

# *Investigating Growth, Instability and Concentration of Indian Agricultural Export*

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## **Abstract**

Export is an important source of foreign exchange and plays essential role in the growth of Indian economy. India is one of the major exporters of agricultural commodities there by earning good foreign exchange reserves. The study aims to investigate the growth rate instability and concentration of agricultural export in terms of earnings and quantity. The secondary data of export quantity (in MT) and Value (in Crore) has been extracted from official portal of Agricultural and Processed Food Products Export Development Authority (APEDA) Ministry of Commerce, Government of India. Exponential regression model, Cuddy - Della Valle Instability Index and Gini-Hirschmann Index have been used to measure the growth, instability and export concentration respectively. Results shows that Export growth of agricultural products in quantity and earning are aligned in the same line except few products such as fresh fruits and fruits/vegetable seeds where the growth of export quantity reduced significantly and earning has been increased due to increased price. Positive trends show that export concentration has been increased over the period of time. Which depicts that India need to reduce the commodity concentration, specific export promotional policies may be considered to provide well diversifiable and growing export base.

**Keywords:** Concentration, Gini-Hirschmann, Export, Agriculture

## **Introduction**

Agriculture sector is one of the conventional occupations in India. The country occupies second position in agriculture production output and employed 50% of the Indian work force. The sector serves as a cushion and safety net by providing employment in the face of large economic shocks and significantly contributes to country's GDP but the contribution of agriculture sector in GDP is declining due to urbanisation. No country can manage the sustainable growth and development without contribution of agriculture sector. Thus, the health of the agricultural sector is critical for increasing economy-wide productivity, especially in areas with a relative gain in agriculture. The larger challenge of an increased population and rising economic growth is putting tremendous pressure on both the agriculture sector and the natural resources that are needed to meet the present and future demand for food and nutritional security. India is trying hard to deal with domestic demand for consumption and providing raw

material to industry as well as global demand of agro products which is important for foreign exchange.

India exports large number of agricultural products and processed food to worldwide. The major crops are wheat, rice, vegetables, fruits, animal casing, pulses, meat and many more. In the year 2016-17, export of agro based industries quantity amounted 24339910 MT with the value of 18059.25 US\$, of which non-basmati rice (6813622 MT) followed by basmati rice (3999722 MT), Oil meals (3647307 MT) were the major agro based products exported from India (Paramasivan and Pasupathi, 2017). Indian agriculture sector experienced significant increase in cereals, guar gum, cotton, spices, sugar and decline in some commodities such as fish and marine products, fruits and nuts and coffee and tea. Basmati rice and maize, chilies and coriander, mango and grapes recorded high growth in cereals, spices and fruits respectively (Suresh and Mathur, 2016).

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With the export growth of agro products to the world wide, instability in terms of earning as well as quantity is major issue because irregular and sudden variations in export and price creates the unfavorable impact on the overall growth of developing countries like India. Higher the commodity and geographic concentration leads to higher instability (Devkota, 2004). Exports instability has been criticized over the period of time as it has depressing impact on economic growth. Pattern of export instability ultimately depends upon growth and changing composition of exports sector (Altman, 1980). The causes of instability vary from country to country. Elasticity of demand, fluctuation in supply and composition of export could be few reasons. Geographical concentration of export is one of the important reasons as change in demand from importing country surely has larger impact on the exporting country (Malhotra and Pinky, 2015). Most of the developing countries heavily depend on the few products and small number of foreign markets. This concentration creates instability in earning therefore products and market diversification is very important. Insufficient diversification suggests that changes in the prices of one or two commodities could lead to quick alteration in total export revenues.

Therefore it is important to study the export instability to smooth out fluctuations by taking appropriate corrective policy measures such as diversification of export portfolio and liberalization of flow of financial capital in and out of the country. Keeping in view the above facts, the present paper is an attempt to address the following objectives in the context of export of Indian agricultural products from past ten years. Similar study has been conducted by Singh and Goyal in 2005 by taking study period between 1993-2003 with agriculture and additionally processed food products.

### Objectives

1. To determine growth rate and instability of export earnings and quantity exported of selected agricultural products from India.
2. To determine concentration/diversification of export earnings and quantity exported of selected agricultural product from India.

### Literature Review

#### *Growth in Agriculture*

International trade plays essential role in the growth of any economy. Exports is an important source of foreign exchange and stimulates investment, profit and saving, employment generation etc. Global food processing sector is experiencing rapid growth which in turns created the huge demand of agro products. India seizes the opportunity and exports large number of agricultural food products such as cereals, milk, sugar, fruits and vegetables, wheat, Basmati rice, Pulses and many more. Therefore economists have extensive interest to see the export growth, volatility, and concentration. Number of studies has been conducted to establish the relationship among these indicators. Koundinya and Kumar (2014) studied growth in vegetable seed industry and the challenges. As the growth showed the positive impact on the economy in terms of income, employment generation and earning foreign exchange. India is one of the major exporters of fruit and vegetable seeds in the world there by earning good foreign exchange reserves. The major seed importing countries from India are Bangladesh, Saudi Arabia, Netherland and Korean Republic. Few constraints such as highly expensive, perishable nature of seed, contract farming and adverse effect of extreme climate are the main challenges of the industry. Another study conducted by Muthuswamy (2010) also supported and revealed that increased export growth of agro product not only increased the foreign exchange but large number of people involved in increased production, processing and export of agro product.

Paramasivan and Pasupathi (2017) also revealed that contribution of food based agro products and allied products increased gradually to make contribution in GDP. Suresh and Mathur (2015) measured the export potential through RCA and argued that cotton, maize, and certain fruits and vegetables have increased relative advantage but in case of plantation based spices and other commodities; India is slowly trailing its comparative edge, specifically Asian countries. Improvement in agricultural production through total factor productivity may result in growth of exportable surpluses and stimulating India's export. Singh and Goyal (2005) measured the export growth of agro products and analyzed wheat, jaggery and confectionery, animal casings, dried & preserved

vegetables, fresh vegetables, floriculture were the main source of export earnings during decades. The growth in earning has been higher than the amount of growth in quantity terms except in case of jaggery & confectionery, alcoholic & beverages, and milled products.

### ***Volatility in Agro Export***

Volatility in export and its impact have been studied in different economies. Malhotra (2015) studied export instability and hypothesized that primary exports instability index, chemical products export instability index, engineering products exports instability index and petroleum products are significant indicators of total export instability. Multiple regression analysis used and result shows that export instability of textile products, petroleum products have negative and significant association with total export instability of India, while export instability of primary products, chemical products, engineering products and geographical concentration of exports have positive and significant relation with total export instability. Devkota (2004) analyzed the reasons of export instability in Nepal and revealed that higher commodity and higher market concentration leads to exports instability. Qammer & Baba (2016) examined the growth, instability, and determinants of Indian walnut export using Revealed Comparative advantage (RCA) and Gravity model. Study found significant annual growth in production but only 2.73 percent of the global export of shelled walnut in 2012. The largest importer of Indian shelled walnut is United Kingdom followed by Egypt, Germany, Spain, and Netherlands. (Malhotra and Pinky, 2012) suggested necessary measures to stimulate export and control export instability such as commodity based export encouragement policy, stimulate FDI, R&D facility to improve competitiveness of exports. Also suggested that government should adopt various policies to promote exports and reduce instability and continuous assessment of the existing export policies to provide more flexibility to the exporters.

### ***Export Concentration***

Dumičić, Jošić and Žmuk (2018) analysed the export concentration among the developed, developing and transition countries using Gini-Hirschman indices and concludes that there has been decline in market

concentration of world exports between 1948-2016, the importance of developing and transition countries increased while developed countries preferred mutual trade. Dani (2015) analyzed the export concentration of BRIC nations during 2000-2008. Index of Commodities and Geographical location concentration has been used and revealed that Brazil and India experienced relative decline in the degree of commodity concentration but Russia and China shows higher degree of commodity concentration, indicating decline in their diversification in exportable product groups. Geographical concentration increased in all the BRIC nations.

Singh and Goyal (2006) analyzed the quantity and value concentration using Gini-Hirschman for selected agro product exported from India and revealed that 2001-02 was a year of export earnings diversification and that export earnings were spread over the whole range of agricultural products. Commodity concentration in quantity has been observed in while 2002-03. Tegegne (1991) used Gini-Hirschman measure of export commodity concentration of African Countries and tried to establish the relationship between the concentration and export earnings instability. Study argued that commodity diversification may or may not escort to reduced instability in export earnings due to other reasons such as importance of a country's major commodity, world-demand, domestic supply conditions. Esteves and Prades (2018) construct a new indicator for product concentration and recommend that domestic demand developments are more appropriate for explaining exports in countries with a lower product concentration.

### **Research Method**

The past 10 years data series 2009-2018 on export earnings and quantity of selected agricultural products have been studied to analyze the last decade's export concentration. The study was focused on five different product categories i.e. Floriculture, fresh vegetables and fruits, animal products, cereals and pulses, therefore Vegetable seed representing floriculture, fresh Vegetables and fruits, buffalo meat, Sheep meat and animal casing to represent animal products, wheat and Basmati rice representing cereals have been selected for the study.

The secondary data of export quantity (in MT) and Value (in Crore) from 2009-2018 has been extracted from official

portal of Agricultural and Processed Food Products Export Development Authority (APEDA) Ministry of Commerce, Government of India on Jan 2, 2019. Growth rates, instability and concentration / diversification indices were estimated through the following methods.

**Growth Rate**

Annual Compound Growth Rates of export earnings and quantity exported has been determined by the following exponential regression model.

$$Y = \alpha \beta^t$$

$$\text{Log } Y = \text{Log } \alpha + t \text{Log } (\beta)$$

Where Y export quantity and export value

t = time (2009-2018)

Annual compound growth rate (r) was computed as:  $r = \{\text{Anti log } (\beta) - 1\} \times 100$

**Instability Measure**

To measure the instability in export quantity and export value, Cuddy-Della Valle (1978) index of instability has been used.

$$\text{Cuddy - Della Valle Instability Index (\%)} = C.V. \cdot \sqrt{1-R^2}$$

Where, C.V is the Coefficient of Variation, and R<sup>2</sup> is the coefficient of determination from a time trend regression.

**Concentration and Diversification**

Gini-Hirschmann, the most widely used Index of commodity concentration has been used to measure the Concentration and Diversification and also known as Herfindahl - Hirschmann index. Herfindahl index is considered an improvement over other concentration ratios because it uses data from each product category and each year irrespective of its contribution in that particular year or products. Therefore any change in values and quantity of export will reflect in Herfindahl index. This is not true for concentration ratios.

$$\text{Herfindahl Index} = Si^2 = \sum (X_{it} / X_t)^2$$

where X<sub>it</sub> = Export of i<sup>th</sup> commodity in t year

X<sub>t</sub> = Total export in t year

$$\text{Hirschmann Index} = \{\sum (X_{it} / X_t)^2 - \} / \{1 - \}$$

$$\text{Gini-Hirschmann} = \sqrt{Si^2}$$

Herfindahl-Hirschman's Concentration Index	Concentration level
Lower than 0.01	Perfect equality
0.01 - 0.15	Low
0.15 - 0.25	Moderate
0.25 or higher	High

Concentration level according to standardized Herfindahl-Hirschman's concentration index value

**Trend Value of Concentration and Diversification**

The estimated indices by Herfindahl - Hirschmann, Gini-Hirschmann have been taken as dependent variables and time has been taken as independent variable, trend values are measured through regression model.

$$\text{Concentration Indices (QTY)} = \alpha + \beta t$$

$$\text{Concentration Indices (Value)} = \alpha + \beta t$$

Where Concentration Indices are Harfindahl, Hirschman and Gini-Hirschmann estimated values.

## Results and Discussion

*Table 1: Showing the Growth Rate and Instability of Export (QTY)*

Product (QTY)	R	R Square	F	$\beta$	CAGR% ={Antilog( $\beta$ )- 1}*100	CV	CUDDY- DELLA VALLE INDEX
Animal Casings	0.33	0.11	0.86	0.20	58.00	159.90	150.85
Basmati Rice	0.47	0.22	1.96	0.03	7.64	17.10	15.11
Buffalo Meat	0.45	0.20	1.76	0.04	9.10	21.50	19.21
Fresh Fruits	0.22	0.05	0.35	0.02	4.23	22.99	22.44
Fresh Vegetables	0.41	0.17	1.43	0.03	7.89	25.00	22.78
Fruits / Vegetable Seeds	0.41	0.17	1.44	-0.03	-7.32	22.59	20.57
Pulses	0.09	0.01	0.06	-0.01	-2.06	27.33	27.22
Sheep/Goat Meat	0.68	0.46	6.01	0.07	18.57	26.69	19.58
Wheat	0.17	0.03	0.22	0.19	53.00	133.69	131.67
Aggregate					16.56		47.71

Table 1 shows the growth rate and instability of export (QTY) of the commodities. The overall growth rate is 16.56 % in the period of 2009-2018. While closely analysing the commodity wise growth rate, it is observed that animal casing has the highest growth 58 %. The growth rate of Wheat (53 %), Sheep/Goat Meat (18.57%), Buffalo Meat(9.10 %), Fresh Vegetables(7.89 %), Basmati Rice (7.64 %), Fruits / Vegetable Seeds (-7.32 %) and Pulses (-2.06 %) are measured. The instability index helps in policy formation. The Aggregated instability is 47.71 and highest in animal casing (150.85 %), Wheat (131.67 %). The lowest instability observed in basmati rice (15.11%).

*Table 2: Showing the Growth Rate and Instability of Export (Value)*

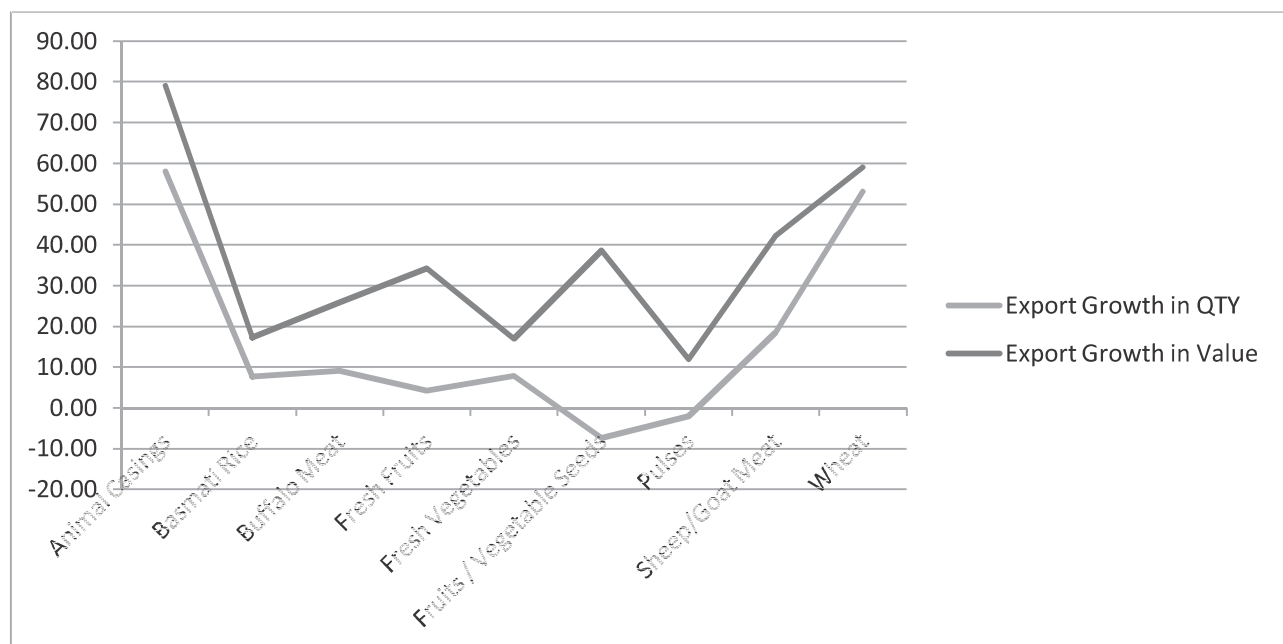
Product (Value)	R	R Square	F	$\beta$	CAGR% ={Antilog( $\beta$ )- 1}*100	CV	CUDDY- DELLA VALLE INDEX
Animal Casings	0.56	0.31	3.12	0.25	79.00	150.46	125.16
Basmati Rice	0.62	0.39	4.40	0.07	17.22	26.82	21.02
Buffalo Meat	0.67	0.45	5.76	0.10	25.89	32.96	24.42
Fresh Fruits	0.83	0.70	15.98	0.13	34.28	36.05	19.91
Fresh Vegetables	0.69	0.47	6.18	0.07	16.95	25.28	18.42
Fruits / Vegetable Seeds	0.96	0.92	76.15	0.14	38.68	35.93	10.41
Pulses	0.62	0.39	4.38	0.05	11.94	20.67	16.21



Sheep/Goat Meat	0.82	0.67	14.34	0.15	42.23	40.35	23.11
Wheat	0.19	0.04	0.27	0.20	59.00	133.82	131.32
<b>Aggregate</b>					<b>36.13</b>		<b>43.33</b>

Table 2 shows the growth rate and instability of export (Value) of the commodities. The overall growth rate in export earnings is 36.13% in the period of 2009-2018. It is observed that animal casing has the highest growth 79 % followed by wheat (59 %), Sheep/Goat Meat (42.23 %), Fruits / Vegetable Seeds (38.68 %) and fresh fruit (34.28 %). The lowest growth is observed in Pulses (11.94 %). On the other hand the aggregated instability in export earnings is 43.33 and highest in Wheat (131.32%). Further animal casings (125.16 %), Buffalo Meat (24.42%) Sheep/Goat Meat (23.11%) instability observed by Cuddy Della Valle Index. The lowest instability observed in Fruits / Vegetable Seeds (10.11 %).

*Figure 1: Showing the Export Growth in Quantity (MT) and Value (Cr)*



**Table 3: Showing concentration/diversification of export in value and quantity**

Year	Herfindahl Index (QTY)	Gini-Hirschmann (QTY)	Hirschmann Index (QTY)	Herfindahl Index (Value)	Gini-Hirschmann (Value)	Hirschmann Index (Value)
2010	0.31	0.55	0.33	0.33	0.58	0.37
2011	0.27	0.52	0.29	0.33	0.57	0.36
2012	0.31	0.55	0.33	0.26	0.51	0.27
2013	0.27	0.52	0.29	0.29	0.53	0.30
2014	0.24	0.49	0.24	0.32	0.57	0.36
2015	0.30	0.54	0.32	0.33	0.57	0.36
2016	0.30	0.55	0.33	0.32	0.57	0.35
2017	0.31	0.56	0.34	0.33	0.57	0.36
2018	0.31	0.55	0.33	0.32	0.57	0.36

Table 3 shows the level of concentration and diversification in terms of quantity and values of export. Higher concentration in export quantity observed in 2017 as Herfindahl Index (0.31), Gini-Hirschmann (0.56) and Hirschmann Index (0.34) estimated highest in the year. Higher concentration reflects the degree of export concentrated on lesser number of products. Year 2014 was the year of diversification or lower concentration as Herfindahl Index (0.24), Gini-Hirschmann (0.49) and Hirschmann Index (0.24) estimated lowest which shows the degree of export diversified and exports are comprised of larger number of products. Export Value concentration/ diversification is also appeared in table 3. Higher value of Herfindahl Index (0.33), Gini-Hirschmann (0.58) and Hirschmann Index (0.37) show that the export values (earning) were due to fewer commodities in the year 2010. On the other hand lower value of Herfindahl Index (0.26), Gini-Hirschmann (0.51) and Hirschmann Index (0.27) estimated in the year 2012 shows lower concentration. Which means that export value (earning) were spread over the large number of commodities in the year 2012.

**Table 4: Showing the results of trend equations (t= independent variable and Index=dependent variable)**

Index	Quantity Exported	Value of Exports
Harfindahl	.281+.002t p=.520 (not significant)	.304+.002t p=.516 (not significant)
Gini-Hirschmann	.525+.002t p=.456 (not significant)	.550+.002t p=.545 (not significant)
Hirschmann	.296+.003t p=.507 (not significant)	.328+.003t p=.535 (not significant)

The trend lines were estimated by considering calculated concentration/diversification indices as independent variable and time taken as dependent variable. Table 4 shows the estimated trend values. All the positive trend values indicate the increase in concentration in quantity exported and earning, although the coefficients found to be insignificant.

### Conclusion and Discussion

Export growth of agricultural products in quantity and earning are aligned in the same line. The growth has been significantly increased in last ten years. Singh and Goyal (2005) also studied and found the agricultural export growth in India. Animal Casing and Wheat are the potential agro products for the export. Few products such as fresh fruits where the growth of export quantity is only 4.23 % but earning is 34.28%, therefore fresh fruits are again potential commodity for foreign exchange. To gain the economic benefits, government needs to promote production of fresh fruits so that export quantity can be further increased. Export of fresh vegetables have the inverse condition where the export growth in terms of quantity is 7.89% but value growth is only 16.95%, therefore special attention needs to pay on pricing strategies to gain economic benefits.

Huge difference found in fruits/vegetable seeds, where the growth of export quantity reduced significantly and earning has been increased due to increased price. As seed is the most important commodity for successful vegetable and food cultivation therefore demand is also increasing at domestic and global level. The country has an opportunity to earn foreign exchange in international market and employment generation. Increased contribution of public sector in R&D is desired to contend with private players so as to supply high-quality seeds. The alliance of both public and private sector may evidently help in quality vegetable seed production in India which will increase the export growth also. It can be concluded that vegetable seed business will ever have huge scope to success and will play an essential role in economy like India where the livelihood of greater part of the people is agriculture.

Alarming situation for the basmati rice and pulses where export quantity has been declined. In the presence of various other markets like Pakistan, Vietnam and Thailand where they are offering rice in lower rates, the

Indian rice export industry has challenges in the future ahead. Indian exporters are facing tough competition as now China also became the low-cost rice exporter. Similarly Indian pulses have been reasonably popular in global markets, especially in countries with huge expatriate Indian population but due to new entrance such as Myanmar and East African nations in the pulses of export market the volume of export has been decreased from India. There is strong need to promote export of rice and pulses in the foreign market by adopting appropriate differentiation strategies.

Excessive variations in foreign trade create variations in supply and demand or other financial and non-financial factors which ultimately cause the export instability. Most of the recent studies found that the export instability is largely correlated with the commodity and market concentration. The present study found that with the increased growth of export earning and quantity, instability also increased in Animal Casing and Wheat. In the year 2017 quantity wise export concentration increased which shows exports are increasingly more concentrated on smaller range of products. Increased concentration may result in economic shocks for the economy. Therefore country needs to export diversified range of commodity to cushion the economy. Similarly in the year 2010 earnings from export was concentrated from the limited number for commodities.

Calculated positive trends in case of quantity show that export concentration has been increased over the period of time. On contradictory agro based quantity concentration trend calculated by Singha and Goyal (2005) revealed negative trend value which shows that concentration has been decreased from 1993-2003. This depicts that in case of agriculture export India has been depending on lesser number of commodities from last 10 years. Calculated positive trends in case of earning show that export concentration has been increased over the period of time. Singh and Goyal (2005) also support the result and revealed that earning concentration increased in agriculture export sector. The results are based on the vary recent data i.e. 2009-2018, therefore it is upsetting situation for the country. There is a strong need to reduce the commodity concentration to avoid any economic burden. Specific export promotional policies may be considered to



provide well diversifiable and growing export base.

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