



## Trade Performance and Potential of Lemongrass Oil Market: a Global Prospect

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### Abstract

Lemongrass is an important essential oil bearing crop. It is successfully cultivated in tropical and subtropical regions of the world. In India it is commercially cultivated in different states. The production of lemongrass oil has proved quite remunerative to the growers and especially for marginal land holders. This study has merely focused on to estimate the trade performance and potential of lemongrass oil export over two decades by using the different statistical tools like exponential growth model, coefficient of variance and cuddy-della valle instability index. Results revealed that the domestic consumption and global demand of lemongrass oil has been increased and registered the positive trend. At present, India is major exporter of lemongrass oil with exporting to more than 80 countries. Between 1997-02 and 2017-20 the global demand of Indian lemongrass oil has been increased from 80.28 thousand kg to 2552.42 thousand kg. While, India earned the foreign exchange from lemongrass oil export has been increased by 413.65 lakh to 30874.49 lakh. Among the top nine importing countries or major destinations of Indian lemongrass oil contributed 81.62%, in which North America region: U.S. and Canada imported (44.18%); Europe: U.K., France, Germany and Spain (11.84%); Asia pacific: Australia, China and Singapore (4.08%). The compound annual growth rate both in quantity and value lemongrass oil have been registered 16.13 and 28.04 per cent it indicates good potential and higher profit for Indian lemongrass oil. The continuous increasing the domestic as well as global demand of lemongrass oil, has opened up wide opportunities for earning of foreign exchange, promotion of Indian aroma industry. The increasing area under the cultivation of lemongrass provided the employment opportunities of rural people and especially for agricultural labours and resource poor peoples. It is also provided the year-round income, better option of crop diversification and mechanisms for utilization of marginal land.

**Keywords:** *Constituents and Consumption, Growth and instability index, Marginal land, Trade, Import destination.*

### Introduction

Lemongrass (*Cymbopogon flexuosus*) has considered as a fast-growing, essential oil bearing tall perennial plant. Lemongrass is widely cultivated in tropical and subtropical regions of World (Ewa, M. *et al.*, 2019). In India, lemongrass can be easily cultivate on marginal land and in any type of soil, for good yield it can cultivate in sandy or clay loam soils with a pH range of around 5 to 8.5.

It is less caring and less risky against wild and stray animals grassing, infestation of insect-pest and diseases and weather phenomenon like hailstorm and high wind velocity and temperature, etc. The well-ramified root system of the plant helps in soil, water conservation, promoted the vegetation and biomass production. In India for production of essential oil, lemongrass is commercially

cultivating in different states like Uttar Pradesh, Jharkhand, Odisha, West Bengal, etc. The cultivation of lemongrass proved quite remunerative to the farmers especially for less fertile and underutilized landholders. From a hectare of land, framers obtained Rs.0.40 to 1.30L annual profit over the cost of cultivation and distillation charge (Rs.0.20-0.50L).

In additional, the cultivation of lemongrass also acts like crop insurance because this crop is tolerance to degree drought, insects, pests and diseases and also against uncertain and unexpected climate extremes. It is also save the foreign exchange as this oil is currently imported and provided the valuable raw material for Indian aroma industry. The produced essential oil significantly contributed in Indian exchequer. The continuous increasing the area under the cultivation of lemongrass significantly provided the employment opportunities of rural people and especially for agricultural labours and resource poor peoples. It is also provided better option of crop diversification, year -round income to farmers and better mechanisms for increase the supply of land through its cultivation on marginal land. The cultivated aromatic crops required relatively low consumption of inorganic fertilizers and plant protection chemicals so government can save the subsidy by investing today more on promotion of lemongrass cultivation in India.

#### **Constituents and Consumption Sector**

Essential oil is the main economic yield of lemongrass plant. The prefix 'lemon' indicates its typical lemon-like odour because presence of aldehyde Citral as a chief constituent. It is starting material for the preparation of important ionone viz.  $\alpha$ -Ionone widely used in food, flavour, perfumery and cosmetics industries and  $\beta$ - Ionone-used in pharmaceutical for the manufacture of synthetic vitamin A and used to relief headache and tension by aromatherapy. Oil has bactericide, insect repellent and medicinal uses and it is popular ingredient in aromatherapy (Anon, 2006). Lemongrass oil has been used since ancient time in folk medicine as a remedy to improve circulation,

stabilize menstrual cycles, promote digestion or increase immunity. It is also used to produce perfumes, flavours, detergents and pharmaceuticals (Ewa, M. et al., 2019). The spent grass is a good source for making compost, fuel for distillation aromatic crops and cattle feed and can be converted into good silage.

#### **Area and Production**

In India, lemongrass is traditionally cultivated as a rainfed crop in Kerala state (Singh and Shivraj, 1999). Although, under semi-arid tropical conditions, it is grown as irrigated crop in Karnataka, Tamil Nadu, West Bengal, Chattishghar, Odisha, Uttar Pradesh, Assam, Jharkhand, Bihar, Maharashtra, Madhya Pradesh and Rajasthan in about 4000 hectare and the annual production is around 250 tonne. Since, 2018 CSIRI-CIMAP introduced the different aromatic crops like Palmarosa, Lemongrass, Tulsi and Vetiver in highly drought prone area of Bundelkhand region of Uttar Pradesh and Madhya Pradesh. Among these aromatic crops, Lemongrass emerges as most profitable crops among the marginal land holding and resource poor famers. The area under cultivation of lemongrass increased continuously in this region. At present, about 250 hectares covered under cultivation aromatic crops. In which about 61.00 per cent area has covered under lemongrass cultivation.

#### **Production and Export**

During early fifties, India held monopoly in production and global trade of lemongrass oil. This has situation no longer exists because introduction of some countries like Guatemala, China, Mexico, Bangladesh, etc. have developed its cultivation over large areas. The annual world production of lemongrass oil is around 1000 tonne from an area of 16000 hectare (Gawali and Meshram, 2019). At present, India has largest producer of lemongrass oil in the world about 80% of the produced oil has exported to more than 75 countries (Jagdish Reddy, 2018). The study offers a critical assessment of trade performance and potentiality Indian lemongrass oil in global markets.

## Material and Methods

For the study, primary information collected from lemongrass cultivated farmers of major cultivating states of India and secondary data on Export and Import (quantity and value) of lemongrass oil for the last two decades (2000-01 to 2009-10) and 2010-11 to 2019-20) have been collected from official portal of Department of Commerce, Ministry of Commerce and Industry, Government of India and National Horticulture Board, Government of India. The Annual Compound Growth Rate (CAGRs) and Instability Index were used to estimate the trade performance and potentiality of lemongrass oil export. As analytical tools, the exponential regression model (Gujarati, 1992), coefficient of variance and Cuddy-della valle instability index were used as the following form.

### Estimation of Growth Rates

$$Y = \alpha\beta^t e_t \dots\dots\dots (i)$$

Where, 'Y' is dependent variable for growth rate is estimated in the year t; ' $\alpha$ ' is intercept of the equation; ' $\beta$ ' is regression co-efficient that shows growth rates in a data series; 't' is time variable in the year 'n' and 'e' is error

$$\text{Coefficient of Variation (C. V.)} = \frac{\text{Standard Deviation } (\sigma) \text{ of } X}{\text{Mean } (\mu) \text{ of } X} \times 100$$

Here, Standard Deviation of X was has been calculated by using the formula

$$\text{Standard Deviation } (\sigma) \text{ of } X = \sqrt{\frac{1}{N} \sum (X - \bar{X})^2}$$

Where,  $X_i$  is individual observation in time series data;  $\bar{X}$  is arithmetic mean of X;  $(X - \bar{X})$  is deviation from the mean and N is number of observation.

The degree of instability is also computed around the trend i.e. coefficient of variation is multiplied by the square root of the difference between the unity and coefficient of multiple determinants ( $r^2$ ) in cases where  $r^2$  was

$$\text{Instability index} = \frac{\sigma}{\bar{X}} \times 100 = \sqrt{(1 - r^2)} \text{ or Cuddy - Dell Valle instability index } (\%) = C. V \times \sqrt{1 - R^2}$$

Where, C.V. = Coefficient of Variation in per cent,  $R^2$  = Coefficient of determination from a time trend regression adjusted for its degrees of freedom.

## Result and Discussion

### Export and Import of Lemongrass Oil

term. By taking natural logarithm on both sides of equation first, we get the linear form of the equation

$$\ln Y = \ln \alpha + t \ln \beta \dots\dots\dots (ii)$$

Then, the per cent of compound annual growth rate was computed by using the following relationship

$$g = (\beta - 1) \times 100 \dots\dots\dots (iii)$$

Where, 'g' is estimated compound growth rate per annum in per cent and  $\beta$  is antilog of  $\log \beta$ . To estimating the long-run trend of lemongrass oil import and export, the Ordinary Least Squares (OLS) technique was employed as:

$$Y_t = \alpha + \beta X + e$$

Where,  $Y_t$  is trend values at time t; X period in years;  $\alpha$  is intercept parameter;  $\beta$  is slope parameter and e is standard error.

### Instability Analysis

For the estimation of instability in export (volume and value) of lemongrass oil, the coefficient of variation or index of instability and Cuddy-Della Vella index have been computed by utilized the following formula:

significant to obtain the instability index. The following formula was suggested by J.D.A. Cuddy and P.A. Della Valle in (1978) is called the Cuddy-Della Vella index.

Export growth is an essential contributor to economic growth in term of development economics. However, this contribution depend on the stability of exports earnings.

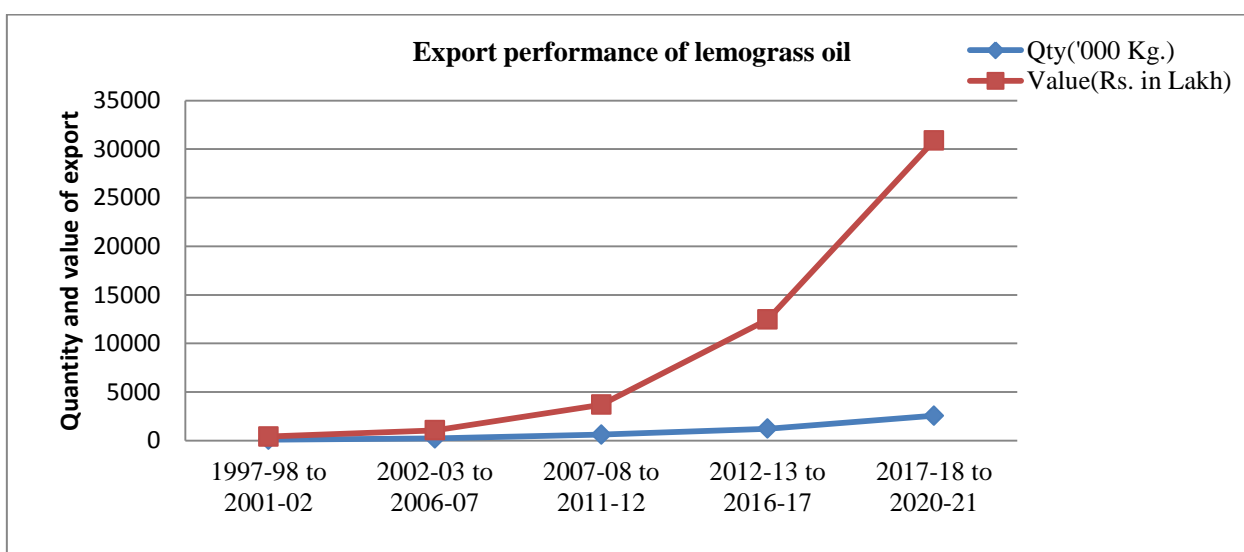
(Abdelhadi, *et al.*, 2019). The growth of lemongrass oil export from India both in quantity and value terms were estimated for over two decades (i.e.1997-98 to 2019-20) and presented in Table1. Over decades, India's export of lemongrass oil had spread to around 81 different countries in the world. The export quantity of lemongrass oil export has been increased from 80.28 thousand Kg in 1997-01 to 2552.42 thousand kg in 2017-20. Moreover, India earns the foreign exchange from lemongrass oil export increased by 413.65 lakh to 30874.49 lakh it may due to growing demand for lemongrass is stimulated by its therapeutic benefits such as for anti-fungal, antiseptic, anti-inflammatory properties.

Growing awareness of the therapeutic benefits of essential oils has spurred the utilization of lemongrass for commercial use in personal care and food industry. The Asian nation have seen rise trend in commercial production of lemongrass. Rise in adoption of lemongrass oil in aromatherapy is a key trend bolstering the production of lemongrass oil. Growing popularity of aromatherapy for therapeutic end is also boosting the prospects in the lemongrass market. India is also import the lemongrass oil despite being the largest producer. During 2002-07 India has imported 1.44 thousand kg lemongrass oil and increased 21.67 thousand kg during 2017-19 to 2020-21.

**Table 1:** Export and import of lemongrass oil during 1997-98 to 2020-21

Period	Import		Export		Import to Export Ratio	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>P1.</b> 1997-98 to 2001-02	0.00 (0.00)	0.00 (0.00)	80.28 (1.72)	413.65 (0.85)	0.000 (0.00)	0.000 (0.00)
<b>P2.</b> 2002-03 to 2006-07	1.44 (4.04)	10.38 (1.89)	208.74 (4.47)	1059.67 (2.19)	0.007 (24.14)	0.010 (19.23)
<b>P3.</b> 2007-08 to 2011-12	3.37 (9.46)	78.37 (14.31)	606.29 (12.99)	3683.93 (7.60)	0.006 (20.69)	0.021 (40.38)
<b>P4.</b> 2012-13 to 2016-17	9.15 (25.68)	136.48 (24.91)	1219.59 (26.13)	12450.15 (25.68)	0.008 (27.59)	0.011 (21.15)
<b>P5.</b> 2017-18 to 2020-21	21.67 (60.82)	322.61 (58.89)	2552.42 (54.69)	30874.49 (63.68)	0.008 (27.59)	0.010 (19.23)
<b>Total</b>	<b>35.63</b>	<b>547.84</b>	<b>4667.32</b>	<b>48481.89</b>	<b>0.008</b>	<b>0.011</b>

**Note:** quantity in '000' kg and Value in lakh, 'P' indicates time period



### Major Export Destination

Among the top ten lemongrass oil importers, USA has largest importer of lemongrass oil

with a share of 41.49 % quantity and 42.26 % value followed by France having 10.41% share in quantity and 9.42% share in value and

other major importing countries mentioned in table 2. We are closely analysed the country wise growth performance in quantity and value of lemongrass oil, it is observed that in top nine importing countries; Spain, Canada and USA has accounted the highest growth rates (22.49, 22.45 and 22.41 %) followed by France (20.79%), the UK (18.88%), Singapore (16.94%), Australia (16.31%), Germany (15.80%) and China (15.00%) per annum. The earning of foreign exchange from lemongrass oil export has increased from Rs. 782.89 lakh to 3172.13 lakh with 28.04 percent per annum. In the same progression the percent share and annual compound growth rates of top nine destinations are also exceeded. The details on foreign earnings or value of lemongrass oil export are given in table 2.

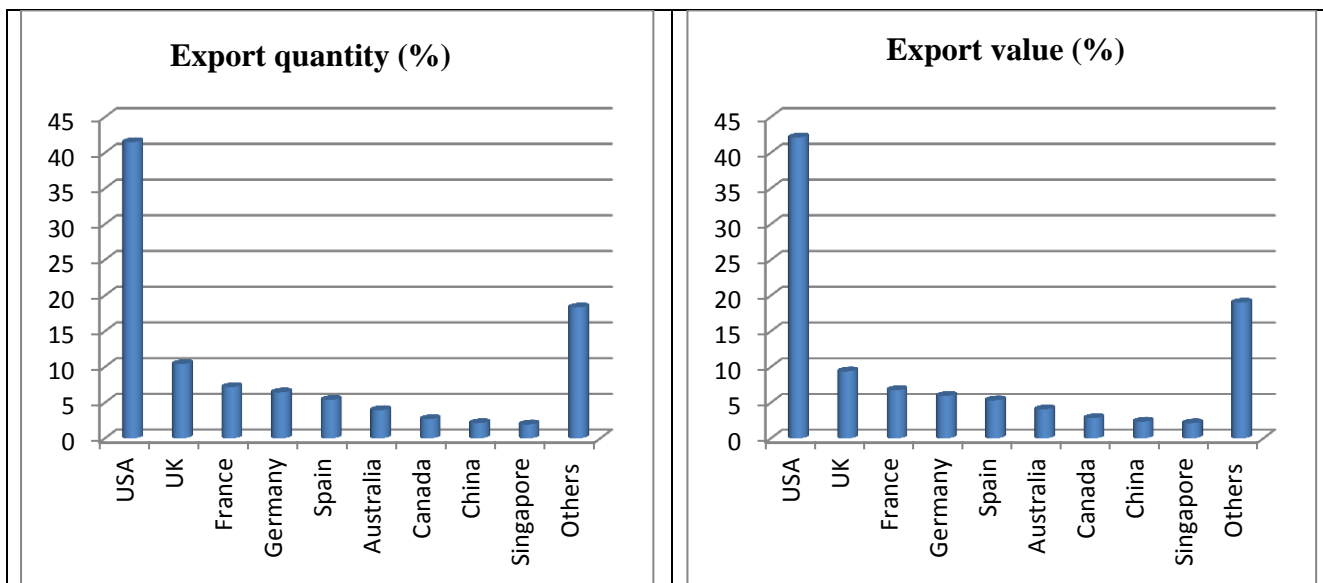
#### Growth and Instability

To find out the instability in the export of lemongrass oil from India for current decade (2009-10 to 2019-20) has been calculated by

coefficient of variance and Cuddy-Dell-Valle Index. The results presented in Table2. The instability of export earning refers to the short-term variation of the earnings from the trend value over a given period (Lim, 1988). The export instability may arise because of price instability, commodity concentration, and geographic concentration of export market, bilateral and multilateral trade agreements, change in exchange, etc. From the results it is revealed that the countries like Singapore and China are highest instable markets for importing of Indian lemongrass oil. The instability of these countries was observed to be 30.04% and 28.09 % respectively. The instability in value of lemongrass oil export of China (77.23%) and Spain (72.21%) followed by top ten countries which are mentioned in table1. The overall instability in quantity and value of lemongrass oil export were found to be 30.86% and 49.23 %.

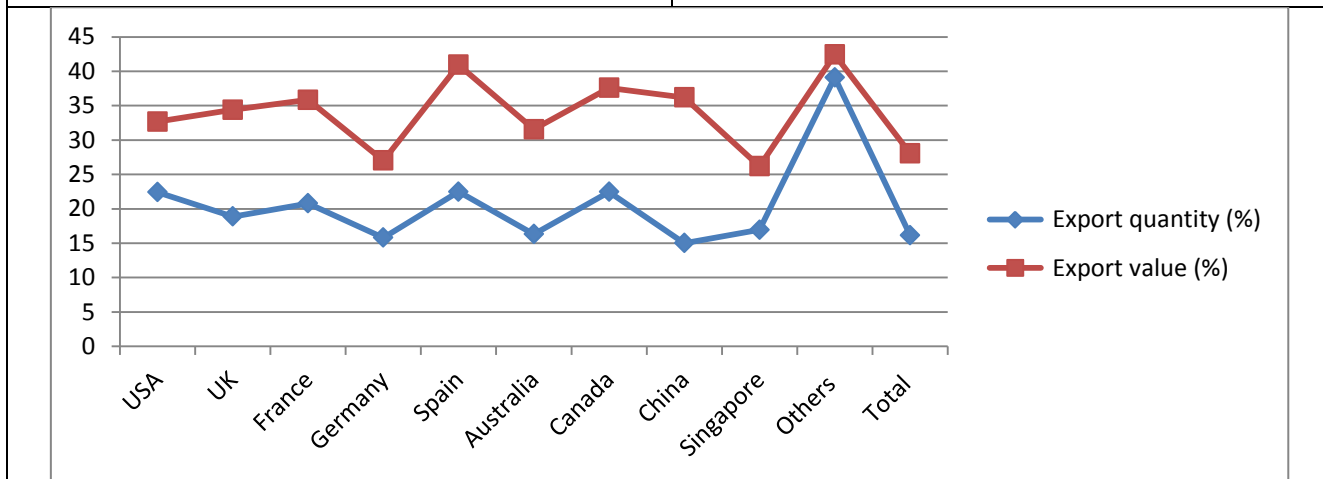
**Table 2:** Export volume and foreign earnings of lemongrass oil from major importing countries (1997-98 to 2020-21)

Country	Export quantity (In'000' kg.)	CAGR (% p.a.)	Instability (%)	Foreign earnings (Rs. lakh)	CAGR (% p.a.)
USA	1145.70 (41.49)	22.41	85.38	13406.16 (42.15)	32.67
UK	287.60 (10.41)	18.88	67.76	2986.63 (9.39)	34.40
France	198.27(7.18)	20.79	75.42	2152.76 (6.77)	35.85
Germany	177.86 (6.44)	15.80	61.19	1895.27 (5.96)	27.02
Spain	149.10 (5.40)	22.49	120.05	1697.48 (5.34)	40.93
Australia	109.43 (3.96)	16.31	78.09	1294.94 (4.07)	31.55
Canada	74.53 (2.70)	22.45	106.57	904.35 (2.84)	37.59
China	58.77(2.13)	15.00	174.31	747.73(2.35)	36.19
Singapore	53.95(1.95)	16.94	79.73	672.96(2.12)	26.18
Others	506.48(18.34)	39.11	112.45	6046.46 (19.01)	42.44
<b>Total</b>	<b>2761.69 (100.00)</b>	<b>16.13</b>	<b>83.41</b>	<b>31804.74 (100.00)</b>	<b>28.04</b>



**Fig 1:** Quantity of lemongrass oil export in per cent

**Fig 2:** Exported value of lemongrass oil in per cent



**Fig 3:** Trend of Trade in Lemongrass oil in per cent

**Conclusion**

Between 1997-98 and 2001-02 the global demand of Indian lemongrass oil was 80.28 thousand kg and during 2017-20 exceeded 2552.42 thousand kg with 16.13 per cent CAGR in terms of quantity and 28.04 per cent in terms of value. The compound growth rates both in case of exported quantity as well as value were found to be high and positive significant, it indicating good potential and higher profit for Indian lemongrass oil also indicating increase the output level and growing demand for lemongrass oil is stimulated by its medicinal properties and consumption in food, flavour and figrance industries. Among the top nine importing countries of Indian lemongrass oil contributed 81.62 %, in which North America region: U.S.

and Canada imported (44.18%); Europe: U.K., France, Germany and Spain (11.84%); Asia pacific: Australia, China and Singapore (4.08%). The continuous increasing the domestic as well as global demand of lemongrass oil, has opened up wide opportunities for earning of foreign exchange, promotion of Indian aroma industry. The increasing the area under cultivation of lemongrass significantly provides the employment opportunities for rural peoples and especially for agricultural labours and resource poor peoples. It is also provided the year-round farm income, better option of crop diversification, and mechanisms for utilization of marginal land. As required relatively low consumption of fertilizers and plant protection chemicals so government can

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