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Comparative Analysis of Tobacco Farming Trends and Export Dynamics in India and Zimbabwe: Economic Growth and Social Implications

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Abstract
Tobacco is an important cash crop in India and Zimbabwe and has gained the 'golden leaf' name as it is a high foreign currency earner in both countries. Climatic condition of India and Zimbabwe are favourable for tobacco farming. In this study an effort was made to comparatively analyse the trends and growth pattern for area, production, productivity and export of tobacco in India and Zimbabwe. The analytic tools used for growth rate trends were Compound Annual Growth Rate (CAGR), Coefficient of Variance (CV) and Instability Index Cuddy Della Valle Index (CDVI) for instability measure over a period of 12 years 2010- 2011 to 2021- 2022. The secondary data relating to area, production, productivity and export during the period 2010-2011 to 2021- 2022 was collected for India and Zimbabwe from Indian Tobacco Board Annual Report and Zimbabwe Production Statistics respectively. The CAGR between the two countries indicate that India has been increasing growth rate at a slower rate for area it was 0.0074%. Then for production and productivity it was 0.32% and 0.34% respectively for the period 2010 - 2022. Zimbabwe had a high growth in area and production of 5.54% and 5.07% respectively. The productivity CAGR for Zimbabwe was a negative at -0.59% for the period 2010- 2022. For export growth trends the quantity of tobacco exported from India has shown a negative growth trend of -1.26% over a period of 12 years (2010-2011 to 2021-2022). Whereas export earnings have exhibited positive growth rates of 0.47% for the same period due to better prices in export market. In Zimbabwe the quantity and value of tobacco exported has shown positive growth rates of 3.74% and 3.78% respectively. Both countries India and Zimbabwe indicated being stable exporters on the Instability Index measure. In export quantity and value India had a CDVI of 15.14 and 17.5 respectively. Zimbabwe had a CDVI of 18.5 and 14.7 in quantity and value respectively in the study period 2010-2022.

Keywords: Export, Tobacco farming, Area, Production, Productivity

Introduction

Tobacco (*Nicotiana tabacum)* is an important commercial crop that plays a crucial role in farmers' income and livelihoods to a sizeable population and contributes significant exchange earnings to the Indian and Zimbabwean economy **(Yogesh & Srivastava, 2020; Ngarava, 2020)**. In Zimbabwe tobacco farming contributes nearly 10% of the GDP, employing an average of 27.5% of the formal workforce and accounting for close to 14.5% of the country's foreign currency earnings **(Mutsvangwa - Sammi et al., 2018; Ngarava & Mushunje, 2018).** In India tobacco farming contributes 6% of the national GDP, employing an average of 46 million people involved in general labour, manufacturing, processing and export activities **(Goger et al., 2019)**. In Zimbabwe tobacco is often referred to as the "golden leaf "being the largest agricultural export cash crop and a key foreigner currency earner accounting for 10% of the nation's economic output **(Dube et al, 2017)**.

India has a long standing tradition of tobacco cultivation primarily in states like Andhra Pradesh, Karnataka and Gujarat **(Nisha et al, 2019)**. The country is among the top producers of tobacco worldwide with a stable production framework supported by established agricultural practices **(Indian Tobacco Board, 2020)**. Tobacco is grown in 0.4 million hectares in India accounting approximately 0.27% of net cultivated area **(Rani et al, 2022)**. In Zimbabwe tobacco is grown under area of 1.25 million hectares which is 0.03% of the net cultivated land **(TIMB 2013)**. Both India and

Zimbabwe play a pivotal role in tobacco production in the world. India is the second largest producer in terms of farming area and yield produced whilst Zimbabwe emerges as 5th largest producer of tobacco in the world **(World Bank, 2007)**. Climatic conditions of India and Zimbabwe are favourable for tobacco farming with India even having the privilege to cultivate tobacco twice a year **(TIMB, 2014; Indian Tobacco Board 2020)**.
India and Zimbabwe are the most significant countries in the global tobacco industry. In global exports India's share has increased from 4.6% in 1990 to 7.8% in 2020 **(FAO STATS, 2021)**. Zimbabwe has also increased its global export share from 8% in 1990 to 15% in 2020 **(FAO STATS, 2021).** International trade of tobacco keeps

gaining momentum in the developing countries like India and Zimbabwe due to the export price presented to the farmers at the auction floors during tobacco sales. In 2023 the price was US$ 4.99/kg in Zimbabwe and in India it was ₹257.46/kg (approximately US$ 3.14/kg) making it an attractive cash crop for smallholder farmers **(Euromonitor 2022; TIMB 2023)**. This price incentive has significantly influenced rural livelihoods, employment opportunities, and regional economies, particularly in marginalized agricultural areas. The two countries Zimbabwe and India differ in diversity in types of tobacco exported **(FAOSTATS, 2021; Ngarava, 2020)**. India has a wide range of tobacco exported ranging from stripped, sun cured, hakkoh and flue cured Virginia tobacco. Zimbabwe exports 98% FCV (**Reddy et al, 2024; Woelk et al, 2020)**.
Just like all industries, tobacco industry has some together with a lot of opportunities. Tobacco farmers face some challenges in both the countries, mostly in market dynamics. In Zimbabwe power imbalances exists between smallholder farmers and large tobacco companies as sometimes the price will not be favourable to the farmers **(Chingosho *et al*, 2020)**.This proves to be an opportunity to the Zimbabwean government to open more value addition institutions and companies for tobacco. With this the farmers will be selling processed tobacco that has more money than raw tobacco hence increasing the country's revenue basket **(Dube *et al*, 2017)**. Also in India global changing market dynamics are proving to be a challenge to the tobacco industry. In the midst of challenges India has immerse opportunities as the country has one the best tobacco research centers that is known for coming up with the best varieties in tobacco. this presents an opportunity for India to increase its tobacco production scale and revenue income **(Indian Tobacco Board, 2022)**. This paper seeks to compare trends and growth rate analysis of tobacco farming area, productivity and production in Zimbabwe and India . Also derive insights that each country can learn from the other.

Study Area and Methodology
India and Zimbabwe were selected as the study areas to analyze the growth and stability of tobacco cultivation in terms of area, production, productivity, and export performance. Data for a 12-year period (2010–11 to 2021–22) were sourced from the Indian Tobacco Board Annual Reports (2011–2023) and Zimbabwe Tobacco Production Statistics. The analysis was based on both quantity and value of tobacco exports.
To assess growth and variability, the study employed statistical tools such as Compound Annual Growth Rate (CAGR), Coefficient of Variation (CV), and Cuddy-Della Valle Index (CDVI). These tools helped evaluate long-term trends and the consistency of performance in both countries

Compound Annual Growth Rate (CAGR)
It was used to find the growth rate of tobacco farming in area, production, productivity and export in value and quantity in India and Zimbabwe. Based on the nature of data polynomial trend equations were fitted to tobacco production in Indian and Zimbabwe. The polynomial trend equation was of the following forms

$Y=a+bt+ct^2+dt^3+e$

Where
Y= Production of tobacco in India and Zimbabwe t= Time period (years)
a= Intercept
b,c, d= slope of coefficients e= error term

The compound annual growth rate was analysed using the following functional form $Yt= ab^t e^{ut}$

Where
Y = area, production, yield in period t
a = Yt in the base period
b = 1 + g where g= growth rate t = time period
Ut= Disturbance term in year t

The equation (1) can be transformed into log linear form as In Yt= In a + t Inb +Ut (2)

For Ordinary Least Square (OLS) estimation , equation (2) can be written as

$\ln Y_t = A + bt + U_t$ .....(3)
Then the compound annual growth rate can be calculated as g= antilog B- 1
The statistical significance of the growth rate was tested with "t" statistics

Coefficient of Variance (CV)
It was used to determine the variation in area, production, productivity and export in value and quantity in India and Zimbabwe. Over years the coefficient of variation (CV) was worked out by employing the following formula

$$\text{Coefficient of Variation (\%)} = \frac{\text{Standard Deviation}}{\text{Mean}} * 100$$

Instability Index (Cuddy - Della Valle Index)
Coefficient of Variation (CV) is used for instability of variation but simple CV can overestimate the level of variation in the time series data that are characterized by long term trends. However, the use of Cuddy Della Valle Index (CDVI) corrects the coefficient of variation for the trend component in the time series data (Cuddy & Della. 1978. So, it was used to measure instability of quantity and value of exported tobacco in India and Zimbabwe. The low value of CDVI elaborates on the low instability and vice versa. The low value of CDVI elaborates on the low instability and vice versa. Instability will be low if CDVI lies on $0 \leq CDVI \leq 15$, medium if CDVI lies in $15 \leq CDVI \leq 30$ and high if $CDVI > 30$.

Results and Discussions
Growth Trends in Area, Production, Productivity, and Export of Tobacco in India and Zimbabwe
In this an effort was made to analyse the growth trends of Indian and Zimbabwean tobacco farming area, production and productivity. The growth trends have been examined in detail to study various aspects such as contribution of tobacco agricultural production, productivity and export in India and Zimbabwe.
Growth trends of area in Indian and Zimbabwean tobacco farming

It is quite visible from this figure that India grows tobacco on vast land almost 4 times to Zimbabwe area. However, CAGR indicate that over the past 12 years Zimbabwe has been growing its tobacco farming area. The CAGR for Zimbabwe as indicates in Table 1 is 5.54% and for India it is 0.0074%. The results are showing a positive trend

for both countries though low for India and high for Zimbabwe by nearly 5% margin. The compound annual growth rate in area under tobacco production in India had minimal increment of 0.0074%. **Kulkarni et al (2012)** supports this. Similar results were obtained by **(Nisha et al, 2019).** The increased area CAGR in Zimbabwe can be due to external financial support it gets from China through contract farming support of tobacco farming . This is also supported by **Scoones et al (2016)**

Table1: Production, area and productivity data for India (2010-2011 to 2021-2022)

Year	Area 000'(Ha)	Production (M/TONS)	Productivity Kg/Ha
2010-2011	460	750	1800
2011-2012	446	660	1850
2012-2013	425	740	1900
2013-2014	431	860	1900
2014-2015	436	800	1800
2015-2016	435	810	1950
2016-2017	442	950	2000
2017-2018	445	660	1950
2018-2019	448	800	1950
2019-2020	432	760	1850
2020-2021	440	780	1890
2021-2022	450	750	1900
CAGR	0.0074	0.318	0.34
CV	2.2%	10.2%	3.27%

Table 2: Production, area and productivity data for Zimbabwe (2010-2011 to 2021-2022)

Year	Area 000'(Ha)	Production (M/TONS)	Productivity Kg/Ha
2010-2011	78	132	1689
2011-2012	76	145	1893
2012-2013	89	167	1879
2013-2014	103	216	2108
2014-2015	105	199	1900
2015-2016	103	202	1972
2016-2017	111	189	1705
2017-2018	133	253	1899
2018-2019	146	259	1777
2019-2020	118	184	1566
2020-2021	125	209	1675
2021-2022	140	289	1970
CAGR	5.54	4.7	-0.59
CV	20.90%	22.70%	8.40%

Growth trends of production in Indian and Zimbabwean tobacco farming

The growth trend of production of tobacco in India and Zimbabwe has been depicted by bar diagram Figure 2. It is clear from this figure that India has had fluctuations in the growth trends of tobacco production. The average production of tobacco in India during the study period increased a bit better than area. The Compound Annual

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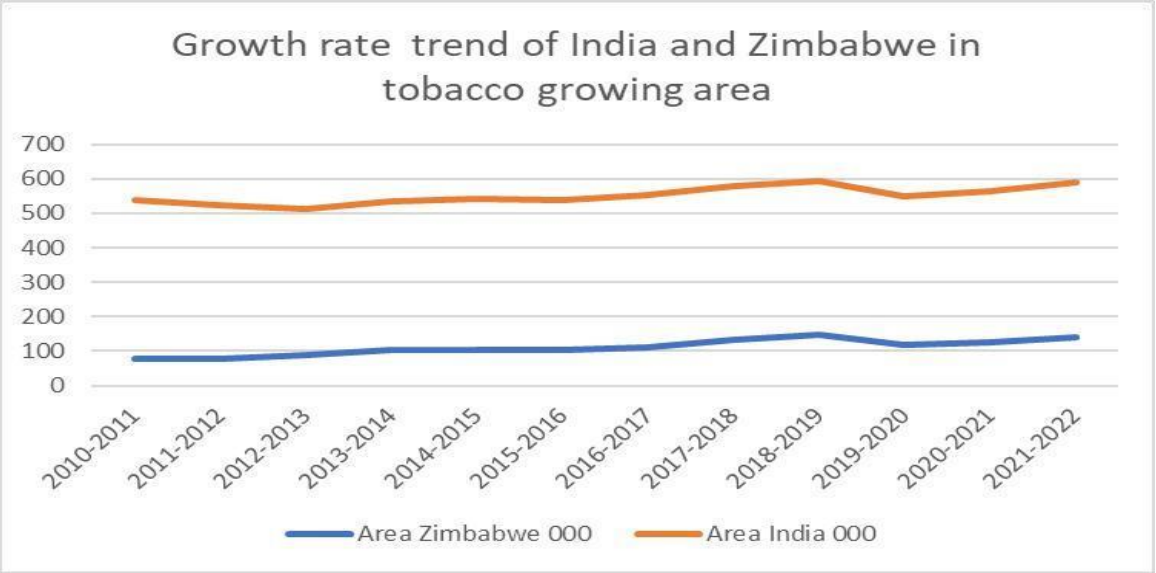

Fig 1: Growth trends of India and Zimbabwe in tobacco growing area

Growth Rate (CAGR) increased by 0.318% for production for overall period (2010- 2022). this could be due to improved tobaccoagricultural practices that the Indian tobacco research center has been introducing to the farmers. This resonated with the findings of **Bee et al (2020).** India has been comfortable with an average of 750 metric tonnes a figure it can increase if it puts more efforts and resources. In Zimbabwe the results showed that the CAGR for the overall period (2010- 2022) for productivity was 4.7%. this could be due to improved tobacco farming technologies that the contract companies have been introducing to the tobacco farmers. India and Zimbabwe had a positive CAGR of 0.318% and 5.07% respectively.The results were similar to **Ram et al (2023)**

Growth trends of productivity in Indian and Zimbabwean tobacco farming

India does show its capability for growth and improvement through its increased productivity. The results showed that the CGAR for the overall period (2010- 2022) for productivity were CAGR which is more than the Zimbabwean productivity CAGR. This can be due the international standard research center for tobacco in India which is always at the fore front of coming up with improved tobacco varieties. The results are similar to **Rani et al (2022)** where productivity was positive. . **Indian Tobacco Board (2022)** acknowledges the competitive advantage India has, if only it can increase its area of production and its production forging its pathway to be becoming number one producer of tobacco.

Fig 2:Tobacco production growth trend of India and Zimbabwe

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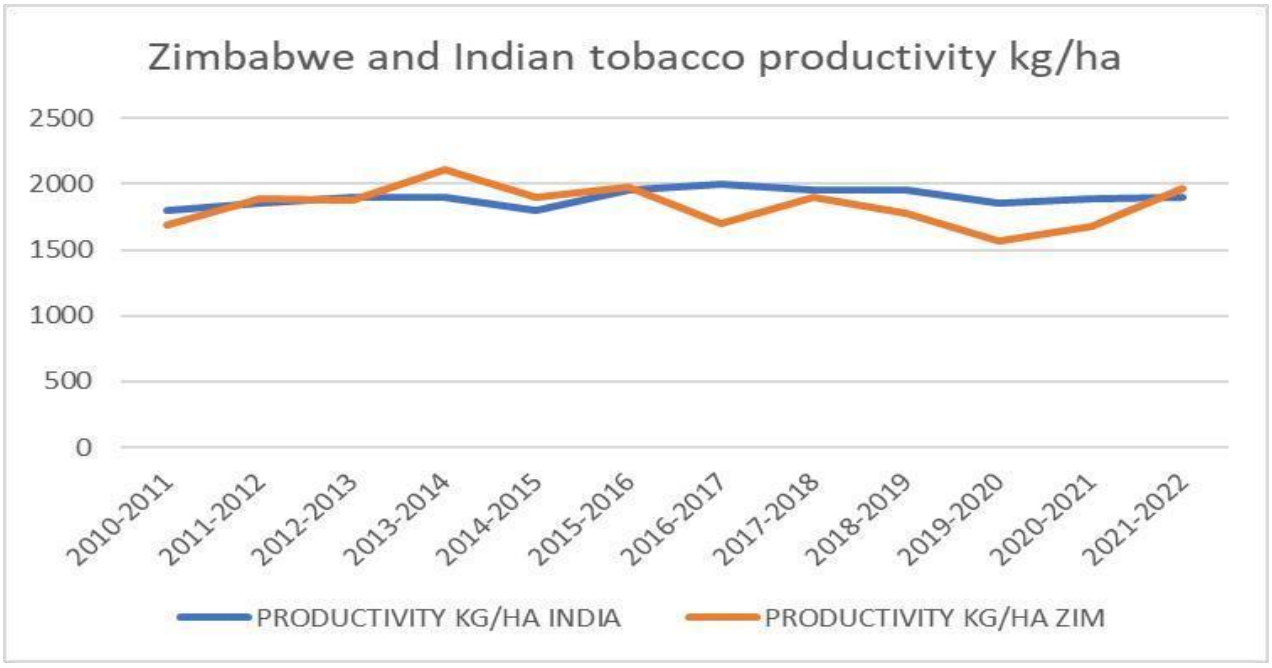

Fig 3: Tobacco productivity trend of India and Zimbabwe

Growth and Instability Analysis of Tobacco Export Value and Quantity in India and Zimbabwe (2010–11 to 2021–22)

As mentioned earlier that tobacco is one of the main cash crops in both India and Zimbabwe , the countries also export some or most of its production. India produced up to 900 m/tonnes of tobacco and Zimbabwe produced up to 289 tonnes within the study period. Out of this production India exports nearly 235 tonnes of tobacco and the rest is consumed within the country as chewed or smoked tobacco **(Indian Tobacco Board, 2022)**. Zimbabwe exports nearly 90% of the tobacco it produces, it exported up to 234 tonnes within the study period.

Table 3: Export in quantity and value of tobacco in India (2010- 2011 to 2021- 22)

Year	Production (MTons)	Export (MT)	Export value (US$ millions)
2010-2011	750	245.22	875.30
2011-2012	660	232.45	833.42
2012-2013	740	259.97	924.14
2013-2014	860	262.01	1011.39
2014-2015	800	251.18	958.62
2015-2016	810	249.16	982.01
2016-2017	950	239.91	958.69
2017-2018	660	220.11	983.59
2018-2019	800	231.80	934.25
2019-2020	760	218.84	983.59
2020-2021	780	221.64	897.78
2021-2022	750	224.95	923.40
Mean	776.67	238103.67	938.84
STDEV	79.47	15395.23	51.55
CV	10.23	6.46	5.49

R SQUARE		0.5	0.09
CAGR	0.32	-1.26	0.47
CDVI		4.50%	5.25%

Source: Indian Tobacco Board, 2023

Analysis of data show that the quantity of tobacco exported from India is showing a decreasing trend with negative of (1,26%) over a period of 12 years from 2010- 2022. This could be possibly be due to high consumption of tobacco in India so the India processing companies buy it for their own processing and resale. This finding is supported by **Reddy et al (2024).** Zimbabwe's CAGR on the quantity of tobacco exported was 3.78% over a period of 12 years. This could be possibly be due to
contract farming going on in Zimbabwe for tobacco farming by big multinational companies who buy it after harvest as export tobacco on auction floors.

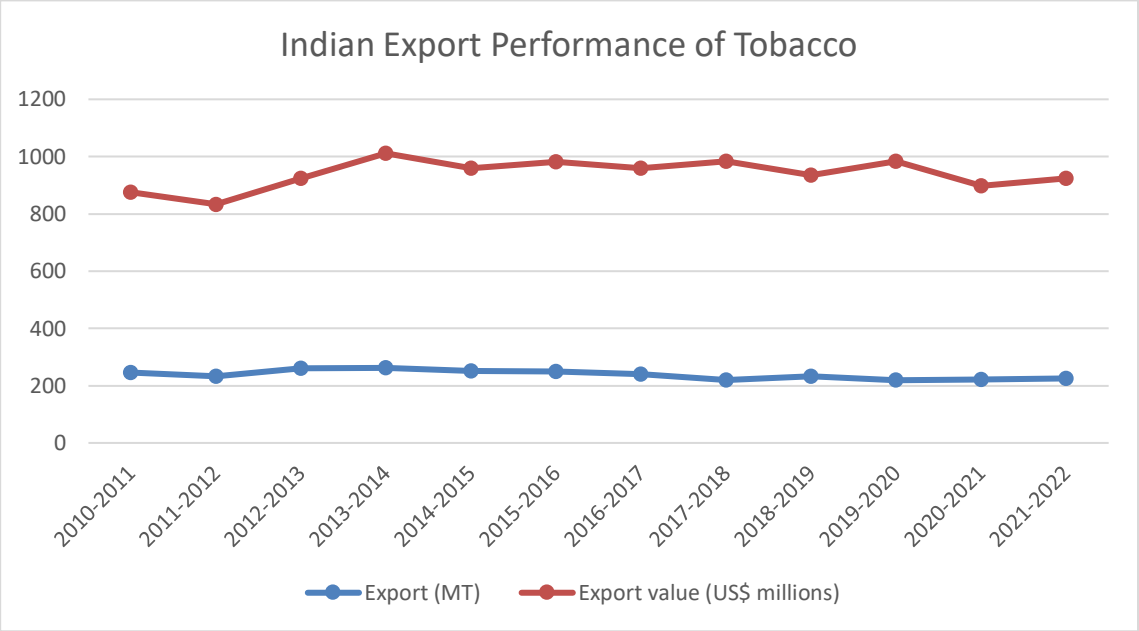

Fig.4: Trends in Tobacco Exports from India in Quantity and Value

Indian export earnings for tobacco have exhibited positive growth rate of 0.46% over a period of 12 years due to better prices of tobacco in export market. This finding was supported by Kaur et al (2004). The export earnings for tobacco are also high for Zimbabwe as they are 3.78% over a period of 12 year from 2010 to 2022. The reason could be the same as India , due to better prices of tobacco in the export market. This finding was supported by **Cousins (2013).**

Table 4: Export in quantity and value of tobacco in Zimbabwe (2010- 2011 to 2021- 22)

Year	Production (MT)	Export (MT)	Export Value (US$ Millions)
2010-2011	132	85.5	412.18
2011-2012	145	144	640.22
2012-2013	176.97	167	744.07
2013-2014	235.65	216	863.97
2014-2015	211.21	199	864.18
2015-2016	209.24	202	933.60
2016-2017	199.38	189	778.33

2017-2018	253	181.58	845.41
2018-2019	259	183.06	795
2019-2020	184	180.72	765.30
2020-2021	209	174.18	795
2021-2022	289	220.18	946
Mean	208.62	178.52	781939.25
STDEV	46.23	35994.71	143434.91
CV	0.02	20.16	18.34
R SQUARE		0.25	0.36
CAGR	4.70%	3.74%	3.78%
CDVI		18.50%	14.70%

Source:Zimbabwe Tobacco Industry Marketing Board 2022

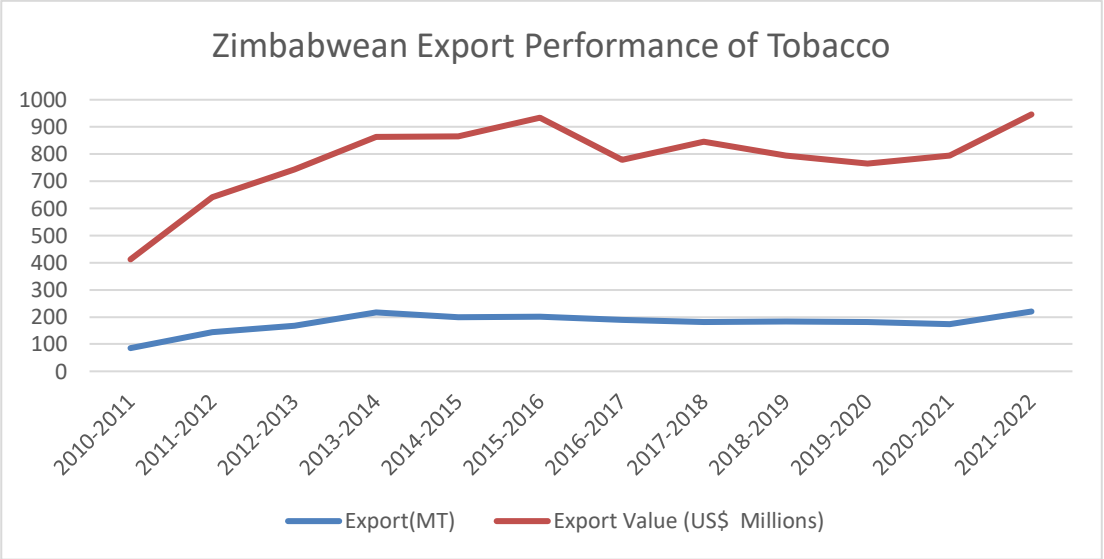

Fig.5: Trends in Tobacco Exports from Zimbabwe in Quantity and Value

Instability measure of Indian and Zimbabwean tobacco for export in quantity and value

The instability in export of tobacco in terms of quantity and value was analysed using Instability Index (Cuddy - Della Valle Index and the results are presented in Table 3. it was observed from the table that the export of tobacco in terms of quantity and value from India was relatively in instability meaning it was stable at 4.5% and 5.25% respectively. For Zimbabwe it was observed that export of tobacco in terms of quantity and value was medium in instability meaning it was also stable at 18.5% and 14.7% respectively. The same results were generated by **Aher (2008)**.

From the results it was concluded that Zimbabwe and India are stable exporters of tobacco in quantity and value. The possible reason is that the tobacco produced in the two countries is largely desired by countries due to minimal metals found in the tobacco.

Social impact of tobacco to the Indian and Zimbabwean farmers

Tobacco crop offers economic empowerment to both Indian and Zimbabwean farmers. It is a high remunerative crop offering higher returns compared to other crops there by improving the socio-economic status of farmers in India. According to **Tobacco Economics in India (2025)** tobacco offers up to 300% more profit than other crops being farmed in major producing states. Tobacco also offers an export gateway to the farmers something that other crops cannot offer. The farmers doing tobacco were found to be having a better socio-economic parameter compared to non-

tobacco growing regions largely due to higher returns from tobacco.
In Zimbabwe tobacco is highly profitable cash crop for both larger and small-scale farmers offering good financial returns compared to many traditional and non-traditional crops. Small holder farmers particularly rely heavily on tobacco as a cash crop with it often constituting more than 50% as their cash income. As with India tobacco is more profitable than other cash crops offering 400% profit more than other crop ensuring a steady income **(Keyser, 2002).**
Despite these economic benefits, the social impacts of tobacco farming are not uniformly positive. Concerns have been raised regarding labor conditions, including the involvement of child labor, exposure to nicotine and pesticides, and the long-term health risks faced by farming communities. Additionally, the economic reliance on a single export crop may expose farmers to market volatility and price shocks.

Recommendations
The study recommends

- Indian government to push corporate entities to invest in development initiatives in tobacco growing regions.
- To also use its area and climate competitive advantage to grow the tobacco farming industry. The has the privilege to grow the crop twice a year and the tobacco crop does well in semi arid regions where other cash crops do not do well
- The study also recommends the government to increase its support to the tobacco farmers so that more can benefit from tobacco farming. This is especially in financial and license issuance to more farmers.
- For Zimbabwe the study recommends it to learn value addition techniques of tobacco from India.
- As much as growth trends are indicating a positive the country can increase its profits in tobacco through value addition. Processed tobacco can fetch more earnings for Zimbabwe and better the country.
- both countries can collaborate and do massive tobacco production to increase their earnings. The competitive advantage of Zimbabwe is the capacity and willingness to grow its tobacco industry whilst India has value addition knowledge and techniques that can benefit both countries.

Conclusion
Analysis revealed that while both countries are serious contributors of tobacco in the world there are differences when it comes to growth trends. India emerges as the 2nd largest tobacco producer however growth wise the country is slower than the 5th largest producer in the world Zimbabwe. Indian tobacco growth rate both in area and production has been driven by consumption and tobacco industry. This is being attributed to the fact that India has the 2nd largest consumers of tobacco and its tobacco value addition industry of cigarettes and bidi is the 7th largest in the world.

Zimbabwean growth rate is driven by net exports as the country exports 90% of its production. The 2 countries have nearly similar productivity trends. The mean for India is 1895kg/ha and for Zimbabwe it is 1836kg/ha. This highlights that both countries are working hard in research of tobacco to improve their yields. Overall as much as India has done well in maintaining the 2nd position of being the largest tobacco producer, it has to start growing its production and area for tobacco farming as there is room for improvement. Zimbabwe can also learn from the Indian tobacco value addition industry so as to increase its earnings and revenue base.

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