production would reduce milk export from India by 0.09 tonnes, Therefore, short term credit should be easily availed to livestock farmers to meet operational costs of livestock production. The effect of International milk prices and government expenditure on animal husbandry even though positive was non-significant at 5 percent.

Table 6: Nominal Protection Coefficients of milk and milk products from India, 1980-2014

TE	Particulars			
	Dairy products	WMP	SMP	Butter
1982	1.47	1.77	2.42	1.87
1985	1.57	2.20	2.21	1.98
1988	1.97	1.77	2.00	3.87
1991	1.20	0.90	0.77	2.76
1994	0.68	0.83	0.91	1.48
1997	0.65	0.76	0.83	3.48
2000	0.62	0.89	0.95	1.54
2003	0.68	0.93	0.94	1.90
2006	0.65	0.97	0.92	2.28
2009	0.59	1.10	1.02	2.85
2012	0.73	0.91	0.94	1.46
2014	0.77	1.77	2.42	1.40

Table7: Factors determining milk exports from India

Variables	Parameter Estimate	t-statistics	p-value
Intercept	7.76 (1.35)	574	<0.00
Govt's expenditure on animal husbandry (Rs. Crores)	0.003 (0.01)	0.47	0.14
World milk production(million tonnes)	-0.09* (0.02)	4.14	0.01
International milk export price(US\$/tonne)	0.001 (0.004)	0.19	0.54
Institutional agricultural credit (Rs. Crores)	2.56** (0.01)	134.70	0.02
Exchange rate of Indian rupee(rupee/dollar)	0.05** (0.02)	3.26	<0.00
GDP of importing country(million US\$)	0.03** (0.01)	2.62	<0.00
R ² (%)	76.6		

Note: ***,**,* Significant at 1,5and 10 percent respectively. Figures in parentheses indicate standard errors.

Conclusions

To augment milk output and productivity, continuous breed improvement must be encouraged across all the regions through gradual replacement of indigenous with high yielding breeds and improvement in delivery of livestock services and information to dairy farmers.

To strengthen export supply capacity and competitiveness, India needs to improve value addition to its livestock exports by subsidizing its exports through increased public and private expenditure on processing plants, cold chains and refrigerated trucks. Also strict adherence with various sanitary and phyto-sanitary requirements should be followed to increase market access to developed countries where India could earn high value per quantity of exports. Concerted efforts to market especially in building global brands and establishing international marketing channels are also called for.

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