Journal of Agricultural Development and Policy, 2017
Volume 27, No. 1&2, 81-90

Production and Export Competitiveness of Meat Sector in India: An Economic Analysis

Sserunjogi B and Parminder Kaur
Department of Economics and Sociology, Punjab Agricultural University Ludhiana

Abstract

The results revealed that region-wise shares to total meat output exhibited increasing trends for all regions except the eastern region. The southern and northern regions respectively contributed the greatest shares to total meat output while the shares in the eastern region drastically declined. The post- liberalization period registered higher growth rates in total meat output than the pre-liberalization period. Meat output in India was found to be modestly stable however, the post-liberalisation period recorded higher output instability. The yield effect was found to be stronger than the population and interaction effects as sources of meat growth in India. Meat exports were dominated by carabeef exports while the shares of mutton, chevon and beef were marginal and exhibited declining trend. The growth performance of meat exports has been highly encouraging during the post-liberalization period however meat exports were highly volatile. The NPC values for meat products indicated a high export potential, but these witnessed an increasing trend, indicating erosion of competitiveness. The factors that significantly influenced meat exports were institutional credit, government expenditure on animal husbandry, private investment in agriculture and Gross domestic product of the importing country. The study has recommended continued expansion of credit to livestock farmers to improve feeding and livestock health care and emphasis on finding regional markets for meat exports to boost foreign reserves from livestock exports.

Keywords: *Export competitiveness, Decomposition model, Meat exports, Meat production.*

JEL Classification: *Q01, Q10, Q18, R11*

Introduction

The Indian livestock sector is on a rising spree with its current contribution of about 26 per cent to the agricultural gross domestic product (Ag GDP) and providing employment to over 20 million people, particularly to women folk, in principal or subsidiary status (Anonymous, 2013). The economic policy reforms triggered in 1991 were reoriented towards liberalization and integration with the world economy and widened the market opportunities for the livestock sector.

Sustained economic growth and rising incomes during the past two decades have been fuelling a rapid growth in the demand for livestock products. The rising global demand for livestock products, various global trade negotiations and domestic reforms in India, have improved the access to international markets substantially, particularly during the post-WTO period. The production performance of meat in India increased at a rate of 7.73 per cent per annum during the period 2009-10 to 2013-14 (Anonymous, 2015). The annual growth for the year 2013-14 was 4.24 per cent while 2011-12 registered the highest growth (13.25%) in meat output due to increased commercial poultry production across Indian states. Buffalo meat exported registered tremendous growth over the last two

Corresponding Author e-mail: parminderkaur@pau.edu

decades, especially since 1991 (Birthal *et al.,* 2006). Although, India is not a significant player in international trade in livestock products, integration of global markets under World Trade Organization (WTO) is creating opportunities for increased livestock exports. Global market for animal based foods expanded rapidly and between 1991 and 2014, world trade in bovine meat increased by 1.7 times. Despite the impressive livestock performance, the average yield of Indian livestock is among the lowest in the world. The average milk yield of milch animals (cows and buffaloes taken together) is much less than the global average (Kumar *et al*., 2013). For meat production, during 2009-10 to 2013-14, the productivity of buffalo meat increased from 110kg to 122.4 kgs (Anonymous, 2015).

On the other side, apprehensions are being raised about the ability of Indian livestock farmers, a majority of whom are small and marginal, in taking the advantage of emerging opportunities, under the liberalized trade scenario. Also, non-tariff barriers like stringent sanitary and phyto-sanitary (SPS) standards, technical barriers to trade (TBT), anti-dumping duties, countervailing duties, etc. are emerging as the major constraints in tapping the benefits of export potential of the livestock. Besides, concerns have also been expressed about the necessity to improve and expand the supply capacity to augment livestock exports from India. Supply conditions are fundamental in defining the export potential of a sector or an economy (Fugazza, 2004). It against this backdrop, the current study was undertaken (i) to analyze the region-wise trends in meat output in India (ii) to determine the sources of growth for the observed meat production (iii) to analyse the export performance of meat exports (iv) to analyse the factors determining meat exports.

Data and Methodology

The study was based on the secondary data compiled from various published sources. Data on state-wise meat production, livestock population and meat yields were compiled from the Basic Animal Husbandry Statistics*,* published by the Department of Animal Husbandry, Dairying and Fisheries of the Ministry of Agriculture, Government of India. Data on meat exports were compiled from FAO website. The state-wise trends in meat production were studied at a decadal interval for the period 1992-93, 2002-03 and 2013-14 as per data availability. Meat exports were studied for a period of 30 years. The study period was divided into the pre-liberalization (1980-81 to 1994-95) and post-liberalization period (1995-96 to 2013-14) as well as the overall period (1980-81 to 2013-14) to be in tandem with the policy of market liberalisation that was initiated by government of India in 1991.

Decomposition model

Besides tabular and trend analysis, decomposition analysis was carried out to assess the relative contribution of animal population and meat yield to the growth of meat production.

$$\Delta Q = \Delta P.Yo + \Delta Y.Po + \Delta P.\Delta Y \text{ where, } \Delta Q = Q_t - Q_0, \Delta P = P_t - P_0, \text{ and } \Delta Y = Y_t - Y0$$

Here, $\Delta P.Y0$ represents the population effect, $\Delta Y.P0$ represents the yield effect, and $\Delta P.\Delta Y$ represents the interaction effect. Q, Y and P represent milk production, milk yield and population, respectively; subscripts o and t represents the base year and terminal year, respectively.

Multiple linear regression analysis

To determine the factors influencing meat exports, the following model was fitted;

$$Y=b_o+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6+b_7+X_7$$

The data relating to the following variables were considered for a period of 10 years (2003-04 to 2013-14).

Where;
Y = Total meat exports (tonnes)
X_1 = Total institutional agricultural credit (crores)
X_2= Government expenditure on animal husbandry (crores)
X_3 = Private investment in agriculture (crores)
X_4 = Importer population (million)
X_5 = Distance between India and importer country (kilometers)
X_6= Exchange rate of National currency of importer and Indian rupee
X_7= Importer GDP per capita (US$)
U = Random error term.
β_0 = intercept and
β_1, β_2, $\beta 3$ . . . . . β_7 are the respective partial regression coefficients.

Nominal protection coefficient

Nominal protection coefficient is the most widely used measure of export competitiveness (Kumar, 2009; Rakotoarisoa and Gulati, 2006). The nominal protection coefficient is defined as a ratio of the domestic price to the world reference price of the commodity under consideration. A ratio of less than unity implies the commodity under consideration is

competitive in the international market and has positive incentives for exports and that of greater than unity conveys lack of competitiveness.

Symbolically,

$$NPC = \frac{\text{India's export price}}{\text{World export price}}$$

Results and Discussion

Regional contribution, growth trends and output instability of meat in India

The state-wise shares of meat output to the total national meat production studied at three time intervals *viz.*, 1992-93, 2002-03 and 2013-14 is presented in Table 1. The results of the regional contribution to the national meat output revealed that during the study period, all regions with exception of the eastern region registered improvements in their share to the national pool. However, the period 2002-03 experienced a significant increase in the shares contribution for all other regions, with exception of the eastern region. The growth of meat output during period 2004-14 was higher than that of 1992-2003 as a result of market liberalization policy that enabled tax breaks for export oriented units and hence increased private investment into processing infrastructure (Taneja and Birthal, 2004). During the period 1992-2003, the southern region registered the highest growth in meat output on the account of increase in commercial poultry production while negative growth was registered in the eastern region as a result of significant decline in the meat output from West Bengal state. In the southern region, high growth in Andhra Pradesh and Karnataka states favoured overall regional growth while negative growth in Bihar state in the eastern region offset the positive growth in other states. On the other hand, meat growth during the period 2004-14 registered double

Table 1. State-wise contribution, growth and instability in total meat output across Indian regions

State/Period	Share in national meat production (%)			CAGR (%)		Coefficient of variation (%)	
	1992-93	2002-03	2013-14	1992-2003	2004-2014	1992-2003	2004-2014
Uttar Pradesh	8.25	9.92	20.92	5.78	22.5	19.36	50.93
Jammu &Kashmir	0.78	1.43	0.57	7.62	3.25	23.99	9.66
Punjab	0.39	0.27	4.03	1.09	14.7	8.60	54.01
Haryana	0.54	0.47	6.29	1.57	11.6	12.18	26.97
Others	14.4	14.1	9.77	11.6	26.5	14.6	11.2
Northern	**9.96**	**12.09**	**31.80**	**5.63**	**26.9**	**18.69**	**21.57**
Tamil Nadu	4.67	2.48	7.97	-4.62	19.2	21.22	40.85
Andhra Pradesh	7.47	23.72	16.02	17.8	9.52	58.11	26.10
Karnataka	4.51	5.16	2.91	5.48	6.32	18.57	19.47
Kerala	2.57	2.53	7.13	3.07	29.1	10.81	80.53
Others	1.20	1.07	0.85	18.4	28.0	29.5	37.2
Southern	**19.22**	**33.88**	**34.03**	**9.98**	**13.4**	**35.42**	**34.33**
Bihar	20.23	9.29	5.00	-5.32	5.24	28.4	16.82
Orissa	2.26	2.38	2.64	4.67	5.27	16.10	10.41
West Bengal	31.91	24.53	11.12	1.17	7.02	4.11	29.96
Assam	1.71	1.19	0.65	1.87	4.44	15.36	12.46
Others	7.77	18.5	20.7	1.51	11.0	15.5	23.4
Eastern	**56.11**	**37.38**	**19.41**	**-0.67**	**7.04**	**8.18**	**23.97**
Rajasthan	1.95	3.34	3.00	9.06	11.86	29.38	35.38
Gujarat	-	0.58	0.57	1.58	11.01	28.86	33.39
Maharashtra	11.44	11.94	10.37	3.79	12.72	12.86	32.65
Madhya Pradesh	1.32	0.79	0.82	-4.01	12.31	22.6	31.28
Others	-	0.34	0.58	9.70	23.6	141.1	73.3
Western	**14.71**	**16.65**	**14.75**	**4.53**	**12.42**	**15.19**	**31.48**
India	**100**	**100**	**100**	**7.68**	**20.9**	**8.82**	**36.8**

Note: *Denotes data not available*

digit positive growth rates for all the states, leading to impressive growth rates at the regional level. The northern, southern and western region recorded the highest growth respectively during this period while the eastern region made significant growth improvements compared to the period 1992-2003. As far output instability was concerned, meat output was much more stable during the period 1992-2003 compared with 2004-14. During the period 1992-2003, the meat output from the southern region was most unstable while the eastern region registered the highest stability in meat production however; the period 2004-14 registered increase in instability of meat output across all regions. It was observed that the instability in the western and eastern regions was found to be more than doubled during this period.

Animal –wise contribution to total meat output across Indian regions

The animal-wise contribution of the different livestock in India was studied at two different points of time namely; 1998-99 and 2013-14 as per data availability. A perusal of Table 2 revealed that at the all India level, the share of poultry meat was almost doubled between the two study periods due to rapid uptake of commercial poultry production across India. For the bovine meat, the share of buffalo meat was greater than that of cattle meat because cows are sacred in India and hence its slaughtering is restricted due to religious sentiments however such sentiments are not felt for buffaloes (Kumar *et al*, 2012). The share of sheep and goats meat declined between the said study periods. Birthal *et al.*(2006) reported that in India,

Table 2. Animal wise share to total meat output across Indian regions

State/Period	1998-1999						2013-14					
	Livestock meat (%)											
	Buffalo	**Cattle**	**Sheep**	**Goat**	**Poultry**	**Pig**	**Buffalo**	**Cattle**	**Sheep**	**Goat**	**Poultry**	**Pig**
Uttar Pradesh	75.9	0.0	3.56	16.3	0.0	5.2	46.1	0.0	2.4	15.2	22.1	14.2
J&K	0.0	0.0	51.0	27.9	21.2	0.0	0.0	0.0	57.9	24.2	18.1	0.0
Punjab	0.0	0.0	29.1	54.2	0.0	16.8	51.6	0.0	1.5	2.6	44.0	0.3
Haryana	0.0	0.0	34.4	38.8	0.0	26.8	0.0	0.0	1.1	1.6	95.9	1.3
Others	-	0.0	6.70	0.47	-	1.85	-	0.0	3.63	8.62	0.43	1.75
Northern	**61.1**	**0.0**	**11.6**	**19.7**	**2.8**	**5.5**	**36.9**	**0.0**	**3.0**	**11.1**	**39.4**	**9.6**
Tamil Nadu	21.0	18.3	30.1	25.2	0.0	5.4	1.3	8.2	7.6	9.3	48.4	0.9
Andhra Pradesh	17.9	9.4	11.3	6.3	54.5	0.6	13.1	0.0	22.0	9.6	14.3	0.4
Karnataka	8.0	12.5	34.0	25.8	14.2	5.1	3.9	9.0	17.6	12.0	48.1	9.3
Kerala	2.6	17.3	4.0	1.7	8.2	1.0	22.5	33.1	0.0	4.3	11.9	3.7
Others	0.17	0.92	-	0.05	-	-	0.04	2.45	-	-	0.35	0.44
Southern	**9.2**	**14.1**	**11.1**	**7.1**	**23.9**	**1.6**	**11.5**	**9.6**	**13.6**	**8.6**	**24.7**	**2.0**
Bihar	15.3	12.9	5.1	35.0	8.0	31.6	20.7	11.9	0.5	27.6	9.9	24.7
Orissa	44.3	4.4	22.5	64.6	0.0	8.4	0.0	0.0	8.0	38.0	18.5	6.7
West Bengal	10.5	11.8	6.6	28.4	36.4	1.9	1.6	1.7	4.1	37.8	50.6	26.7
Assam	2.3	19.1	0.6	19.5	28.4	29.1	0.2	9.9	1.6	29.7	16.2	42.0
Others	1.93	18.9	1.44	2.95	1.87	**6.50**	20.9	49.6	11.5	7.55	22.3	84.6
Eastern	**13.7**	**12.0**	**6.7**	**32.4**	**24.1**	**13.5**	**6.2**	**4.4**	**3.6**	**34.9**	**34.6**	**23.9**
Rajasthan	19.7	0.0	18.9	48.3	0.0	13.0	16.9	0.0	22.1	40.3	16.2	4.4
Gujarat	55.1	0.7	16.4	24.9	0.0	0.7	3.3	0.0	2.2	3.8	91.0	0.3
Maharashtra	36.9	26.8	10.8	23.1	0.0	2.5	10.0	6.6	2.5	9.5	23.7	2.9
Madhya Pradesh	28.3	10.1	9.1	47.2	0.0	5.4	34.3	0.0	1.3	28.6	33.3	1.8
Others	1.04	10.2	-	0.55	-	6.60	-	3.38	-	0.04	1.58	0.26
Western	**34.0**	**20.6**	**12.0**	**29.0**	**0.0**	**4.3**	**12.5**	**4.6**	**6.4**	**16.6**	**25.3**	**3.1**
India	**19.3**	**12.8**	**9.63**	**20.9**	**18.7**	**6.86**	**18.7**	**4.82**	**7.26**	**15.7**	**31.4**	**8.83**

***Note**: Denotes data not available*

pastures and other grazing lands had quantitatively and qualitatively declined and hence this affected stocking rates for small ruminants whose major source of feeds comes from grazing on common property resources.

During the study period, the northern region registered the highest contribution to buffalo meat due to high concentration of buffaloes in the irrigated northern plains of India which possesses adequate quantities of crop residues for feeds. The high poultry meat output registered in the southern region was due to rapid uptake of improved hens for commercial poultry and easy access to poultry feed (Birthal *et al.,* 2005) . As far as small ruminants' meat is concerned, the western and eastern regions registered the highest share for sheep meat and goat meat due to high density of ovines in the rainfed regions possessing abundant grazing land.

Growth of meat output across Indian regions

The growth trends in animal-wise meat output in India have been presented in Table 3. During the period 1998-2006, the northern region registered negative growth for all the different livestock meats while growth in the other regions was generally meager. The southern and western regions registered the highest growth in poultry meat output respectively while the eastern region registered the highest growth in buffalo and cattle meat. The growth in sheep and goats meat was negative for most of the regions. The animal-wise meat production did not show an appreciable change in growth during year 2007-14. With exception of poultry meat, there existed no clear trend in growth for the various livestock meats. Overall, the growth in species-

Table 3. Animal wise meat output growth across Indian regions

State/Period	1998-2006						2007-2014					
	CAGR (percent per annum)											
	Buffalo	**Cattle**	**Sheep**	**Goat**	**Poultry**	**Pig**	**Buffalo**	**Cattle**	**Sheep**	**Goat**	**Poultry**	**Pig**
Uttar Pradesh	-0.27^{NS}	-	-0.06^{NS}	0.64^{NS}	-	0.08^{NS}	0.51^{NS}	-	-0.56^{NS}	0.11^{NS}	-14.6**	-0.41**
J&K	-	-	2.87**	2.43**	-	1.39**	-0.06^{NS}	-	0.86^{NS}	0.58^{NS}	-13.7**	-2.59**
Punjab	-	-	-1.97**	-4.25**	-	-11.2**	0.83^{NS}	-	2.02**	2.08**	3.01**	1.23^{NS}
Haryana	-8.79**	-	0.73^{NS}	0.55^{NS}	-	0.73^{NS}	-1.33**	-	1.19**	0.66^{NS}	10.6**	0.58^{NS}
Others	-	-	-5.13**	1.15**	-	3.11**	-	-	3.63**	1.47**	20.2**	1.76^{NS}
Northern	**-6.20****	**-**	**-1.17****	**-1.58****	**-**	**-4.56****	**0.79**^{NS}	**-**	**0.98****	**1.01**^{NS}	**-4.41****	**0.01**^{NS}
Tamil Nadu	2.41**	1.5**1	-5.03**	-4.53**	-	6.61**	0.58^{NS}	2.19**	1.23**	0.26^{NS}	-1.73**	-2.12**
Andhra Pradesh	-1.25**	1.17**	0.96^{NS}	-0.68^{NS}	-	0.34	-0.18^{NS}	1.41**	0.82	-0.99^{NS}	1.46**	-4.34**
Karnataka	1.65**	1.12**	1.72**	1.74**	1.50**	2.20**	1.08^{NS}	1.93**	1.90**	1.28**	-0.85**	-2.94**
Kerala	-1.77**	-3.24**	-5.84**	7.65**	0.89^{NS}	6.36**	9.17**	9.84**	-2.18**	-3.16**	-2.65**	2.53**
Others	3.48**	17.8**	-	0.37^{NS}	-	-12.9**	-9.99**	-0.82^{NS}	-	8.72**	1.21^{NS}	8.00**
Southern	**0.36**^{NS}	**0.57**^{NS}	**-1.91****	**0.97**^{NS}	**1.18****	**3.96****	**2.13****	**1.76****	**0.60**^{NS}	**-0.54**^{NS}	**0.03**^{NS}	**-1.57****
Bihar	-2.76	-0.64^{NS}	-1.14**	-3.83**	-	-2.17**	0.79^{NS}	1.67**	-0.69^{NS}	0.24^{NS}	13.5**	0.16^{NS}
Orissa	20.1**	25.7**	-5.33**	2.53**	4.67**	8.96**	-0.09^{NS}	3.19**	1.28**	1.30**	0.97^{NS}	0.94^{NS}
West Bengal	-5.38**	0.78^{NS}	0.0^{NS} 0	0.79^{NS}	-0.56^{NS}	-5.09**	1.46**	0.99^{NS}	0.60^{NS}	-0.06^{NS}	1.13**	5.30**
Assam	0.00**	0.00^{NS}	0.97^{NS}	-1.24**	-	-0.92**	-1.95**	-1.73**	1.55**	2.33**	4.03**	1.33**
Others	-14.4**	0.39^{NS}	3.26**	4.18**	1.08**	3.59**	-10.1**	17.3**	-2.09**	0.80^{NS}	3.09**	4.49**
Eastern	**4.58****	**6.82****	**-1.35****	**-0.65**^{NS}	**2.17****	**0.56****	**-0.27**^{NS}	**0.60**^{NS}	**0.7**^{NS}	**1.09****	**2.19****	**-1.71****
Rajasthan	0.24^{NS}	-	-0.56^{NS}	0.37^{NS}	-	3.78**	1.80**	-	-1.07**	0.13^{NS}	4.91**	-2.45**
Gujarat	0.00^{NS}	-0.003^{NS}	0.00^{NS}	0.00^{NS}	-	0.00^{NS}	-0.001^{NS}	0.001^{NS}	-0.01^{NS}	0.01^{NS}	0.73^{NS}	0.14^{NS}
Maharashtra	-1.19**	-0.64^{NS}	-0.04^{NS}	-1.65**	-	3.77**	0.31^{NS}	0.09^{NS}	0.48^{NS}	0.43^{NS}	-2.75**	1.05**
Madhya Pradesh	3.07**	-	7.03**	8.26**	-	2.65**	1.44**	-	0.37^{NS}	0.98^{NS}	11.4**	-0.68^{NS}
Others	-	4.34**	-	-	-	-	-	1.63**	-	1.74**	3.91**	1.98**
Western	**0.48**^{NS}	**-0.33**^{NS}	**1.58****	**1.84****	**-**	**2.75****	**0.82**^{NS}	**-2.30****	**-0.06**^{NS}	**0.42**^{NS}	**4.26****	**-0.87**^{NS}
India	**-0.20**^{NS}	**2.35****	**6.47****	**1.23****	**1.67****	**0.68****	**0.55**^{NS}	**1.98****	**1.01**^{NS}	**1.97**^{NS}	**1.63****	**1.75****

***Note: -** ** represents significant at 5 percent, NS –non –significant, - represents data not available*

wise meat production in India remained erratic and meager across the different regions.

Sources of growth for meat output in India.

The results of a decomposition analysis presented in Table 4 revealed that during period I (1993-94 to 2004-05), meat yield was the single most important contributor to beef output while for carabeef, the contribution of population was most paramount. For ovine meat yield was the single most important contributor to meat output for sheep, goats and pig while for poultry meat , the contribution of population was most important during this period. During period II (2004-05 to 2013-14) meat yield was the single driving factor for meat production in all livestock except poultry and pig meats. For poultry meat, fowl population remained the major contributor to meat production while for pig meat; the yield effect which was positive during period I, turnout to be negative during period II however, the contribution of the interaction effect had tremendously increased. The observed high contribution of yield effect towards meat output implies that the future growth of meat production shall come largely from gradual replacement of low-yielding indigenous animals with fast maturing and high yielding crossbreds.

Composition of meat exports from India

India's meat exports were dominated by carabeef in both value and quantity terms (Table 5). Overall, the

Table 4. Animal -wise sources of growth in meat output in India

Animal type	1993-94 to 2004-05	2004-05 to 2013-14
Share in growth of meat output (%)		
Cattle meat		
Population	-11	11
Meat yield	120	86
Interaction	-8	3
Buffalo		
Population	115	38
Meat yield	-21	59
Interaction	7	3
Sheep		
Population	27	31
Meat yield	69	65
Interaction	5	4
Goat		
Population	18	33
Meat yield	81	62
Interaction	1	5
Poultry		
Population	44	75
Meat yield	40	17
Interaction	16	8
Pig		
Population	7	267
Meat yield	92	-220
Interaction	2	52

Table 5. Share of meat exports in total exports: 1980-2014

(Per cent)

Year (TE)	% share of export value in total meat exports (US$)						% share of export quantity in total meat exports					
	Carabeef	Chevon	Mutton	Beef	Poultry meat	Pigmeat	Carabeef	Chevon	Mutton	Beef	Poultry meat	Pigmeat
Pre- liberalization period												
1982	64.8	0.00	12.6	1.0	0.05	0.01	84.2	0.00	9.44	1.37	0.05	0.00
1985	51.9	0.00	30.1	0.6	0.03	0.04	70.9	0.00	23.6	0.82	0.03	0.00
1988	54.4	0.10	18.3	8.3	0.05	0.74	81.5	0.07	13.4	12.3	0.04	1.03
1991	56.7	0.07	14.6	9.5	0.21	0.01	89.2	0.05	10.5	15.0	0.19	0.00
1994	59.4	0.18	12.1	8.2	0.12	0.18	90.7	0.13	8.70	14.3	0.14	0.24
Post- liberalization period												
1997	62.4	0.21	6.2	10.0	0.23	0.17	94.6	0.17	4.59	16.5	0.24	0.29
2000	66.6	0.17	6.0	4.8	0.14	0.06	94.6	0.13	4.98	6.66	0.13	0.06
2003	69.6	0.05	3.1	3.3	0.61	0.18	96.0	0.05	2.69	4.41	0.87	0.04
2006	70.0	0.06	2.1	4.2	0.19	0.14	97.7	0.05	1.61	6.43	0.29	0.16
2009	68.8	0.46	6.5	0.9	0.18	0.25	93.1	0.47	5.72	1.19	0.33	0.10
2012	73.4	0.01	1.7	0.1	0.28	0.07	97.7	0.01	1.32	0.09	0.74	0.03
2014	71.1	0.24	4.1	0.5	0.23	0.16	95.4	0.24	3.52	0.64	0.53	0.06

post liberalization period (T.E. 1995 to 2014) registered higher percentage shares of the different livestock meat exports compared to the pre-liberalization period (T.E. 1982 to 1994).Similar results were reported by Ohlan (2012) and raju (2007). Among the different livestock products , the export value and quantity of mutton and beef in total meat exports depicted a declining trend during the study period due to growth in domestic demand for the mutton and socio-cultural factors attached to slaughtering of cows in India. However, the export value of chevon and poultry meat depicted marginal but gradually rising trend during the study period. The share of pig meat in total meat exports in value and quantity terms was meager.

Growth trends and instability in meat exports

A perusal of Table 6 reveals that the growth of total meat exports in value terms was significant at 12.7 percent per annum during the overall study period (1984-85 to 2013-14) however; period II (1994-95 to 2013-14) registered the highest growth rates for the different meat exports indicating the positive impact of the liberalization policy initiated in 1991. Mutton, carabeef, poultry meat and pig meat registered positive growth rates during the study period. The growth rate of chevon drastically declined from 30.4 percent during period I (1980-81 to 1993-94) to percent per annum during period II (1994-95 to 2013-14) due to ad-hoc export prohibitions put forward by government of India to ensure local availability to domestic consumers (Kumar, 2009). In quantity terms, total meat exports registered positive and significant growth rates during the study period. Poultry meat and carabeef registered the highest growth among all the meat exports. The negative growth recorded in the quantity of chevon exports during period II (1994-95 to 2013-14) could have resulted into the negative growth rates observed for its export value. The growth performance of pig meat in quantity terms was not impressive during the study period since its growth rates during the second and third period were not statistically significant at 5 percent.

The export instability in value terms (Table 7) depicted a mixed pattern however; export instability of different meat exports was relatively lower during the

Table 6. Growth of meat exports from India

(% per annum)

Year	Carabeef	Chevon	Mutton	Beef	Poultry meat	Pork	Total meat
CAGR of meat exports (Export value) (% per annum)							
1980-94	5.35**	38.0**	25.4**	-0.17	4.59	14.4	5.17**
1995-14	18.3**	-5.47**	9.46	10.3**	50.5**	16.5**	16.8**
1980-14	14.1**	9.65**	13.5**	3.98**	21.1**	21.8**	12.7**
CAGR of meat exports (Export quantity) (% per annum)							
1980-94	7.11**	40.4**	32.3**	-0.86	23.6**	-	5.26**
1995-14	11.7**	-11.9**	8.13	7.17**	21.4**	6.90	11.6**
1980-14	11.4**	7.16**	14.4**	2.15	21.2**	2.18	10.5**

** *Significant at 5 %*

Table 7. Instability index of meat exports in the pre and post liberalization periods

Product/Meats	Export value (000 US$)			Export Quantity (000 MT)			Unit value (US$/tonne)		
	Period I	Period II	Period III	Period I	Period II	Period III	Period I	Period II	Period III
Carabeef	28.9	100.7	144.0	33.6	52.6	93.9	8.61	42.8	39.1
Beef	79.3	40.8	68.3	83.3	54.7	72.6	24.4	34.9	32.7
Chevon	61.3	160.7	195.8	54.3	140.4	162.7	-	47.3	33.1
Mutton	18.5	88.3	91.4	22.4	60.9	55.8	9.77	41.3	31.8
Poultry meat	46.7	134.7	196.9	87.1	95.2	153.2	69.4	66.3	74.8
Pig meat	146.8	89.6	128.8	-	65.9	61.2	51.7	111.7	89.5
Total meat	24.1	95.6	135.0	25.9	52.2	90.8	11.3	42.4	40.4

Note: *Period I: 1980-81 to 1994-95, Period II: 1995-96 to 2013-14 Period III: 1980-81 to 2013-14*

period I (1984-85 to 1994-95) compared to Period II (1995-96 to 2013-14). The highest instability in meat exports was recorded during period III (1984-85 to 2013-14). Kumar (2009) postulated that instability and growth in international prices were positively related and moved concurrently. The period which witnessed higher growth in prices, witnessed higher instability too. Mutton exports were most stable while pig meat exports were least stable during period I however during period II all meats with exception of beef and pig meat became highly unstable.

During period III, poultry meat and chevon registered the highest export instability while beef and mutton were most stable. The export instability in quantity terms revealed a similar trend as export value. Chevon exports registered the highest instability during period II and III while pig meat exports were moderately stable during the same period. The observed high instability in ovine meat export could have resulted from increasing growth in domestic demand for sheep and goats meat hence precluding its export.

Export competitiveness of meat exports from India

The values of NPC for the species-wise meat exports for the period 1980-2014 are presented in Table 7. The NPC values for bovine meat plummeted from 0.5 in TE1982 to 0.38 by TE 1994 however; after 1994 the NPCs depicted a consistently increasing trend, indicating erosion of competiveness. India was found to be competitive in pig meat exports, though its competiveness had deteriorated drastically during the study period due to increasing domestic demand devoid of commensurate supply which fuelled the domestic pork prices. Besides, the international price of pig meat remained relatively stagnant. These developments may be attributed to the successive erosion in the competiveness in pig export. In the case of mutton, India did not enjoy much competitiveness to emerge as a significant exporter in the world market due to rising domestic demand for the mutton. The NPCs for poultry meat indicate that India has protected poultry sub-sector heavily or the international prices have been depressed due to price distortion in the world market.

Factors influencing meat exports

The results of stepwise linear regression model (Table 8) revealed that meat exports from India were positively and significantly influenced by private investment in agriculture, government expenditure on animal husbandry, institutional agricultural credit and the Gross Domestic Product (GDP) of the importing country. Similar findings were reported by Fugazza (2004), Senthilkumar *et al* (2016) and Kumar *et al.* (2013). Commercial meat output is a capital intensive enterprise, requiring high expenditures on feeds and health care, therefore availability of affordable credit would enable famers to access the vital production inputs ,while increased government expenditure on animal husbandry would enhance research aimed at introduction of geographically adapted breeds, that are high yielding and disease resistant. Private investment needs to be encouraged especially in the value addition segment to improve and increase pig meat and by-

Table 8. Nominal Protection Coefficient (NPCs) of meat exports from India: 1982-2014

Year (TE)	Bovine meat	Poultry meat	Sheep meat	Pig meat
1982	0.50	1.05	0.99	-
1985	0.59	1.91	1.20	0.98
1988	0.47	0.84	1.26	-
1991	0.37	0.61	0.96	-
1994	0.38	0.21	0.87	-
1982	0.47	0.04	0.83	0.33
1997	0.48	0.18	0.77	0.38
2000	0.47	0.52	0.54	0.65
2003	0.49	0.59	0.57	2.35
2006	0.63	0.52	0.70	0.96
2009	0.68	0.69	0.76	1.59
2012	0.50	1.05	0.99	2.77
2014	0.59	0.87	0.88	2.18

***Note** : Denotes data not available*

Table 9. Factors determining meat exports in India

Variables	Parameter estimate	t statistics	p-value
Intercept	-134417 (65977)	-2.04	0.061
Total institutional agricultural credit	0.23*** (0.029)	7.93	< .0001
Government expenditure on animal husbandry (crores)	283.4*** (42.0)	6.74	< .0001
Private investment in agriculture (crores)	0.37*** (0.084)	4.4	.0005
Importer population (million)	1.61.5* (84.8)	1.90	0.07
Distance between India and importer country (kilometers)	-20.8 (16.8)	-1.24	0.24
Exchange rate of National currency of importer and Indian rupee	1790* (636.6)	2.14	0.05
Importer GDP per capita (US$)	29.6**	6.34	< .0001
R2	85.6		

Note**: *,**, significant at 10, 5 and 1 per cent respectively. Figures in parentheses indicate standard errors*

product processing. The government should focus on finding regional markets having less sanitary and phyto-sanitary requirements.

Conclusions and policy implications

The study has revealed the contribution of the eastern region towards the total meat output drastically declined during the study period. However, the regional growth trend in meat production revealed that the period 2004-2014 registered higher growth rates than 1992-2003. Meat production in India was more stable during the period 1992-2003 however significant instability was noticed during the period 2004-2014. The animal -wise share of meat production revealed that poultry meat experienced rapid growth in share between 1998-99 and 2013-14 while the share of sheep, goats and cattle drastically declined. The rapid uptake of commercial poultry rearing needs to be encouraged by development of regional breeding centres for timely supply of improved chicks at affordable prices and improvement of healthcare infrastructure to reduce disease outbreaks and attacks. As far as sources of meat growth were concerned, the contribution of meat yield effect was greater than the population effect for all the different livestock meat implying that future growth in meat production shall come largely from gradual replacement of low-yielding indigenous animals with fast maturing and high yielding crossbreds.

Carabeef exports were most dominant in both value and quantity terms therefore concerted efforts are required to diversify meat exports. The contribution of small ruminants' meat *viz.,* sheep and goat in the total meat exports from India depicted declining shares during the study period. The growth performance of meat exports has been highly encouraging, with consistent improvement in the post-reform period, indicating the positive impact of the liberalization policy initiated in 1991. The NPCs values for meat products indicated a high export potential, but these witnessed an increasing trend, especially after TE 1997, indicating erosion of competitiveness. The factors that significantly influenced meat exports were institutional credit, government expenditure on animal husbandry, private investment in agriculture and Gross domestic product (GDP) of the importing country.

References

Anonymous 2013. All India Basic Animal Husbandry and Fisheries Statistics report-2013 Department of Animal, Dairying and Fisheries, Krishi Bhavan, New Delhi.

Anonymous 2015. All India Basic Animal Husbandry and Fisheries Statistics report-2015 Department of Animal, Dairying and Fisheries, Krishi Bhavan, New Delhi.

Birthal PS, Mishra S N Dixit A K and Tripathi G 2005. India's livestock feed balance and its environmental implications, Project report. National Centre for Agricultural Economics and Policy Research, New Delhi, India.

Birthal PS, Taneja VK, Thorpe W 2006. Livestock sector in India: Opportunities and challenges for smallholder in India. In Proceedings of *National Centre for Agricultural Economics and Policy Research* (NCAP), New Dehli. *India and the International Livestock Research Institute* (ILRI), Nairobi, Kenya.

Chand R. and Raju SS 2008. Livestock sector composition and factors affecting its growth, *Indian Journal of Agricultural Economics*, **63**: 198-210.

FAO (Food and Agriculture Organization) 2003. *Milk Production in India: Opportunities and Risks for Small Scale Producers*. PPLPI Policy Brief, Rome.

Fugazza Marco 2004. *Export Performance and Its Determinants: Supply and Demand Constraints*, United Nations Conference on Trade and Development, Geneva, Switzerland.

Kumar A 2009. India livestock sector trade: opportunities and challenges under WTO regime, Policy paper 24, Draft for approval, *National Centre for Agricultural Economics and Policy Research,* New Delhi.

Kumar A 2010. Exports of livestock products from India: performance, competitiveness and determinants. *Agricultural Economics Research Review* **23**: 57-67

Kumar A, Shinoj P and Joshi P.K. 2013. Structural Transformation in Dairy Sector of India. *Agricultural Economics Research Review.* **26** :209-219

Kumar A, Shiv J and Chitra Y 2012.Export of buffalo meat from India: Performance and prospects. *Indian Journal of Animal Science* **82**: 1578-1583

Ohlan R 2012. Global competitiveness in dairy sector . *Agricultural Situation in India.* **69**: 257-264

Raju SS 2007. Indian livestock products and their global competitiveness. Outlook on agriculture. **36**: 281-284

Rakotoarisoa M and Ashok G 2006. Competitiveness and trade potential of India's Dairy Industry. *Food Policy* **31**:216-227.

Senthilkumar G, Selvakumar K N , Prabhu M, Serma S P, Valli C and Thilakar P 2016. Factors influencing draught cattle population in Tamilnadu. *Indian Veterinary Journal* **93**: 22-24

Taneja VK and Birthal PS 2004. Role of buffalo in food security in Asia. *Asian Buffalo Magazine* **1**:4–13.

Received: April 2, 2017 Accepted: October 5, 2017