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COMPREHENSIVE ANALYSIS OF ECONOMICS, MARKETING, AND TRADE PERFORMANCE OF ASHWAGANDHA: INDIAN PROSPECTIVE

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ABSTRACT

Ashwagandha is also known as 'Indian Ginseng or winter cherry'. It is an erect branched shrub up to 1.25 meters in height normally found in all the states of India, especially in subtropical regions like Punjab, Haryana, Rajasthan, and Gujarat. Ashwagandha is the best rejuvenate that helps maintain proper nourishment of tissue, particularly muscle and bones while supporting the appropriate function of the adrenals and reproductive system. The study was conducted in Andhra Pradesh and Telangana state to comprehend the relationship between cost and return, the impact of input costs on Ashwagandha yield, returns, marketing of Ashwagandha, and export performance & growth potential. The study is entirely based on primary data gathered from 240 farmers and secondary data. The objectives of the study are to use the different statistical tools used for the result. The results revealed that the total variable cost of cultivation was observed at Rs. 31991/- per hectare in this respect to total gross income through cultivation of Ashwagandha crop Rs. 115777/- per hectare and net income was observed at Rs. 83786/- per hectare. And also analyzed that the B-C ratio was observed at 2.62:1 which implies that spending one rupee on the cultivation of the Ashwagandha crop gave Rs 2.62 in net return as a profit to the farmers. The marketing cost incurred by all the market intermediaries; total market margin earned by different functionaries; and price spread were found to be highest in Channel-I. The involvement of market intermediaries, market cost, margin, and spread of price were lesser in channel II. The compound growth rate of the last twenty years both in quantity and value of Ashwagandha extract have been analyzed at 14.74 and 24.43 percent and the variation is 74.58 percent in quantity and 88.82 percent in value respectively, indicating the good potential and sustainable supply of Indian Ashwagandha extract in the world market.

***Keywords*:** Ashwagandha, cost & returns, market margin, price spread, CGR, AGR, instability.

Introduction

Ashwagandha is commonly known as "Indian Winter cherry" or "Indian Ginseng". It is one of the most important herbs of Ayurveda (the traditional system of medicine in India) used from the ancient time. The raw material used in medicine is the root, and the name "Ashwagandha" is derived from the word "ashwa", meaning horse. The second part of the name "gandha," means fragrance and refers to the characteristic smell of the fresh root of the plant (Singh *et al*., 2011).

It is used in Indian systems of medicine and homeopathy to cure diseases like leprosy, nervous disorders, intestinal infections, and rheumatism. In Ayurveda and Unani preparations roots, bark, leaves, fruits, and seeds are used to cure various body ailments. Its products are also used as a health tonic to

overcome all kinds of weaknesses and to increase vigor and stamina.

It is used to cure diseases including rheumatism, neurological problems, intestinal infections, and leprosy in Indian medical systems and homeopathy. Roots, bark, leaves, fruits, and seeds are all to be used in Ayurvedic and Unani medicines to cure various types of physical problems. Additionally, its compounds are utilized as a health tonic to boost energy and endurance and to combat all forms of weakness.

Ashwagandha a hardy and drought-tolerant plant species, occurs naturally in drier regions of the Mediterranean, South Africa, tropical Africa, the Canary and Cape Verde Islands, the Middle East and Arabia, Sri Lanka, Pakistan, Afghanistan, Baluchistan, China, Nepal, and India (Kumar, 2023). In India, it is extensively grown as a medicinal plant in sub-tropical regions in the north western region of Madhya Pradesh and cultivated on more than 5000 ha of land. Other major Ashwagandha-producing states are Rajasthan, Gujarat, Uttar Pradesh, Punjab, Haryana, Andhra Pradesh, and Maharashtra. About 10,768 ha of land is under Ashwagandha cultivation in India (Kulkarni, *et al*., 2008). One and half decades before it was mostly collected from forest areas to meet the domestic requirements of the Ayurveda industry. The cultivation of Ashwagandha was started in the late 90s and at the beginning of the 21st century. CSIR-Central Institute of Medicinal and Aromatic Plants (CIMAP) in the Deccan plateau introduced Ashwagandha cultivation one decade before through its Research Centre situated at Hyderabad (Chaudhary *et al*., 2020).

The demand for Ashwagandha roots has increased in the domestic market over the last decade and in recent years, the demand for Ashwagandha alkaloids has also increased in the international as well as the US market for Nutraceuticals. Hence, producing quality raw materials using improved high-yielding varieties and applying improved agricultural and processing technology is imperative. The annual demand for Ashwagandha is about 7000 t, and the estimated production in India is only 1500 t. There is a considerable gap between the demand and supply of Ashwagandha. The high industry needs for Ashwagandha roots, leaves, and seeds can be met by expanding its cultivation and adopting its new, high-yielding improved varieties for commercial cultivation (Khan *et al*., 2023 & Kumar *et al*., 2022).

Materials and Method

The present study is merely based on primary and secondary sources of data. For primary data, the purposive cum random sampling technique was used to select the 240 farmers from Andhra Pradesh and Telangana state, India through personal interviews with the help of pre-structured schedules were analyzed and estimated with certain statistical and economical (Cost and return of Ashwagandha crop were calculated) technique. Secondary data were collected from the Ministry of Commerce and Industry, Government of India. For showing the export performance and growth potential of Ashwagandha extract export in India.

Cost and Return

The cultivation of Ashwagandha of the total cost, gross return, net return, and benefit-cost ratio has been analyzed based on the current market price of input and output. The given statistical methods are as follows:

Total cost = TFCij + TVCij

Total return (TRij) = YijPij

Net return = TRij – TCij

Where,

TCij = Total cost (Rs.ha^{-1})

TFCij = Total fixed cost (Rs.ha^{-1})

TVCij = Total variable cost (Rs.ha^{-1})

TRij = Total return (Rs.ha^{-1})

Pij = Price (Rs.ha^{-1}) of jth the crops received by the ith farmer

Yij=Quantity (kg.ha^{-1}) produced

Benefit-Cost ratio (B-CR)

To determine the benefit over the cost of cultivation of Ashwagandha in the study area by following formula:

$$B-CR = \frac{\text{Net Return}}{\text{Total Cost}}$$

Estimation of Price Spreads:

Marketing margin : This is the difference between the receipts (sale price) of the middleman and the total payment made (purchase price + expenses incurred) by the middleman during the marketing of produce.

Price spread:

The difference between the price paid by the consumer and the net price received by the producer was taken as the concept of spread. The model prices at different levels were obtained to work out the gross margins of various agencies. The deduction of the costs incurred by the concerned agencies from the gross margin gave rise to the net margin.

$$\text{Price Spread} = \frac{\text{Consumer Price} - \text{Net Price of producer}}{-\text{consumer price}} \times 100$$

Annual Growth Rate Analysis

Once the growth rate percentages for each period have been calculated, they are added together and divided by the total number of the periods, giving the AGR. The annual trend or performance of exports (quantity and value) was found with the help of the following formula:

AGR= [(EV/ BV)-1] * 100

Where:

AGR= Annual Growth Rate

EV= Ending value of production, consumption, and export for the year t

BV= Beginning value of production, consumption, and export for the year t

*100= Percent growth rate

Compound Growth Rate Analysis:

The compound annual growth rate, percentage change, or annual growth rate was calculated. Compound annual growth rates (CAGR) were worked out to study the changes in export quantity and value of Ashwagandha extract over a period. The compound annual growth rate was calculated by fitting the following equation in the time series data export quantity and value.

$$Y_t = Y_0(1 + r)^t$$

Taking logs on both sides;

$$L_n Y_t = L_n Y_0 + tL_n(1 + r)$$

$$L_n Y_t = a + b_t$$

Where;

$$a = L_n Y_0$$

$$b = L_n(1 + r)$$

Y_t= export quantity and value

Y_0= Constant

t= period in years and

b= regression coefficient

% Compound Growth Rate (CGR) = (Antilog b –1) * 100

Instability Analysis

To study the trend and instability of Ashwagandha extract export quantity and value in India mean, standard error (S.E.) and coefficient of variation (c.v.) were worked out using the formula;

$$\text{C.V. (\%)} = \frac{\sigma}{\bar{X}} \times 100$$

Where,

σ = Standard Deviation

$\bar{x}$ = Arithmatic Mean

The coefficient of Variation is used as a measure of Instability.

Result and Discussion

1. Cost and Income of Ashwagandha Cultivation

It is evident from Table 1 that the total variable cost of Ashwagandha cultivation was found to be Rs. 31991 /ha. Among the variable costs, the highest contribution made by cost is constituted by harvesting charges (28.53%) followed by intercultural operations (17.51%), land preparation (12.61%), manure & fertilizer (10.25%), processing and packaging (8.63%), irrigation (7.35%), and remaining 15.12% cost shared by miscellaneous charges, planting material, plant protection, and seed sowing. Moreover, Ashwagandha cultivation requires comparatively low irrigation and little threat against infestation of insect pests and diseases. It is revealed that only 10.09. % cost incurred in irrigation and plant protection.

The economic yield of Ashwagandha cultivation is depicted in Table 1. The overall average yield of the main product obtained by Ashwagandha cultivators was 6.98 qtl./ha and the By-product was 189.00. Total profitability was calculated as the total cost of output at the current market price and net profit is calculated as the total profitability minus the total cost incurred in the cultivation of the Ashwagandha crop. The main product is sold at a market price of Rs. 14150/- per kg as well and the by-product is Rs. 90/- per kg. Which observed a total average gross income of Rs. 115777/- per hectare and a net profit of Rs. 83786/- per hectare. The net income is inversely related to the cost of cultivation. The B-C ratio was observed at 1:2.62 which implies that spending one rupee on cultivation of Ashwagandha crop gave Rs 2.62. Thus, the Ashwagandha cultivation in India is considered being profitable and financially feasible.

Table 1: Cost of Cultivation and Income of Ashwagandha

Particulars		Ashwagandha	
		Rs./ha	Per cent
A. Cost of Cultivation			
Land Preparation		4035.00	12.61
Planting material		1268.00	3.96
Seed Sowing		670.00	2.09
Manure & Fertilizers		3279.00	10.25
Irrigation		2350.00	7.35
Intercultural operations		5602.00	17.51
Plant Protection		875.00	2.74
Harvesting		9126.00	28.53
Processing & Packaging		2760.00	8.63
Miscellaneous charges (including transportation etc.)		2026.00	6.33
Total Variable cost		**31991.00**	**100.00**
Interest on working capital @7%		2015.23	-
Cost of depreciation (Farm building, machinery, etc.)@10%		13050.00	-
Total cost		**43854.20**	**-**
B. Production and Income			
Main Crop yield	Quantity (quintal)		6.98.00
	Average Price (per quintal)		14150.00
By-product yield	Quantity (quintal)		189.00
	Average Price (per kg.)		90.00
Total return (Rs./ha)			**115777.00**
Total variable cost (Rs./ha)			**31991.00**
Net return over cost (Rs./ha)			**83786.00**
Benefit-cost ratio (Ratio) on variable cost			**2.62:1**

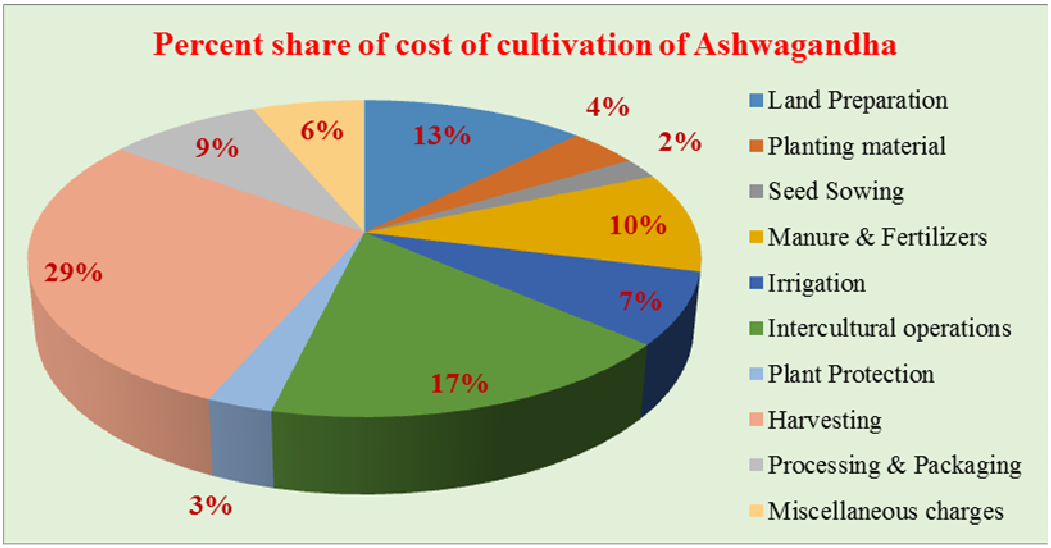

Fig. 1 : Cost of Cultivation of Ashwagandha

2. Marketing Channel

Based on data collected from the Ashwagandha growers, it was observed that medicinal herbs reach the ultimate consumers through the following two different channels.

I. Growers/Farmers-Village traders- Wholesalers-Retailers-Consumers

II. Growers/Farmers-Wholesalers-Retailers-Consumers

Out of these identified channels (Table 2), Channel II was the most dominant in the study areas about 79.17 percent of growers sold Ashwagandha roots through this channel, and the remaining 20.83 percent of growers sold their medicinal produce

through Channel I. The growers received a higher sell price by Channel-II followed by Channel-i. The marketing cost incurred by all the market intermediaries; total market margin earned by different functionaries; and price spread were found highest in Channel-I.

Table 2: Marketing system (Marketing channels) of Ashwagandha

Marketing channel	Ashwagandha
Channel-I	50 (20.83)
Channel-II	190(79.17)
Total	**240(100.00)**

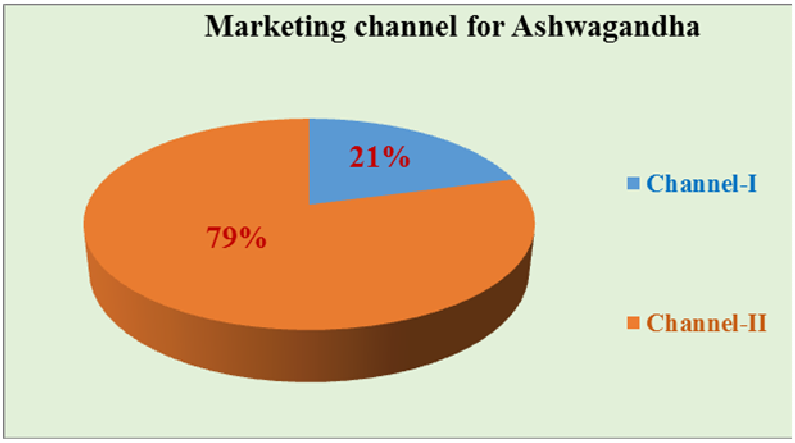

Fig. 2 : Marketing system of Ashwagandha

2.1. Marketing margin

The analysis of the marketing margin is presented in Table 3. It is revealed from the table that the margin earned in the marketing of Ashwagandha through channel II is Rs. 1696 whereas through channel II is Rs. 2768. It implies, that when the farmer is selling his produce to a retailer, the marketing margin earned by other market functionaries is minimized. Most of the functionaries involved in the marketing of Ashwagandha earned margins in proportion to the cost incurred by them except for village traders and wholesalers. Compared to total marketing margins, margins earned by traders and wholesalers are comparatively less in channel II compared to channel I.

2.2. Marketing cost

It is observed from Table 3 that the total marketing cost of Ashwagandha for Channel-I (Rs. 1130) is higher than that of Channel-II (Rs. 750). It implies that farmers who disposed of the produce on their own incurred relatively more costs in Channel-I as compared to Channel-II farmers. Comparing the total marketing costs incurred by different intermediaries in the marketing of Ashwagandha, the highest cost was incurred by the wholesalers followed by village traders.

2.3. Price spread analysis

The price spreads under two prominent channels i.e., channel I and channel II in the marketing of Ashwagandha presented in Table-3 revealed that the price spread in the case of channel I Rs. 3898 per qtl was higher than channel II Rs. 2446 per qtl. Since price spread is directly proportional to the number of intermediaries involved in the marketing of a product, channel-II where the producer was directly approaching the market was found to have less price spread compared to farmer marketing Channel-I. Due to more number of market functionaries involved in Channel-I producer share in the consumer's rupee has decreased compared to Channel-II.

Table 3: Marketing system (marketing cost, margin, price spread) of Ashwagandha plants (Rs/qtl.)

Particulars	Channel-I	Channel-II
Net price received by farmers	13252	15054
Farmers' sale price/village trader purchase price	13252	15054
Total cost incurred by village trader	450	-
Village trader sale price/wholesaler purchase price	15700	-
The total cost incurred by a wholesaler	680	750
Wholesaler sale price/ retailer purchase price	17150	17500
Market margin		
(a) Village trader	1998	-
(b)Wholesaler	770	1696
Total margin	2768	1696
Total marketing cost	1130	750
Price Spread	3898	2446

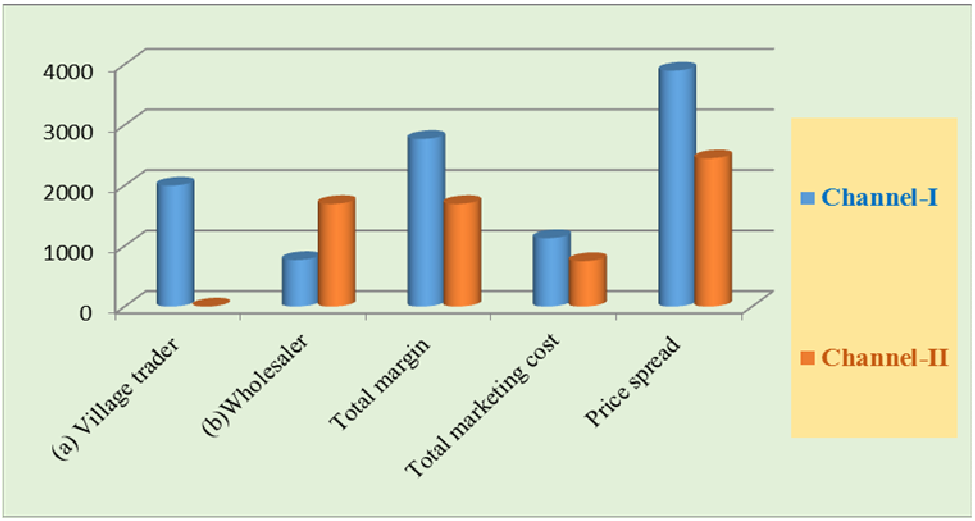

Fig. 3: Marketing cost, margin, price spread

3. Performance of Ashwagandha extract export from India (Quantity & Value)

The performance of the Ashwagandha extract export is presented in Table 4. The quantity of extract exported under Ashwagandha from India has increased from 517.58 in 2003-04 to 6245.54 thousand kilograms in 2022-23, while the value has increased from Rs. 3720.00 lakh to Rs. 306672.98 Lakh in the same year. The average quantity Ashwagandha extract of exported during the period was 2849.35 thousand kilograms, whereas, in value, it was Rs. 106692.49 lakhs. The leptokurtic (positive kurtosis-1.85) nature and positive skewness (1.26) suggested that output increased at the beginning of the study and remained nearly constant throughout the study period. During the period, Ashwagandha extract Export from India increased nearly twelve fold, from just quantity 517.58 thousand kg. in 2003-04 to 6245.54 thousand kg. 2022-23. The positive skewness (0.79) indicated that a continuous effort was made to increase Ashwagandha extract export beginning in the first year of the study period and the platykurtic nature (-0.40) indicates that it stayed nearly unchanged during the research period. The measure of central tendency, namely, mean > median > mode, confirmed the positive skewness criterion, implying that the data were asymmetric. Thus, the combined effect of expansion quantity and value has resulted in a brighter picture of Ashwagandha extract export from India.

Table 4: Descriptive statistics of Ashwagandha extract (quantity and Value export)

Particular	Quantity (000' Kg)	Value (Rs. In Lakh)
Mean	2849.35	106692.49
Standard Error	487.53	21741.62
Standard Deviation	2180.28	97231.48
Kurtosis	1.85	-0.40
Skewness	1.26	0.79
Minimum	424.85	3720.72
Maximum	8958.87	306672.98
Range	8534.02	302952.26

4. Annual, compound growth rates and instability of export of Ashwagandha extract:

4.1 Annual Growth Rate:

Export growth is an essential contributor to economic growth in terms of development economics. However, this contribution depends on the stability of export earnings. Table 5 shows that Annual growth rates of export of Ashwagandha extract in India had been increase from 517.58 thousand kg. during 2003-04 to 6245.54 thousand kg. During 2022-23. The quantity exported of Ashwagandha extract has been a maximum 8958.87 thousand kg. in the year 2021-22. Moreover, India earns foreign exchange from the Ashwagandha extract was highest at Rs. 306672.98 lakh in 2022-23 due to the growing demand for Ashwagandha extract stimulated by its benefits to cure various body ailments (diseases like leprosy, nervous disorders, and intestinal infections and rheumatism, etc.) as well as the higher price per kg. of Ashwagandha extract as compared to 2021-22. It also shows that the highest percentage increase in annual growth rates has been observed during 2005-06 in both 73.42% in quantity and 100.48 % in value respectively. It is also revealed that the maximum and positive to negative annual growth rate of the export of Ashwagandha extract.

4.2. Compound Growth rate

The compound growth rate of quantity exported has been estimated as 14.74% found satisfactory and

statistically significant at a 1.00 percent level of probability, while the compound growth rate in terms of the value of Ashwagandha extract exported has been recorded as 24.43 percent statistically significant at 1.00 ($p<0.01$).

4.3. Instability of export of Ashwagandha extract

The data also revealed that between 2003-04 to 2022-23, India exported both the quantity and value of Ashwagandha extract. The calculated mean, standard deviation, and instability index or coefficient of variation are presented in Table 5. According to data coefficient of variation of both quantity and value exported has been recorded as 74.58 % and 88.82% respectively. It is also concluded from Table-5, that Ashwagandha extract export from India seems unstable from the last decade except for some augmentation in quantity and value in one or two years, this is due to the increase in demand and internal consumption or price fluctuations.

Table 5: Annual, compound growth rates and instability of export of Ashwagandha:

Year	Quantity (000' Kg)	AGR	Value (Rs. In Lakh)	AGR
2003-2004	517.58	0.00	3720.72	0.00
2004-2005	424.85	-17.92	5788.12	55.56
2005-2006	736.78	73.42	11604.17	100.48
2006-2007	1108.33	50.43	19755.6	70.25
2007-2008	1124.35	1.45	16935.84	-14.27
2008-2009	1142.49	1.61	23611.86	39.42
2009-2010	1243.8	8.87	24775.34	4.93
2010-2011	1318.69	6.02	28925.46	16.75
2011-2012	1925.66	46.03	50161.35	73.42
2012-2013	3216.92	67.06	87538.14	74.51
2013-2014	1925.66	-40.14	105649.61	20.69
2014-2015	3216.92	67.06	124412.23	17.76
2015-2016	3514.77	9.26	128481.76	3.27
2016-2017	3350.03	-4.69	140958.63	9.71
2017-2018	3797.3	13.35	141272.62	0.22
2018-2019	3861.04	1.68	172082.56	21.81
2019-2020	4152.37	7.55	201925.24	17.34
2020-2021	5205.1	25.35	244657.55	21.16
2021-2022	8958.87	72.12	294920.06	20.54
2022-2023	6245.54	-30.29	306672.98	3.99
Average	2849.35		106692.50	
Growth (%)	14.74		24.43	
Variation (%)	74.58		88.82	

Source: Ministry of Commerce and Industry, GOI. (Various years)

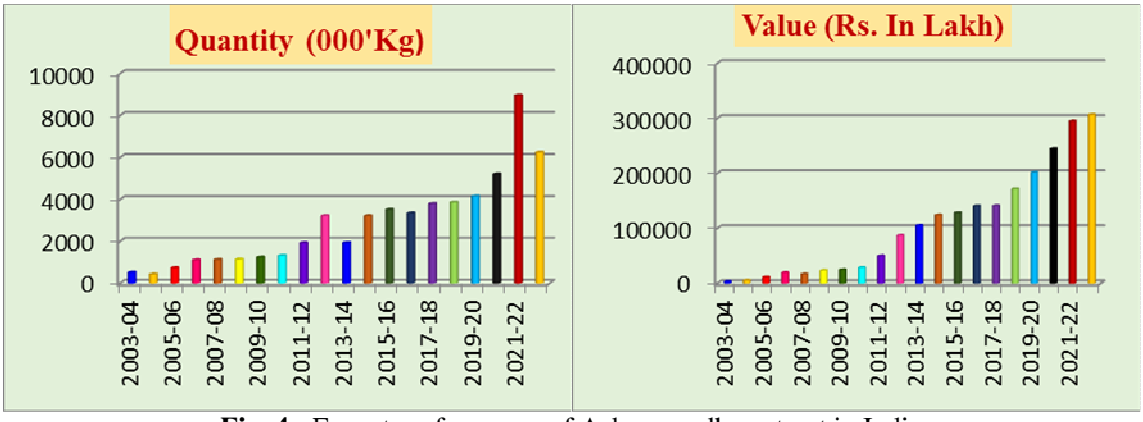

Fig. 4 : Export performance of Ashwagandha extract in India

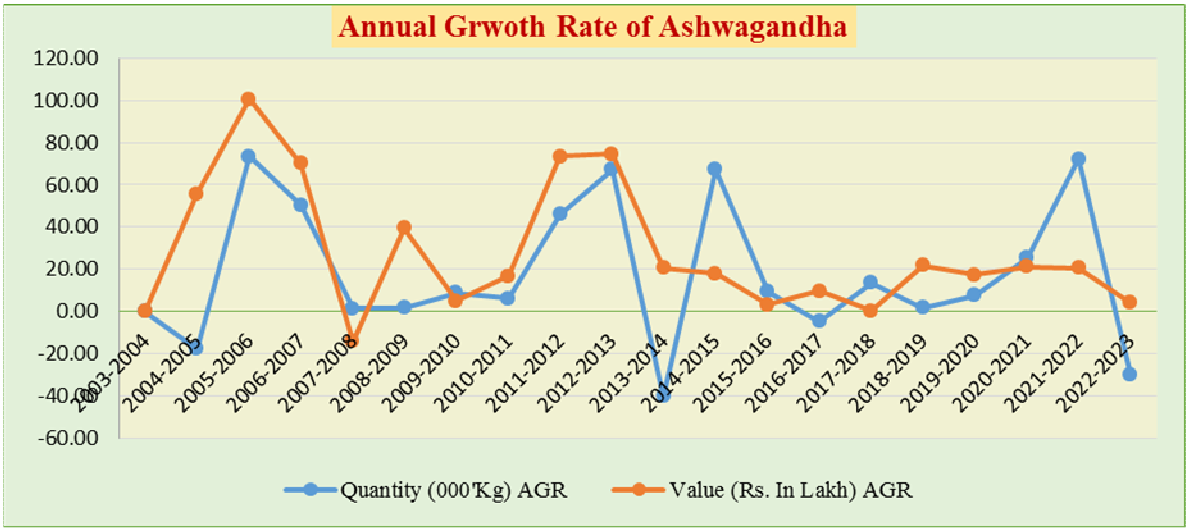

Fig. 5 : Annual Growth of Export of Ashwagandha extract in India

Conclusion

It can be concluded from the present study that the cultivation of Ashwagandha is more profitable than traditional crops in the study area. The export of Ashwagandha extract increased in the country during 2003-2023 and also there was substantial expansion in quantity and value. The Compound growth rates in both quantity and value were found high and positively significant, indicating good potential and profit for Indian Ashwagandha extract. Ashwagandha is not only rich in medicinal value and nutritive value but it can also help poor farmers in rain-fed areas to earn a decent level of profit. The commercial cultivation of Ashwagandha can be promoted as a potential agri-business viable option if proper facilities of processing and market linkages could be developed.

Declaration of Competing Interest:

The authors declare no conflict of interest.

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