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## Assessing export competitiveness of Indian groundnut<sup>§</sup>

Murlidhar Meena<sup>a\*</sup>, K A Khunt<sup>b</sup>, H N Meena<sup>a</sup> and H T Khorajiya<sup>b</sup>

<sup>a</sup>ICAR-Directorate of Groundnut Research, Junagadh-362001, Gujarat, India

<sup>b</sup>Junagadh Agricultural University, Junagadh-362001, Gujarat, India

**Abstract** This paper examines export competitiveness of Indian groundnut during the period 1996-97 to 2013-14 using PAM. Results shows that export of groundnut from India is highly competitive and has great potential in international market. The measured values of NPC, EPC and ESC have been less than unity throughout the period. DRRCR also remains below unity pointing towards efficient utilisation of domestic resources in groundnut cultivation. Positive social profit all through the years reveals social welfare gain. Groundnut export is found generating resources to the Indian economy as the measured total policy transfer is negative.

**Keywords** Groundnut, Export competitiveness, India

**JEL classification** Q1, Q11, Q17

### 1 Introduction

Until 1991 the trade in agriculture was heavily controlled by government interventions, namely tariff and non-tariff barriers, quantitative restrictions, licensing and canalization and subsidies. Economic reforms in the early 1990s followed by establishment of WTO in 1995 changed agricultural trade rapidly. Trade liberalization led to greater integration of world economies. It opened up new opportunities, challenges and competition in agricultural markets (Jagdambe 2016). Studies shows mixed effect of liberalisation on Indian agricultural trade (Bhalla 2004; Karnool et al. 2007; Angles et al. 2011; Sharma 2013). In commodities, like rice, tea, coffee, spices, fresh fruits and vegetables, meat and marine products, India occupies an important place in world agricultural market (Sheshagiri et al. 2011). Trade reforms force domestic producers to adopt more efficient techniques of production to build capacities so that they can withstand the forces of globalisation and compete with international players. In order to boost agriculture

exports it becomes indispensable to assess the competitiveness of agricultural exports. Since the pioneer study of Gulati (1994), many authors (Datta 2000; Mohanty *et al.* 2003; Batra & Khan 2005; Shinoj & Mathur 2008; Chandran 2010; Sheshagiri et al. 2011; Basavaraj et al. 2013; Kanaka & Chinnadurai 2013; Sankar & Kumar 2014; Andhale & Kannan 2015; Idris et al. 2015) have assessed the export competitiveness of agricultural export from India. Most of the studies focus on cereals and horticultural crops. We couldn't come across any study that focuses on competitiveness of groundnut from India other than Rani et al. (2014). Therefore, competitiveness of Indian groundnut in post-WTO period is crucial to analyse its sustainability in domestic and international markets. This study has made a modest attempt to analyse competitiveness of India's groundnut export using PAM approach. The results will be useful to different stakeholders and agencies on the groundnut value chain.

Rest of the paper is organized as follows: Section 2 provides data sources and the empirical framework used to estimate export competitiveness. Section 3 discusses results. Section 4 presents conclusions and policy implications.

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\*Corresponding author: meenamurlidhar@gmail.com

<sup>§</sup>this study is the part of Ph.D. work of 1<sup>st</sup> author

## 2 Database and empirical framework

### 2.1 Data sources

This study is based on primary as well as secondary data collected from various sources. Details on various type of costs and item-wise cost of cultivation were collected for the period 1996-97 to 2013-14 from reports on “*Comprehensive Scheme for the Study of Cost of Cultivation of Principal Crops*” published by the Commission for Agricultural Costs and Prices (CACP) of the Government of India. For comparison the period has been divided in two sub-period: 1996-97 to 2003-04, and 2004-05 to 2013-14. Information on shelling percentage, processing and export costs, breakage percentage and other parameters was collected through a primary survey of traders from *Sourashtra* region of Gujarat, the leading groundnut producer and exporter.

### 2.2 Empirical framework

Nominal Protection Co-efficient (NPC), Effective Protection Co-efficient (EPC), Effective Subsidy Co-efficient (ESC) and Domestic Resource Cost (DRC) are general yardsticks used to analyse export competitiveness and to study comparative advantage in export/import of a commodity. NPC, EPC and ESC are used to find the level of protection accorded to

different commodities and assess their competitiveness for export. DRRCR shows the real cost of export to earn a given amount from its export and is used to find out whether it is worthwhile to use domestic resources for producing a commodity for export. Social profit measures total social gain from the production of a commodity; and total policy transfer measures the total income to an economy from export of a commodity. We use Policy Analysis Matrix (PAM) approach developed by Monke and Pearson (1998) to measure above indices. PAM is a product of two accounting identities; one defines profitability and other measures effects of divergences (distorting policies and market failures). It is a double-accounting matrix that summarizes budgetary information of on-farm and off-farm activities to calculate social values and simulating policy changes (Rani et al. 2014). In PAM, inputs and outputs are classified into tradable (e.g. fertilizers, pesticides and seeds) and non-tradable (e.g. domestic factors like labour, land, and capital) items and are measured in two types of prices i.e. private and social (table 1).

India exports almost 90% of the groundnut in handpicked selection (HPS) kernel form. Therefore, export is classified into two parts; production of basic raw material, i.e. pods in the field; and its subsequent value addition at processing units. Inputs have been divided into (i) tradable inputs (fertilisers, pesticides,

**Table 1. Policy Analysis Matrix (PAM)**

Description	Value of outputs		Value of inputs		Profit/Surplus
	Tradable	Non-tradable	Tradable	Non-tradable	
1. Private values	A	B	C	D	PAI=(A+B)- (C+D)
2. Social/economic values					
i. Border prices	E	-	G	-	INTPAI=(E+B)- (C+D)
ii. Opportunity cost	-	F	-	H	SPA1=(E+F)-(G+H)
3. Divergence/policy transfers	A-E	B-F	G-C	H-D	T=(A-E)+(B-F) + (G-C)+(H-D) =(A+B-C-D) – (E+F-G-H) = PAI-SPA1

Source: Datta (2000)

In terms of PAM the following indices are calculated as:

- (1) Nominal protection coefficient (NPC) = A/E
- (2) Effective protection coefficient (EPC) = (A-C)/(E-G)
- (3) Effective subsidy coefficient (ESC) = [(A-C) + (H-D)]/(E-G)
- (4) Domestic resource cost ratio (DRRCR) = (H-F)/(E-G)
- (5) Private profit under Autarky (PAI) = (A+B)- (C+D)
- (6) Private profit under free trade in output (INTPAI) = (E+B)- (C+D)
- (7) Social profit under free trade (SPA1) = (E+F) - (G+H)
- (8) Total policy transfer (T) = (A-E) + (B-F) + (G-C) + (H-D)

seeds) and (ii) non-tradable inputs (labour, land, and capital). Output is also divided into tradable output (kernels) and non-tradable output (hulm, shell and split kernels).

The method is based on familiar identity: profit = revenue-costs. In this paper, the value of tradable output, i.e. kernel is estimated based on domestic and export prices. The value of non-tradable outputs, i.e. hulm is taken as value of by-product from cost of cultivation data from CACP. Private value of tradable inputs used in groundnut cultivation along with their prices has been culled from the cost of cultivation data from CACP. In case of domestic factors, which are not traded in the international markets (labour, land and capital), the social costs have been calculated using the 'Value of Marginal Product' approach suggested by Rani et al. (2014). This method uses factor shares ( $S_i$ ) of inputs ( $X_i$ ) together with the mean values of outputs ( $Y$ ) and prices ( $P_y$ ). The computation of the social cost of inputs is as follows:

$$P_{xi} = \left[ \left( \frac{S_i}{X_i} \right) * Y \right] P_y$$

### Export competitiveness indices

Commonly used global competitiveness indices are NPC, EPC, ESC and DRCR. NPC is the simplest one that measures divergence of domestic price from international price.

$$NPC = P^d/P^b$$

Where,  $P^d$  is domestic price and  $P^b$  is border price. A value of NPC greater than unity discourages export; and of less than unity measures degree of competitiveness. The main limitation of NPC is that it measures competitiveness from trader's point of view. If domestic producers' margins are not adequate, they may not like to produce the commodity even if NPC is less than unity.

Measuring EPC and ESC requires distinction between tradable (like fertiliser, seed, plant protection chemicals) and non-tradable (like electricity, irrigation water, land resources, unskilled labor) inputs. EPC indicates the combined effects of policies in the tradable commodities.

$$EPC = VP^d / VP^b$$

Where,  $VP^d$  is value added at domestic price, and  $VP^b$  is value added at border price. A value of EPC

exceeding unity shows lack of competitiveness or vice versa. A positive value of  $(1 - EPC)$  indicates ability of domestic producers- cum- processors to withstand a price war vis-à-vis foreign traders. Value of EPC more than NPC means the domestic processors are protected through government policy on tradable inputs. EPC accounts for distortion in tradable inputs but not cover the distortions in non-tradable inputs.

ESC corrects EPC by adjusting for subsidies and taxes on non-tradable inputs.

$$ESC = (VA^d + NS) / VA^b$$

Where, NS is net subsidy/taxes on non-tradable inputs.

ESC covers distortions in markets for both tradable as well as non-tradable inputs. Therefore, it is considered the complete measure for competitiveness. ESC greater than unity indicates that protection is accorded to the commodity under consideration.

NPC, EPC and ESC do not consider social costs of resources used in production. DRCR compares the opportunity cost of using domestic resources (land, labour and capital) and of traded inputs in domestic production to the value added at border prices. DRCR measures the comparative advantage (or) efficiency of domestic production in term of its international cost competitiveness.

$$DRCR = SP^d / VP^b$$

Where,  $SP^d$  is shadow price of the commodity and  $VP^b$  is value added measured at world prices.

Domestic Resource Cost is the value of domestic resources needed to earn a unit of foreign exchange through export or save a unit of foreign exchange through import substitution by production of the commodity under consideration. DRCR greater than unity indicates that production does not represent efficient use of country's resources. DRCR less than unity implies that production is efficient, and indicates that cost of domestic resources spent on producing a unit quantity of output is smaller than the net foreign exchange earned through export (Yao 1997). The overall profit to the society is measured as social profit under free trade scenario (SPAI) which measures foreign exchange earned to the country by exporting a commodity. It takes in to account both tradable and non-tradable output less both tradable and non-tradable inputs to measure net profit. Total policy transfer describes the value of the resources going into (if

positive) or coming out (if negative) of the commodity system.

### 3 Results and discussion

#### 3.1 Economic importance and trends in groundnut

Groundnut (*Arachis hypogaea*), popularly known as peanut, is grown in most countries. Its cultivation, however, is concentrated in India, China, Nigeria, Indonesia and USA, which together account for 60% of the total area and 75% of the total production. India ranks first in acreage and second in production (after China). In India, it is cultivated on 4.6 million hectares with a production level of 6.7 million tonnes (GoI, 2016).

Groundnut has been known to man for many centuries but its economic importance was recognized with its large scale use for oil extraction by crushing industry. At present, this crop is primarily used as source of edible oils. Apart from oil, its by-products contains many other functional compounds like proteins, fibres, polyphenols, antioxidants, vitamins and minerals which can be added as a functional ingredient into many processed foods (Arya et al. 2016).

During 1980s, oilseeds was one of the main sources of agricultural growth in India (Birthal et al. 2014). Currently, India is the world's fourth largest edible oils economy after USA, China and Brazil (Mehta 2015). Oilseeds are the major source of edible oils in India, and occupy the prime position next to cereals. Groundnut accounts for 27 and 17% of the production and area of oilseeds that are cultivated on 13% of the gross cropped area (GCA), and contribute 3% to the gross national product (GNP) and 10% to value of output of agricultural crops (GoI, 2014). Oilseeds produced in the country are valued at 930 billion rupees (at constant price) in 2015-16 (<http://mospi.nic.in>). Groundnut accounts for 25% to the total value of oilseeds. In 2015-16, India exported 5.85 lakh tonnes groundnut, valued at 40.75 billion rupees (GoI 2016).

After globalisation, Indian oilseeds sector observed sea changes in response to trade reforms and changing domestic edible oil consumption pattern (Meena et al. 2015; Mehta 2015). The share of groundnut in the total oilseeds area declined from 29% in 1996-97 to less than 20% in 2015-16, consequently its production share also declined from 35 to less than 30%. In contrast,

soyabean cultivation expanded from 21 to 42% in area and 22 to 37% in production. Still groundnut is an important oilseed in the country grown under 4.56 million hectares producing 6.77 million tonnes pods in 2015-16. In India, it is cultivated mainly in the states of Andhra Pradesh, Gujarat, Karnataka, Maharashtra and Tamil Nadu (table 2). These states together account for 80 and 75% of the total area and production, respectively. Gujarat alone contributes 40% to national production from an area share of 30%. Groundnut yield in Andhra Pradesh, Gujarat and Tamil Nadu has increased significantly. Its production and yield have also registered positive growth. But groundnut area recorded negative growth in major growing states is point to ponder. This crop is primarily grown under rainfed (85% of total area) resource poor condition resulting in higher instability in its yield and production.

#### 3.2 Groundnut export

World trade in groundnut is thin and concentrated, only about 5-6% of world groundnut is traded in international market (Diop et al. 2004). India is the leading groundnut exporter. During 2015-16, it exported 0.54 million tonnes groundnut valued at 40,756 million rupees. China (22.66%), India (18.64%), Argentina (13.59%), USA (14.30%) and Netherland (5.99%), together contribute more than three-fourth to the world's total export (figure 1). India and China, the major groundnut producing countries, export only 5.80 and 0.73% of their total production, respectively because of their high domestic demand. Whereas, Argentina and USA export 18.42 and 19.94 % of their production, respectively.

India has long history in exporting groundnut. It has been by far the leading exporter of groundnut to the world between 1928 and 1945 (Seshadri 1962). In early 19th century until Independence in 1947, this crop was being grown for export purpose. But in post-WTO period its share in world market has come down. Export to production ratio has decreased to less than 5% in post-WTO period, but has improved since 2010-11 (table 3). In 2013-14, India again became the top groundnut exporter with 5.50 lakh tonnes; 30.27% of the world export. European Union, Netherlands, Indonesia, Germany and Mexico are the leading importers of groundnut with 6.18, 3.58, 2.51, 1.18 and 1.06 lakh tonnes, respectively (<http://www.fao.org/faostat/en>).

**Table 2. Growth and instability in area ('000 ha), production ('000 tonnes) and yield (Kg/ha) of groundnut, 1996-97 to 2013-14**

State name	Particulars	Average	Growth (%)	Instability (%)
Andhra Pradesh	Area	1629	-2.58 ***	18
	Production	1368	-2.41	56
	Yield	854	1.03 ***	42
Gujarat	Area	1817	-1.15	13
	Production	2446	2.56	93
	Yield	1342	3.75 **	85
Karnataka	Area	896	-3.33 ***	14
	Production	668	-3.80 **	40
	Yield	733	-0.49 ***	29
Maharashtra	Area	412	-3.58 ***	11
	Production	460	-3.42 ***	19
	Yield	1119	0.17	14
Tamil Nadu	Area	573	-5.61 ***	10
	Production	1031	-0.74 **	48
	Yield	1931	5.17 ***	46
Others	Area	816	1.19 ***	7
	Production	1044	4.73 ***	23
	Yield	1257	3.50 ***	19
All India	Area	6142	-2.08 ***	9
	Production	7017	0.17	40
	Yield	1153	2.30 ***	34

Source: Calculations using data from GoI (2016).

Note: \*\*\*, \*\*, \* indicates significance at less than 1, 5, 10 per cent level, respectively.

Sharma (2013) claims that implementation of AoA has proven beneficial to agricultural export from India. In post-WTO, India's share in world agricultural exports has increased substantially from 1.0 % in 1995 to 2.06% in 2011. India's share in world groundnut market has also improved substantially in post-WTO period from 11% in 1995 to 30% in 2013-14. Groundnut export registered more instability because it depends on many market and non-market factors (Haleem et al. 2005, Ranjan & Rai 2007, Sengupta & Roy 2011, Kannan & Sundram 2011, Adhikari et al. 2016). However, instability in export from India decreased to almost one-fourth, from 90% during 1996-97 to 2003-04 to 25% during 2004-05 to 2013-14. It signals that India is emerging as a regular supplier to the world market. Angles et al. (2011) found similar results in case of turmeric exports where instability in was high in pre-liberalization period. They said that the export during post-liberalization did not fluctuate much due to less restrictions and growing demand of Indian turmeric in world market. Koujalagi and Mundinamani (2012)

observed reverse trend in pomegranate export. Figure 1 shows that China's share in world groundnut market was the highest during 1999-2000 to 2006-07, but declined continuously afterwards. In contrast, India's share in global export has been increasing since 2003-04 reaching to 42% in 2011-12. Between 1996-97 and 2013-14 groundnut export from India increased by 5 and 14 times in quantity and value term, respectively. It confirms the increasing preference for Indian groundnut in the world market. Further, export instability in quantity as well as value terms declined to half from during 1996-97 to 2003-04. This establishes the tremendous performance by Indian groundnut from 2005-06 and onward (table 3).

### 3.3 Export competitiveness

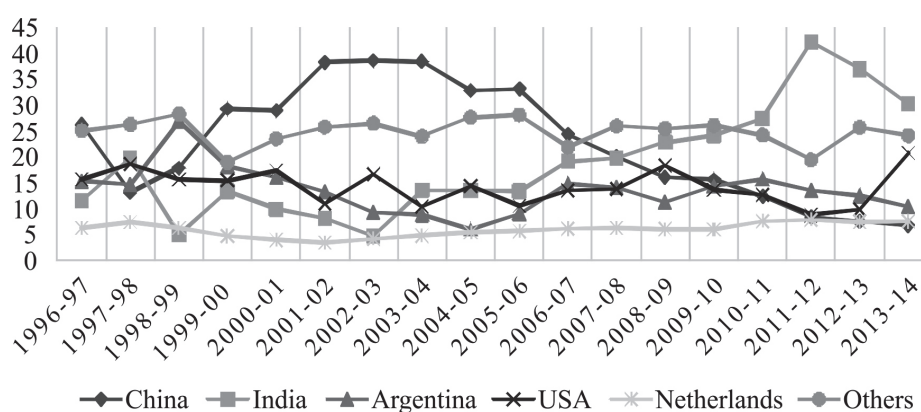
India is among the 15 leading exporters of agricultural products in the world. It has competitive advantage in several commodities because of near self-sufficiency in inputs, relatively low labour cost, divers agro-

**Table 3. Groundnut export from India, its share (%) to national production and world export**

Year	Production (000 tonnes)	Export (000 tonnes)	Value (Rs. Crores)	Share in production	Share in world export
1996-97	7589	151	332	2	11
1997-98	7370	245	566	3	20
1998-99	8980	58	140	1	5
1999-00	5250	158	372	3	13
2000-01	6410	137	316	2	10
2001-02	7028	113	251	2	8
2002-03	4121	68	178	2	5
2003-04	8127	176	544	2	14
2004-05	6774	177	547	3	14
2005-06	7993	190	514	2	13
2006-07	4864	251	798	5	19
2007-08	9183	270	1054	3	20
2008-09	7168	298	1239	4	23
2009-10	5428	340	1426	6	24
2010-11	8266	434	2178	5	27
2011-12	6964	833	5246	12	42
2012-13	4694	536	4065	11	37
2013-14	9714	510	3188	5	30
2014-15	7402	708	4675	10	NA
Mean	7017	298	1454	3	19
Growth (%)	0.17	11.31***	19.44	11.12***	9.12***
Instability (%)	42	56	58	70	56

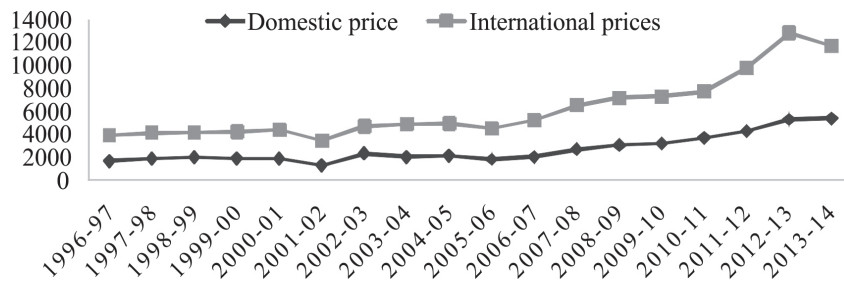
Source: Data compiled from DAC & FW, DGCIS and FAO.

Note: \*\*\*, \*\*, \* indicates significance at less than 1, 5, 10 per cent level, respectively.

**Figure 1. Proportionate share (%) of major exporting countries to world groundnut export (in quantity term)**

climatic conditions and niche market for certain commodities (Gupta 2014). In present era of liberalisation, trade policies have opened up new opportunities and challenges for Indian agriculture export. The comparative advantage is determined by relative prices. It is largely influenced by costs, output

prices, production structure and quality. A country has comparative advantage in a particular commodity if relative price of domestic goods is below its relative price in the world market. Relative prices depend on relative cost of production (Jagdambe 2016). In world market, groundnut is commonly traded in shelled



**Figure 2. Shelled groundnut prices in domestic (Mumbai) and international (Rotterdam) markets in rupees per quintal**

(kernel), in-shell (pod) and value-added forms. From India, shelled groundnut is the most commonly traded; over 90% of total groundnut is traded in shelled or kernels form. Therefore, export competitiveness of shelled groundnut is analysed. The shelled groundnut prices prevailing in domestic market were below international market depicts its export competitiveness (figure 2). Further perusal of NPC, EPC and ESC confirms the export competitiveness. Decreasing value of above estimates throughout the study years shows increasing competitiveness. Average NPC during 1996-97 to 2003-04 was 0.80 that decreased to 0.75 between 2004-05 to 2013-14, because of increase in international prices of groundnut kernels. EPC measures the ratio of surplus available with the domestic processors-cum-traders in domestic market. Throughout, the EPC was less than unity and decreased over time indicating increasing competitiveness. A value of EPC greater than NPC means that domestic processor are being accorded protection to tradable inputs through government policy and they are realizing higher returns as compared to a free trade situation. But in this study the NPC is found greater than EPC throughout implying no government protection. EPC accounts for distortions in tradable inputs only but not for non-tradable inputs. ESC corrects EPC by adjusting for the subsidies and taxes on non-tradable inputs. The value of ESC is less than unity throughout indicating export worthiness of groundnut produced in India. ESC was negative in 1999-00, 2001-02 and 2006-07 because the domestic value of non-tradable inputs was found higher than their economic value.

Above coefficients estimate competitive advantage without taking into consideration the potential for use of non-tradable by-products like haulm used as fodder, shell used as fuel and split kernels having economic

value. Hence, these underestimate the real potential of groundnut export. These limitations are taken care by DRCR. It compares the value of non-tradable resources used in production of a commodity under consideration. It compares opportunity costs of using domestic primary resources (land, labour and capital) and of traded inputs in domestic production to the value added at border prices. DRCR less than unity indicates that production of groundnut in the country is efficient and internationally competitive. It indicates that cost of domestic resources spent on production of unit quantity of groundnut is less than the net foreign exchange earned through its export. The opposite is true when DRCR is more than unity (Yao 1997). DRCR less than unit is taken as an indicator of long-run comparative advantage. Rani et al. (2014) studied the trade competitiveness of groundnut in Andhra Pradesh during 1989-2004 using NPC, EPC and DRCR for triennial endings. These estimates were measured below unity in post WTO period. Our results are in the line with their findings. On the other hand, trade competitiveness coefficients during pre-WTO period are more than unity (Chand 2002; Gulati 2002 and Rani et al. 2014) revealing lack of export competitiveness before WTO. Findings suggests that export competitiveness has improved in post-WTO period.

NPC, EPC and ESC measures, however, examine the competitive advantage from traders or traders-cum-processor point of view without ensuring the social profit. Social profit (SPAI) represents the foreign exchange earned by exporting a unit of commodity or saved by reducing its imports. The estimated per hectare social profit is positive in all the years, and show an increasing trend; (Rs 4,441/ha during 2004-05 to 2013-14 as compared to Rs 1,918/ha during 1996-97 to 2003-04). Social profit of producing and exporting groundnut shows net gain to the society and confirms competitive-



**Table 4. Competitiveness indices of groundnut export from India, 1996-97 to 2013-14**

Year	NPC	EPC	ESC	DRCR	SPAI	T
1996-97	0.77	0.45	0.41	0.45	2224	-2663
1997-98	0.84	0.53	0.40	0.47	2245	-2845
1998-99	0.93	0.65	0.54	0.49	3187	-1962
1999-00	0.83	0.42	-0.02	0.53	1571	-4866
2000-01	0.76	0.35	-0.03	0.52	1384	-5144
2001-02	0.61	0.22	0.02	0.55	1365	-8302
2002-03	0.98	0.68	0.06	0.56	1149	-5202
2003-04	0.71	0.42	0.37	0.57	2692	-6223
2004-05	0.77	0.40	0.15	0.59	1449	-5908
2005-06	0.69	0.31	0.10	0.56	1810	-7635
2006-07	0.64	0.18	-0.09	0.51	1324	-8292
2007-08	0.70	0.43	0.45	0.53	4565	-7012
2008-09	0.74	0.37	0.18	0.52	2817	-10209
2009-10	0.77	0.37	0.10	0.44	3713	-9107
2010-11	0.92	0.56	0.22	0.47	4973	-9278
2011-12	0.78	0.33	0.04	0.40	4407	-18569
2012-13	0.70	0.23	0.07	0.44	8144	-18810
2013-14	0.85	0.51	0.43	0.39	8223	-16429
Period 1	0.80	0.46	0.21	0.52	1918	-4790
Period 2	0.75	0.37	0.17	0.47	4442	-11705
Overall	0.78	0.41	0.19	0.50	3180	-8248

Source: Estimated from PAM of respective year.

Note: NPC= Nominal protection coefficient, EPC= Effective protection coefficient, ESC= Effective subsidy coefficient, SPAI= Social profit under free trade and T= Total policy transfer

ness from social point of view also. Total policy transfer describes the value of the resources going into (if positive) or coming out of (if negative) the commodity system from the economy as a whole. Total policy transfer is negative throughout years meaning that export of groundnut are subject to net taxation. The negative policy transfer throughout indicates that groundnut production system has generated resources for the nation. The average total policy transfer per hectare is Rs. 8,245. It is showing increasing trend throughout year confirms that earning to the nation's economy through groundnut export is improving shows enhancing competitiveness over the years.

#### 4 Conclusion and policy implication

The findings of the study have clearly brought out that export of groundnut from India has considerable potential in international market. NPC, EPC and ESC show its competitiveness from producer and producer-

cum- processor points of view. DRCR has been below unity throughout the post-WTO period indicating efficient utilization of domestic resources in groundnut cultivation. Social profit was measured positive indicating groundnut export is profitable from social perspective as well. The total policy transfer has been negative indicating that groundnut production-cum-export is net taxed or is generating resources for the economy.

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