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Competitiveness of Indian agriculture sector: A case study of cotton crop

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Abstract

This study has critically examined the issue of Cotton subsidies in USA as well made a comparative analysis of cotton sector between USA and India in the background of USA claim that African cotton producers' plight was not due to the trade-distorting subsidies of USA but was on account of upward trend in cotton production in India and China in defiance of market signals. This study also estimated the comparative advantage in cotton production and cotton export diversification by calculation various indicators. Result shows that India has comparative advantage in production and export of cotton in recent years. This study highlights that USA has 14 percent share in world production, however, its share in world export is 38 percent. USA exports 86 percent of cotton production to other countries. The cost of producing cotton is highest in USA, which is 4.5 to 6 times higher than India. During 1995-2010, USA has given about $37 billion to cotton producers though various programmes like counter-cyclical payments, decoupled income, commodity certificates etc. Despite high cost of cotton production, USA is enjoying artificial comparative advantage in cotton market due to high level of domestic support given to farmers and big corporation in USA.

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1. Introduction

Agriculture subsidies in developed countries have been a major stumbling block in Doha Round negotiations. Developed countries are providing huge subsidies to agriculture sector and thereby, create distortions in the international market. Some of the developed countries are enjoying artificial comparative advantage due to a large amount of subsidies and thus, adversely affecting the welfare of millions of farmers in developing countries. Rich countries policies have certainly affected cotton prices to the detriment of non-subsidized cotton growers (Baffes, 2007). Even after
ten years of Doha Round, agriculture support has been a contentious issue between developed and developing countries. Within agriculture subsidy, cotton subsidies are the flashpoint among the WTO members. Cotton is a vital cash crop in developing countries due to its importance in terms of foreign exchange earnings, livelihoods of millions of farmers and agriculture growth. In Doha round, reduction in cotton subsidies has become a litmus test for the successful agriculture negotiations and achieving the development agenda of this round. Highly subsidised cotton sector in USA is hampering the interest of developing as well as of least developing countries. In recent agriculture negotiations, C-4 countries namely Benin, Burkina Faso, Chad and Mali (the cotton-4) are demanding reduction of cotton subsidy in developed countries especially in USA. Due to importance of cotton in C-4 countries, WTO members agreed to “Sectoral Initiative on Cotton” in 2003 and a sub-committee on cotton was created in 2004. Hong-Kong ministerial meeting reaffirm of WTO’s members’ commitment to address cotton “ambitiously, specifically and expeditiously”. Quadrilateral discussion was also held among Brazil, C-4, EU and US on the issue of huge subsidy given to cotton sector but there was no real progress as the USA refused to address cotton until there is an agreement on agriculture modalities. In this context, on July 2009, a dialogue was held between C-4 and USA in Washington, where C-4 raised the issue of US subsidies on Cotton and demanded the reduction of cotton subsidies. In its response, USA explained that Africa's problems were not due to USA cotton subsidies. It was stated that the cotton production in USA has been nearly halved over the past several years and consequently, farm payments are significantly lower than before as more and more cotton growers in the United States were shifting to more lucrative crops - such as corn and soybeans. It was indicated that a strong Euro and subsidized cotton programs and adoption of biotech cotton in other countries - primarily China and India - were impacting African production far more than the US cotton program. It was also observed that African cotton producers' plight was not due to the trade-distorting subsidies of USA but was on account upward trend in cotton production in India and China in defiance of market signals. It was portrayed that the US was also a fellow-sufferer like C-4 vis-à-vis China and India. With this background, the objective of this study is to measure the competitiveness of India in the production of cotton sector between USA and India. To that end, the next section discusses the methodology of this paper, while section 3 deals with an overview of cotton sector. Section 4 measures the competitiveness of India in cotton production and trade through various indicators, while section 5 & 6 highlights the subsidies issue and the impact of USA subsidies on cotton sector. Section 7 summarizes the main findings of this study.

2. Methodology and data source

To measure the competitiveness of cotton sector, standard Revealed Comparative advantage (RCA), Bilateral RCA and Trade Concentration Index is estimated. Data for these indicators has been extracted from WITS Comtrade. To estimate various indicators of trade, Tradesift software and its manual is used.

2.1. Standard RCA

The Balassa index of Revealed Comparative Advantage (RCA) gives an indication of those industries in which a given country may have a comparative advantage. The standard calculation of revealed comparative advantage measures how much a country is exporting a given good relative to its total trade, in comparison to the share of that good in world trade. Country i is said to have a “revealed comparative advantage” in a good when the share of that good in its exports is bigger than the share of that good in world exports.

The revealed comparative advantage (RCA) is calculated as:
where $x_{i}^{k}$ represents exports of sector $k$ by country $i$ to the world, and $X_{i}$ denotes total exports from country $i$ to the World, and where capital letter subscripts represent total flows of all goods. The RCA index ranges between 0 and infinity and where the upper bound for any given calculation is given by $x_{i}^{w}/X_{i}$. An RCA greater than 1 implies that the given country has a comparative advantage in that sector in the sense that compared with the world as a whole, this sector has a large share of the country’s exports. One difficulty with the RCA measure as detailed above is that the upper bound is stable across countries but varies across sectors and years. This makes the index very suitable for cross country comparisons, but it does have to be used carefully when making cross sectoral comparisons and over time. An alternative version of the index which is often also used therefore is: Normalised RCA = $(RCA - 1)/(RCA + 1)$. This is an approximation of the log transformation of the RCA index, and now ranges from between -1 to 1. An index of less than 0 suggests a revealed comparative disadvantage in a given product, and an index of greater than 1 suggest revealed comparative advantage in the product. The normalisation means the index is suitable for cross country, cross sector and cross time comparisons.

2.1 Bilateral RCA

The BRCA1 uses as denominator the exports of a selected comparator country - country $j$. Hence in this case the RCA is calculated by comparing the share of exports of country $i$ to the world, to the share of exports of country $j$ to the world. The indicator then becomes a bilateral RCA, and shows the products for which country $i$ has revealed comparative advantage, with respect to country $j$. The formula is:

$$BRCA_{ij}^{k} = \left(\frac{x_{i}^{k}}{X_{i}}\right) \left/ \left(\frac{x_{j}^{k}}{X_{jw}}\right)\right.$$

Which is the same formula as for the RCA, but where trade with the world is compared country $j$’s trade with the world. Like the RCA, the BRCA1 can also be computed in a normalised form.

2.2 Trade Concentration Index

The Trade Concentration Index is aimed at assessing the degree of concentration / diversification of a given country's exports. The index used here is based on the Hirschmann-Herfindahl Index, which ranges between zero and one. The index can, in principle either be calculated by product or by country. The TCI is a summary measure which aggregates information from across a range of sectors, subsectors or products. Hence the index can be provided either for all trade, or for particular sectors – in all cases on the basis of more detailed sub-sectoral or product level detail. The Trade Concentration Index by product (TCI), which measures how concentrated is the commodity export structure of a particular country is calculated using the following equation:

$$TCI_{\text{by Product}} = \sum_{k} \left(\frac{x_{ij}^{k}}{x_{ij}}\right)^{2}$$

where $x_{ij}$ is country $i$’s exports of product $k$ to country $j$. The index sums across products the squares of the product shares in country $i$’s exports of product $k$ to country $j$; the product shares themselves sum to 1. Where $x_{ij}$ is country $i$’s exports of product $k$ to country $j$, the index sums
across products the squares of the product shares in country i’s exports of product k to country j; the product shares themselves sum to 1. This index describes the degree of diversification of the country’s import and export pattern. It shows the degree to which a given country's exports are particularly concentrated by either product or destination.

### 2.3 Cost of Cultivation

This study also compared cost of cultivation of cotton in different countries to measure the real comparative advantage in the production of cotton. Data for the different component of cost of cultivation of cotton is extracted from international cotton advisory committee.

### 2.4 Cotton subsidies

Cotton subsidies related data is extracted from various WTO notifications on domestic support and Environmental Working Group. In this paper, a comparative analysis of cotton subsidies in India and USA has also been undertaken.

### 3. An overview of cotton sector

Cotton is a major source of raw material to the textile industry. About the production of cotton, China ranks first with a share of 30 percent of total production during 2007-2010. India and United States ranks second and third respectively with 22 percent and 14 percent share. China is the world’s leading cotton consumer as well as leading importer (see table 1). India and Pakistan comes at second and third place respectively in terms of consumption whereas Bangladesh and Turkey are the major importers of cotton. Export market of cotton is dominated by USA, India and Brazil.

#### Table 1: Global scenario during 2007-08 to 2010-11: Cotton

| Production (%) | Consumption (%) | Import (%) | Export (%) |
|----------------|----------------|------------|------------|
| China 30.5     | China 40.8     | China 29.2 | United states 37.8 |
| India 21.7     | India 16.5     | Bangladesh 10.6 | India 15.4 |
| United states 14.0 | Pakistan 9.4 | Turkey 9.8 | Brazil 6.3 |
| Pakistan 8.0   | Turkey 4.8     | Indonesia 6.5 | Australia 5.0 |
| Brazil 6.1     | Brazil 3.7     | Vietnam 4.1 | Uzbekistan 9.7 |
| Australia 1.8  | Bangladesh 3.1 | Thailand 5.0 | Pakistan 1.4 |
| Uzbekistan 4.0 | United states 3.3 | Korea south 2.8 | Greece 2.6 |
| Other 13.9     | Other 18.1     | Other 32.0 | Other 21.7 |

Source: USDA, Foreign Agriculture Service

USA has 14 and 3.3 percent share in the world production and consumption respectively; however, its share in world export is 38 percent (figure 1). USA exports 86 percent of cotton production to other countries whereas India exported about 22 percent of cotton production during 2007-11. Figure 1 shows the trend of export to total production in USA and India during 2007-11. It is to be noted that the share of export to total production of USA was more than 100 percent during 2008-09. It happened due to the fact that USA utilised closing stock of previous year for export. With such a huge share in the export market, agriculture policy in USA has major implications for other cotton producing countries and important bearing on the trend of international prices of cotton.
About India, cotton production has increased substantially after 2001-02 onwards. Area of cotton has increased from 7.82 million hectare in 1980-81 to 11.99 million hectare in 2011-12. Production of cotton has increased 7 million bales to 36 million bales in 2011-12 (see figure 2). It was due to increase in area as well as increase in productivity of cotton after 2001-02 onwards. Yield per hectare has increased from 152 kg/hectare in 1980-81 to 512 kg/hectare in 2011-12 (see figure 3). Increase in production is also due to better irrigation facility as well as introduction of genetically modified seeds in India. Despite, increase in production of cotton, India consumes about 78 percent of production for domestic purpose and only 22 percent of cotton is exported to world market.
Gujarat, Maharashtra and Andhra Pradesh are the major cotton producing states in India. However, productivity is higher in Punjab and Haryana in comparison with major producing states of cotton.

Table 2: Area, Production and Yield of Cotton during 2009-10 in major Producing States

| State            | Area Million Hectares | % to All India | Production Million Bales of 170 Kgs | %     | Yield Kg./ Hectare | Irrigation (%) |
|------------------|------------------------|----------------|------------------------------------|-------|-------------------|----------------|
| Gujarat          | 2.46                   | 24.32          | 7.99                               | 33.25 | 551               | 56.7           |
| Maharashtra      | 3.50                   | 34.50          | 5.86                               | 24.39 | 285               | 2.7            |
| Andhra Pradesh   | 1.47                   | 14.48          | 3.23                               | 13.43 | 374               | 18.2           |
| Punjab           | 0.51                   | 5.04           | 2.01                               | 8.35  | 667               | 100.0          |
| Haryana          | 0.51                   | 5.00           | 1.93                               | 8.02  | 646               | 99.5           |
| Rajasthan        | 0.44                   | 4.39           | 0.90                               | 3.76  | 345               | 93.5           |
| Karnataka        | 0.46                   | 4.51           | 0.87                               | 3.61  | 323               | 20.1           |
| Madhya Pradesh   | 0.61                   | 6.03           | 0.86                               | 3.56  | 238               | 41.2           |
| Tamil Nadu       | 0.10                   | 1.03           | 0.23                               | 0.94  | 368               | 27.7           |
| Others           | 0.07                   | 0.70           | 0.17                               | 0.69  | @                 | -              |
| All India        | 10.13                  | 100.00         | 24.02                              | 100.00| 403               | 35.3           |

Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation
4. Competitiveness of India in cotton production

This section is further divided into five subsections. First subsection shows the trend in export and import of cotton. Second subsection deals with Trade concentration index while third and fourth sub-section show the result related to standard and bilateral RCA respectively. The fifth sub-section makes a comparison of cost of cultivation of cotton in different countries.

4.1 Trend in export and import of cotton

In this study, competitiveness of raw cotton is estimated. Chapter 52 of HS classification deals with cotton. However, there are many lines within chapter 52, which are related to processed cotton. For example, at four digit level, there are twelve lines. In this paper, comparative advantage in cotton production is computed for raw cotton (HS 5201).

Table 3: HS classification of Cotton: 52

| HS Code | 4 Digit Commodity Description                                      |
|---------|---------------------------------------------------------------------|
| 5201    | Cotton, not carded or combed                                       |
| 5202    | Cotton waste(including yarn waste & ginned stock)                   |
| 5203    | Cotton carded or combed                                            |
| 5204    | Cotton sewing thread w/n put up for retail sale                     |
| 5205    | Cotton yarn(othr thn sewing thread)contng 85% or more by wt of coton nt put up fr retail sale |
| 5206    | Cotton yarn(othr thn sewing thrd)contng coton <85% by wt nt put for retail sale |
| 5207    | Cotton yarn(other than sewing thread) put up for retail sale        |
| 5208    | Wovn fbrcs of coton contng>=85% by wt of coton weighng nt more thn 200 g/m2 |
| 5209    | Wovn fbrcs of cotton, contng >=85% coton by wt weighing>200 gm per sqm |
| 5210    | Wovn fbrcs contng<85% coton,mxd mainly or solely wth manmade fbrcs weighng<200g/m2 |
| 5211    | Wovn fbrcs of coton,contng<85% coton,mxd mainly wth mnmd fbrcs weighng>200 g/m2 |
| 5212    | Other woven fabrics of cotton                                       |

Source: World integrated Trade Solution (WITS) database

Table 4: Export and import of Agricultural Commodities and Cotton (million USD)

| Year | Agriculture Export | Cotton : HS 52 | Raw Cotton : 5201 |
|------|--------------------|----------------|-------------------|
|      | Export  | Import | Trade balance | Export | import | Trade balance | Export | Import | Trade balance |
| 1996 | 6010    | 2184   | 3826          | 2826   | 36     | 2790          | 413    | 9      | 404          |
| 1997 | 5703    | 2558   | 3145          | 2628   | 67     | 2561          | 197    | 21     | 176          |
| 1998 | 5248    | 3782   | 1466          | 2018   | 150    | 1868          | 38     | 90     | -52          |
| 1999 | 4725    | 3962   | 763           | 2197   | 316    | 1881          | 11     | 289    | -277         |
| 2000 | 4628    | 2968   | 1660          | 2289   | 359    | 1930          | 9      | 327    | -319         |
| 2001 | 5156    | 3444   | 1712          | 2126   | 430    | 1697          | 10     | 385    | -375         |
| 2002 | 5564    | 3911   | 1653          | 2149   | 353    | 1796          | 7      | 274    | -268         |
| 2003 | 5860    | 4785   | 1074          | 2171   | 496    | 1675          | 37     | 359    | -322         |
| 2004 | 7526    | 5066   | 2460          | 2482   | 394    | 2088          | 180    | 217    | -37          |
| 2005 | 8698    | 5657   | 3042          | 2612   | 436    | 2176          | 326    | 159    | 167          |
| 2006 | 10753   | 5829   | 4924          | 3510   | 463    | 3047          | 968    | 156    | 812          |
| 2007 | 14652   | 7871   | 6781          | 4409   | 515    | 3894          | 1642   | 189    | 1453         |

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India has a positive trade balance in agriculture sector. At the chapter level i.e. HS code 52 and at four digit level (HS code 5201), there is a positive trade balance (table 4). However, India experienced a negative trade balance in raw cotton during 1998 to 2004. It is also noteworthy that cotton accounted for 25 percent of agriculture export; whereas share of raw cotton in agriculture export was 11 percent in 2011 (table 5). The share of raw cotton (HS Code 5201) in total export of cotton (chapter 52) was 43 percent for the year 2011.

Table 5: Share of Cotton: HS52 and Raw Cotton: 5201 in Total Agricultural Export and Import of India

| Year | Cotton : HS 52 | Raw Cotton : 5201 |
|------|----------------|-------------------|
|      | Export         | Import            | Export | Import |
| 1996 | 47.02          | 1.66              | 6.88   | 0.40   |
| 1997 | 46.08          | 2.63              | 3.45   | 0.83   |
| 1998 | 38.45          | 3.95              | 0.72   | 2.37   |
| 1999 | 46.49          | 7.97              | 0.24   | 7.29   |
| 2000 | 49.46          | 12.10             | 0.19   | 11.03  |
| 2001 | 41.24          | 12.47             | 0.20   | 11.19  |
| 2002 | 38.62          | 9.01              | 0.12   | 7.02   |
| 2003 | 37.05          | 10.36             | 0.63   | 7.50   |
| 2004 | 32.98          | 7.78              | 2.40   | 4.29   |
| 2005 | 30.03          | 7.71              | 3.75   | 2.81   |
| 2006 | 32.64          | 7.94              | 9.01   | 2.68   |
| 2007 | 30.09          | 6.54              | 11.21  | 2.40   |
| 2008 | 23.08          | 8.13              | 8.22   | 4.81   |
| 2009 | 21.77          | 3.59              | 6.86   | 1.59   |
| 2010 | 33.71          | 3.38              | 14.55  | 1.21   |
| 2011 | 25.29          | 2.80              | 10.99  | 1.08   |

Source: World integrated Trade Solution (WITS) database

4.2 Trade concentration index

The Trade Concentration Index is aimed at assessing the degree of concentration / diversification of a given country's exports. It ranges between zero and one. In chapter 52, there are twelve lines at four digit level. TCI shows the diversification of cotton export at four digit level. Lower TCI indicates higher the diversification of exports in these lines and vice versa. Result shows that TCI for India is low in comparison to other countries but higher than Pakistan (table 6). It indicates that India portfolio of cotton export was much diversified in comparison to other major players in cotton production and trade.
Table 6: Trade concentration index of selected countries of cotton in chapter 52

| Year | Australia | Brazil | China | Greece | Pakistan | India | USA |
|------|-----------|--------|-------|--------|----------|-------|-----|
| 1996 | 0.73      | 0.33   | 0.45  | 0.28   | 0.52     |       |     |
| 1997 | 0.81      | 0.38   | 0.35  | 0.41   | 0.31     | 0.49  |     |
| 1998 | 0.85      | 0.44   | 0.32  | 0.35   | 0.25     | 0.46  |     |
| 1999 | 0.85      | 0.43   | 0.29  | 0.43   | 0.25     | 0.25  |     |
| 2000 | 0.86      | 0.35   | 0.29  | 0.44   | 0.25     | 0.32  |     |
| 2001 | 0.91      | 0.33   | 0.31  | 0.44   | 0.24     | 0.34  |     |
| 2002 | 0.88      | 0.31   | 0.28  | 0.35   | 0.24     | 0.32  |     |
| 2003 | 0.86      | 0.29   | 0.28  | 0.40   | 0.26     | 0.22  | 0.45|
| 2004 | 0.89      | 0.37   | 0.30  | 0.37   | 0.23     | 0.20  | 0.47|
| 2005 | 0.91      | 0.40   | 0.30  | 0.38   | 0.24     | 0.21  | 0.47|
| 2006 | 0.92      | 0.34   | 0.29  | 0.45   | 0.24     | 0.24  | 0.51|
| 2007 | 0.90      | 0.43   | 0.31  | 0.31   | 0.25     | 0.29  | 0.54|
| 2008 | 0.92      | 0.55   | 0.31  | 0.40   | 0.22     | 0.29  | 0.55|
| 2009 | 0.94      | 0.67   | 0.32  | 0.52   | 0.24     | 0.28  | 0.51|
| 2010 | 0.97      | 0.69   | 0.35  | 0.56   | 0.24     | 0.36  | 0.60|
| 2011 | 0.99      | 0.79   | 0.34  | 0.49   | 0.22     | 0.33  | 0.60|

Source: Author’s calculation

4.3 Standard Revealed Comparative Advantage

Table 7 shows the Standard Revealed Comparative advantage index for some of major players in cotton trade and production. All the countries, except China has comparative advantage in raw cotton trade in 2011. For USA, RCA always remain positive during the period 1996-2011. For India, RCA was negative during 1998 to 2003. However, increase in production and export during the last decade has led to positive RCA in raw cotton trade for India.

Table 7: Standard revealed comparative advantage of selected countries in Cotton - HS 5401

| Year | Australia | Brazil | China | Greece | Pakistan | India | USA |
|------|-----------|--------|-------|--------|----------|-------|-----|
| 1996 | 0.76      | -0.90  | 0.92  | 0.77   | 0.47     |       |     |
| 1997 | 0.83      | -0.99  | -0.98 | 0.90   | 0.60     | 0.47  |     |
| 1998 | 0.86      | -0.89  | -0.64 | 0.88   | -0.09    | 0.47  |     |
| 1999 | 0.90      | -0.82  | 0.19  | 0.94   | -0.52    | 0.19  |     |
| 2000 | 0.80      | -0.47  | -0.14 | 0.89   | -0.78    | 0.22  |     |
| 2001 | 0.82      | 0.22   | -0.70 | 0.87   | -0.75    | 0.29  |     |
| 2002 | 0.78      | 0.08   | -0.44 | 0.87   | -0.82    | 0.39  |     |
| 2003 | 0.68      | 0.20   | -0.71 | 0.88   | 0.41     | -0.47 | 0.47|
| 2004 | 0.67      | 0.41   | -0.97 | 0.87   | 0.57     | 0.15  | 0.50|
| 2005 | 0.78      | 0.60   | -0.98 | 0.90   | 0.68     | 0.54  | 0.64|
| 2006 | 0.75      | 0.46   | -0.95 | 0.91   | 0.57     | 0.79  | 0.65|
| 2007 | 0.61      | 0.58   | -0.94 | 0.84   | 0.51     | 0.86  | 0.65|
2008 0.41 0.61 -0.95 0.88 0.74 0.82 0.63
2009 0.56 0.70 -0.96 0.92 0.85 0.76 0.63
2010 0.60 0.55 -0.99 0.90 0.79 0.84 0.61
2011 0.77 0.64 -0.94 0.77 0.82 0.79 0.63

Source: Author’s calculation

4.4 Bilateral RCA

Table 8 show the bilateral RCA of India with other major players in cotton production and trade. Result shows mixed trend as India has experienced both positive and negative RCA during 1996 to 2011. However, in recent years, bilateral RCA has improved significantly and it is positive for all major partners except Pakistan in 2011.

Table 8: Bilateral revealed comparative advantage of India with selected countries in Cotton - HS 5401

| Year | USA    | AUS    | Brazil | China | Greece | Pakistan |
|------|--------|--------|--------|-------|--------|----------|
| 1996 | 0.472  | 0.040  | 0.987  | -0.522|
| 1997 | 0.179  | -0.460 | 0.998  | 0.994 | -0.663 |
| 1998 | -0.536 | -0.882 | 0.866  | 0.584 | -0.897 |
| 1999 | -0.643 | -0.965 | 0.526  | -0.646| -0.980 |
| 2000 | -0.849 | -0.972 | -0.482 | -0.711| -0.985 |
| 2001 | -0.852 | -0.972 | -0.833 | -0.101| -0.981 |
| 2002 | -0.916 | -0.976 | -0.843 | -0.589| -0.987 |
| 2003 | -0.770 | -0.872 | -0.612 | 0.350 | -0.956 | -0.737 |
| 2004 | -0.382 | -0.574 | -0.279 | 0.978 | -0.822 | -0.457 |
| 2005 | -0.155 | -0.408 | -0.081 | 0.994 | -0.708 | -0.209 |
| 2006 | 0.286  | 0.096  | 0.527  | 0.994 | -0.415 | 0.399 |
| 2007 | 0.473  | 0.525  | 0.557  | 0.995 | 0.064  | 0.627 |
| 2008 | 0.405  | 0.622  | 0.430  | 0.995 | -0.189 | 0.221 |
| 2009 | 0.252  | 0.348  | 0.133  | 0.995 | -0.549 | -0.243 |
| 2010 | 0.471  | 0.486  | 0.535  | 0.999 | -0.253 | 0.152 |
| 2011 | 0.310  | 0.057  | 0.301  | 0.993 | 0.053  | -0.092 |

Source: Author’s calculation

4.5 Comparison of Cost of Cultivation

This sub-section deals with the comparison of cost of cultivation in different countries. International cotton advisory committee provides data on cost of cultivation of cotton in different countries. Table 9 and figure 4 shows the cost of cultivation of cotton in India and USA for the year 2009-10. Total cost of cultivation per hectare in India varied between US$596 in central rained area to US$1007 in north India. Total cost per hectare in USA is much higher than India.

Table 9: Cost of producing one Hectare of Cotton(US$)

| Country/Region | Pre-sowing | Sowing | Growing | Harvesting | Ginning | Economic | Fixed | Total |
|----------------|------------|--------|---------|-----------|---------|----------|-------|-------|
| India, North (Irrigated) | 219 | 162 | 244 | 178 | 119 | 61 | 24 | 1007 |
| India, Central (Irrigated) | 150 | 140 | 229 | 143 | 93 | 52 | 25 | 831 |
| India, Central (Rainfed) | 112 | 121 | 121 | 117 | 80 | 36 | 10 | 596 |
| India, South (Rainfed) | 137 | 131 | 145 | 133 | 88 | 40 | 11 | 685 |

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The net cost of producing one kg of lint in the USA (national average) is 4.5 to 6 times higher than India. For example in USA, the cost of production a kg of lint is US$ 1.96, whereas in India, it varied between US$ 0.33 to US$ 0.44. ICAC (2010) noted that the net cost of producing a kilogram of lint in the US fruitful Rim region is the highest under irrigated conditions, US$2.38/kg lint, closely followed by Colombia and China. The cost of production per kg lint is lowest in India, but it so because of recent increases in yields and the high value for seed after ginning.

![Figure: 4: Cost of producing One Kg of Cotton (US$)](source)

It is clear that India has comparative advantage in the cultivation of cotton in comparison to USA. Variable cash expenses include the cost of seed cotton production plus ginning, but they do not include land rent and seed value. Net cost is total cost (including economic and fixed costs) but does not include land rent and seed value. One important question arises, when the cost of cultivation in USA is highest in the world then how USA ranks first in global export? This brings the issue of cotton subsidy to forefront.

**5. Cotton subsidies in USA and India**

India has made notifications on domestic support for the period 1995-96 to 2003-04 (see WTO notification G/AG/N/IND/1, G/AG/N/IND/2, G/AG/N/IND/7). The product specific subsidy was negative for almost all commodities during 1995-2004 due to the fact that minimum support price of all the commodities (except sugarcane) was less than fixed external reference price of these commodities. Table 10 shows that product specific support for cotton was negative during 1995-96 to 2003-04. The non-product specific subsidy was also within the de minimis limit. In this context, it is noteworthy to mention Art. 6.2 of AoA, if a developing country provide input subsidies to low...
income or poor farmers, then it would be exempted from the calculation of AMS. However, question arises who are low income or poor farmers in India. As per WTO notification (G/AG/N/IND/1 and G/AG/N/IND/2), if a farmer has landholding up to 10 hectare, he would come under the category of low or poor income farmers. About 99 percent of agricultural landholding comes under Art 6.2. It implies, whatever non product-specific support Indian government is giving to farmers, it is exempted from Amber box.

Being a developed nation, USA has taken reduction commitments related to amber box subsidies with base period 1986-88. USA had to reduce the domestic support exceeding the de-minimis limit by 20 percent over the implementation period 1995-2000. Part IV of USA schedule related to goods provides information about the commitments related to domestic support. At present final bound AMS for USA is US$19 billion. About the component of Current AMS of USA, non-product specific support always remained within the de-minimis level i.e. 5 percent of value of production, but product specific support for many crops/products was higher than the de-minimis level (see figure 5 for trend in domestic support).

Table: 10: Aggregate Measurement of Support

| Product                  | 1995-96 | 1996-97 | 1997-98 | 1998-99 | 1999-00 | 2000-01 | 2001-02 | 2002-03 | 2003-04 |
|--------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Cotton                   | -2,106  | ---     | ---     | -64     | -72     | -91     | -147    | -94     | -140    |
| Non-product-specific     | 5,772   | 930     | 1,003   | 0       | 0       | 0       | 0       | 0       | 0       |
| support                  |         |         |         |         |         |         |         |         |         |

Source: WTO Notifications

Figure 5: Trend of domestic support to agriculture sector in USA (Millions $)

However, Current AMS which is the sum of product and non-product specific support remains within the limit of final bound AMS. It is noteworthy that the reduction commitment related to domestic support is applicable at the aggregate level and therefore a member can concentrate or give domestic support to few products/crops provided the aggregate support remain within the final bound AMS limit. Due to absence of any rule related to cap on product-specific support, USA concentrated domestic support only on few products.
Trend of product-specific support reveals that USA’s product-specific support was mainly concentrated on few crops. Product specific support of seven products i.e. dairy, corn cotton, rice, wheat, soybean and sugar accounted for more than 90 percent of calculated AMS.

Product specific support as a percentage of value of production also provides the evidence of highly subsidised agriculture sector of USA which is creating trade distortion in international trade. For cotton, this percentage was 0.44 in 1995, which increased to 74.16 percent in 2001 but decline to 3.33 percent in 2009 (see figure 6). It is to be noted that after 2001, this percentage declined due to introduction of counter cyclical payment in Farm Act 2002 and USA classified support given under counter cyclical payment as non-product specific support. The sum of cotton support under counter cyclical payment and product specific support given in USA notification would be much higher.

Source: WTO notifications
Figure: 6: Product Specific Support of Cotton

Table 11: Various Programme of Cotton Coverage In USA: 1995-2010 (Million USD)

| Program                                      | Total Payments |
|----------------------------------------------|----------------|
| Counter Cyclical Payment - Cotton            | 7413           |
| Commodity Certificates - Coop Cotton         | 4832           |
| Production Flexibility - Upland Cotton      | 4031           |
| Direct Payment - Upland Cotton              | 3823           |
| Crop Ins. Premium Subsidy - Cotton          | 3513           |
| Loan Deficiency - Upland Cotton             | 2565           |
| Market Loss Assistance - Upland Cotton      | 2065           |
| Commodity Certificates - Cotton              | 1434           |
| Estimated Direct Payments 2009-2010 - Cotton| 1010           |
| Market Gains Warehouse - Upland Cotton      | 370            |
| Advance Deficiency - Upland Cotton          | 98             |
| Storage Forgiven - Upland Cotton            | 39             |

Source: Environmental Working Group
According to environmental working group (EWG), USA has given US$32 billion subsidy to cotton under various programmes during 1995-2010. USA provided support to cotton producers through various programmes like counter-cyclical payments, commodity certificates, production flexibility, direct payments etc (see table 11). It is also important to note that the major part of commodity support is given to big corporation or farmers. For example, from 1995 to 2011, USA has provided US$172.3 billion to agriculture sector covering all the commodities. The top 10 percent of commodity payment recipients were paid 77 percent of commodity payments (see table 12). In case of India, about 99 percent of farmers are resource-less or low income farmers and these farmers have less than 10 hectare.

| Pct. of Recipients | Pct. of Payments | Number of Recipients | Total Payments 1995-2011 | Payment per Recipient |
|--------------------|------------------|----------------------|--------------------------|-----------------------|
| Top 1%             | 26.00%           | 29,044               | 44128212077              | 1519357               |
| Top 2%             | 38.00%           | 58,088               | 64697570275              | 1113785               |
| Top 3%             | 46.00%           | 87,133               | 79919957252              | 917218                |
| Top 4%             | 53.00%           | 116,177              | 91906871362              | 791094                |
| Top 5%             | 59.00%           | 145,222              | 101680779953             | 700175                |
| Top 6%             | 64.00%           | 174,266              | 109825764523             | 630219                |
| Top 7%             | 68.00%           | 203,311              | 116708765030             | 574041                |
| Top 8%             | 71.00%           | 232,355              | 122583424444             | 527570                |
| Top 9%             | 74.00%           | 261,400              | 127643996314             | 488309                |
| Top 10%            | 77.00%           | 290,444              | 132036367330             | 454602                |

Source: Environmental Working Group

Now question arises, whether USA subsidy on cotton has any impact on the international prices of cotton?

6. Impact of USA subsidy on international prices of cotton

The Upland cotton dispute is a landmark case as Brazil successfully challenged the trade distorting subsidies of USA. In September 2002, Brazil initiated consultations with the US regarding prohibited and actionable subsidies provided to US producers, users and/or exporters of upland cotton. Brazil complained that international cotton prices were significantly suppressed as a result of huge subsidy given to agriculture sector. Later, Brazil requested the establishment of a panel. This dispute (2003-2009) leads to many important decisions, which has many implications for the trade distorting subsidies. Panel found (which was later upheld by the Appellate Body) that the price-contingent subsidies (marketing loan program payments, user marketing (Step 2) payments, market loss assistance payments, and counter-cyclical payments) has led to a significant price suppression during the reference period 1999-2000. After the original ruling, the USA put an end on the user marketing (Step 2) payments. However, USA did not make any change to the marketing loan or countercyclical subsidies programs. Therefore, Brazil again started compliance proceeding against the USA. Brazil claimed that the effect of the new “basket” of marketing loan and counter-cyclical subsidies caused present serious prejudice, inter alia, in the form of significant price suppression in the world cotton market. In this context, it important to mention the paper submitted by Prof Daniel A. Sumner. He used a traditional log linear equilibrium displacement model to simulate the effects of removing U.S. cotton subsidy programs on U.S. production, U.S. exports and world prices of cotton. The model simulates impacts for recent crop years, 1999
through 2005, and for future years, 2006 through 2008. Result showed that the effect of marketing loan and counter-cyclical payments is to lower world prices of cotton by 9.3 percent to 10.7 percent in marketing year 2005, depending on the procedure used to create proxies for farmers’ expectations.

Fousseini Traoré (2007) also supports the depressing effect of subsidies on real world-cotton Price. He assessed the impact of United States cotton subsidies on world cotton price with a simultaneous equations model of world cotton market. A negative and significant impact of these subsidies on cotton price is founded in the short run as well as in the long run. Ian Gillson (2004) by using GTAP model simulate the effect of removal of all production and income assistance as well as the removal of all tariffs to cotton producers in US and China, on Australian cotton production. The model uses trade and production data for 1999 and assumes US assistance to the cotton sector equal to US$0.31 per kilogram and US$0.59 per kilogram for China. The result shows an increase in the world price of cotton by 13.4 percent; and a drop in US cotton production by 15.9 percent. High support to cotton producer in USA through various programmes led to fall in the international prices of cotton. For example, cotton prices has shown declining trend from 1995 to 2009 (see figure 7). This has led to adverse impact on the welfare of millions of farmers in developing and least developing countries.

![Figure 7: Trend in International Cotton Prices Cotton (COTLOOK, index 'A') - US cents/lb](https://ssrn.com/abstract=3653307)

7. Conclusion

USA claimed that African cotton producers' plight was not due to the trade-distorting subsidies of USA but was on account of upward trend in cotton production in India and China in defiance of market signals. In this context, this study critically has critically examined the issue of cotton subsidies in USA as well as made a comparative analysis of cotton sector between USA and India. This study also estimated the comparative advantage in cotton production and cotton export diversification by calculation various indicators. Result shows that in recent years, India has comparative advantage in cotton production and export due to steep increase in production of cotton during last decade. USA is the largest exporter of cotton in the world. USA has 14 percent share in world production; however, its share in world export is 38 percent. USA exports 86 percent of cotton production to other countries whereas India exports about 22 percent of cotton production. About the cost of production, the net cost of producing a kg of lint in the USA (national average) is 4.5 to 6 times higher than India. Despite high cost of production, USA holds first position in export market. It happened due to the fact that USA is providing huge support to cotton through various programme. USA has given about $37 billion to cotton producers through various programmes during 1995-2010. On the other hand, product specific support to cotton is negative in India. High
level of support in USA has led to fall in international prices of cotton and therefore, has adverse impact on the cotton producers in developing and least developing countries. Given the above fact, it is illogical and unreasonable on the part of USA to blame India for the plight of cotton producing countries especially C-4 countries. Despite huge subsidies given by USA to cotton sector, India still has comparative advantage in international trade of cotton.

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