

Financial competitiveness of vetiver crop as compared to traditional crops – an Indian perspective

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Abstract

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Background: Despite sixty percent of the Indian population working in the agriculture sector, its contribution to GDP is around 18% only, which is very less considering the potential India have due to the vast trench of land, and diverse and favourable climatic conditions. In this context, our study aims to analyse how replacing traditional crops with vetiver crop, which is an aromatic draught resistance crop, easy to store, manage, and transport and can be grown even on the most vulnerable lands, to drought and irrigation, can increase the income and livelihood of the farmers.

Method: The study focuses on income differentials after adopting vetiver crops over traditional crops, based on cost-benefit analysis. The study is based on secondary data, collected from reports and websites of related institutions.

Results: The study tries to make an original contribution by assessing the benefits of cultivating vetiver crops over traditional crops. The results may help farmers and policymakers to adopt and promote the cultivation of vetiver, to increase the income of farmers and contribution of agriculture to GDP.

Keywords: agriculture; aromatic crop; medicinal crop; traditional crops; vetiver crop

Abbreviations: Gross Domestic Product – GDP; Gross Value Added – GVA; Medicinal and Aromatic; Plantations – MAP; Compound Annual Growth Rate – CAGR; Green House Gases – GHG; Vetiver Grass Technology – VGT

Introduction

Indian agricultural economy depends upon traditional crops and systems around it (Ma & Maystadt, 2017), they majorly grow grains and pulses. Agriculture and allied industries contribute an 18.8% (2021-22), share of India's gross value added (GVA), with a growth of 3.6 percent in 2020-21, and 3.9% in 2021-22 (<https://pib.gov.in/PressReleasePage.aspx?PRID=1793829>), 2022. Despite 65 percent of the Indian population living in rural areas, out of which 47 percent are completely dependent on agricultural income for their livelihood (<https://www.indiabudget.gov.in/economicsurvey/doc/echapter.pdf>). The underperformance of the Indian agriculture sector can be understood by the fact

that the average income of a farmer's household is just Rs. 10,218 per annum (\$123.82 at current price) (<https://pib.gov.in/PressReleasePage.aspx?PRID=1884228>), 2022, which is insufficient to cover even basic average monthly expenditure, leave affordability of quality education, sanitation, and health services.

These facts explain the need for change in our agricultural system as current practices are not helping farmers even to manage their household expenses, or pay their debts, making sustainability out of reach.

There can be various solutions to this problem, the most practical would be the introduction of crops and farming cost-effective patterns (Birthal et al., 2015; Weinberger & Lumpkin, 2007; Barghouti et al., 2004; Joshi et al., 2004;

Ali & Abedullah, 2002), which yield higher returns (Suresh et al., 2014), are easier to store and transport (Polakova et al., 2016) and add value to the lives of households indulged in farming.

India is blessed with a tropical climate that favours farming of various high-value medicinal and aromatic herbs (Smyle & Magrath, 1993; Suresh et al., 2012), which fetch good income in the domestic and international markets (Shabbir et al., 2019; Sher et al., 2022). Vetiver is one such crop that has the potential to solve these problems to some extent. Vetiver crop (*Vetiveria zizanioides*), is an all-weather grass of the Poaceae family (Smitha et al., 2014), it is a native of North India (Dhawan et al., 2021; Babu et al., 2021), can be grown without the use of fertilizers and pesticides (Joy, 2009) translates low input cost, draught and flood-resistant (Le & Wal, 2021), makes vetiver suitable for lands with poor irrigation and also for lands, with waterlogging issues (Farahani et al., 2009; Bezu & Tezera, 2019), and highly marketable as it is used in the aroma and cosmetic industry (Smitha et al., 2014; Raman et al., 2018).

It is an anticancer, antifungal, antibacterial, antioxidant, and cures inflammation, which makes it important for the pharmaceutical industry (Archana et al., 2013; Shabbir et al., 2019; Hanif, et al., 2019). Global demand for vetiver oil is on the rise given its vast use in industries, unique aroma and fixative properties (Balasankar et al., 2013; Durge et al., 2021; Sharmeen et al., 2021). India contributes 20–25 tons of vetiver oil production (Smitha et al., 2014) as against the global production of 250 tons annually (Jindapunnapat et al., 2018; Babu et al., 2021; Singh et al., 2019). Vetiver is a blessing to the coastal ecosystem integral for prosperity and ecological stability (*Coastal Agriculture and Climate Change* (94-106, CRC Press). Vetiver oil has a large demand globally (Raman et al., 2018; Babu et al., 2021), but due to low production, it always falls short. In this context, the objectives of the study are to analyse the demand-supply gap of vetiver in the country, as well as world level to check if there any significant gap exists. Also, the study assesses the economic potency of vetiver in comparison to traditional crops, to check whether income generated from vetiver can increase a farmer's income to a significant level.

The study is based on secondary data, collected from reports and websites of related institutions. The study tries to make an original contribution by assessing the benefits of cultivating vetiver crops over traditional crops. The results may help farmers and policymakers to adopt and promote the cultivation of vetiver to increase the income of farmers and contribution of agriculture to GDP.

The study is structured as follows – the first section deals with the introduction of the subject matter. The next

and second section is of literature review on the cultivation of vetiver crops and their advantages over other crops. The subsequent third and fourth sections are related to research methodology and data analysis and discussions. Finally, the fifth section comprises of summarization of the findings and conclusion.

Review of Literature

The vetiver root system is a proven bio-engineering tool (Truong, 2000). Vetiver can be grown in various climates, but uprooting is observed best in tropical climates, whereas meditation climate is not given the best results in uprooting (Mickovski et al., 2005). The influence on agricultural productivity varies depending on latitude and found that more medicinal and aromatic plants (henceforth MAPs), can be used and can be grown in inter-cropping patterns with proper estimated land (Singh et al., 2022). MAPs have huge potential for trade and, due to lack of planning towards them making traders exploit wild-grown MAPs, this makes them vulnerable to extinction, it's important we start cultivating them in farms to avoid disruption of the supply chain at the same time exploitation of wild jungles, emphasis on proper policy and infrastructure is needed (Thakur et al., 2017). Agriculture makes up 25% of the world's GHGs and can reduce 18% of overall emissions. The potential measures of atmospheric carbon capture in the soil are similar utilizing cover crops, agriculture, and perennials; reducing tillage, and minimizing the application of chemical fertilizers. As a proportion of the geographical area, the total wasteland is 20.16. Many MAPs in these countries can be grown. Lemongrass is promised in sodium aromatic crops, such as Palma Rosa (*Cymbopogon martini*). Sodium is a significant issue with about 1.5 billion ha, about 340 million ha (23 percent), of which Saline and an additional 560 M ha (37 percent) influence worldwide sodium irrigated soil. This is primarily because of cumulative effects over decades of supplying water to dry and semi-arid soils with part of the dissolved salts. The north-eastern region can also get benefited by shifting focus to MAPs by decreasing the area in traditional rice crops, but the promotion of MAPs is challenging given the lack of knowledge and resources, more research is required in the North-East region to find out more ways to extract the oils and proper use of roots of the MAPs to fetch good prices in the market (Kikon & Angami, 2017). Indian plants in wetland, such as Nash synonymous with *Chrysopogon zizanioides* (L) Roberty (Family: Poaceae/Gramineae), is extensively grown in these tropical parts of the globe. The plant is unusual in that it is xerophyte (tolerates extended dryness), yet survives lengthy periods of periodic floods; it tolerates severe temperatures

and thrives in a wide range of soil pH (Pareek & Kumar, 2013).

Climate change, population growth, industrial development, urbanisation and insensitive use of nature has created significant environmental issues like soil erosion (Smyle & Magrath, 1993; Safari et al., 2022), and land degradation (Cindik & Demirel, 2013; Seifollahi-Aghmiuni et al., 2022). The adaptation of vetiver grass in the watershed area can avoid floods and function as a natural embankment against floods (Smyle & Magrath, 1993; Mondal & Patel, 2020). Vetiver grass has deep roots, which may penetrate up to 10 m into the soil and can assist mitigate floods if appropriately planted along riverbanks (Jafari et al., 2022). Sapti (2019) discussed that Vetiver grass technology (VGT) was developed in India in 1980s for soil and water conservation. VGT is also one of the best, cheapest, and most natural ways of environmental protection. In addition to it, (Islam et al., 2021) looked at the usability and effectiveness of vetiver grass to protect hill slopes from erosion during extreme rainfall. Because the vetiver root system penetrates deep into the soil, it was discovered that it reduced hill slope erosion by 18% to 71% during heavy rainfall, making vetiver a cost-effective, long-term solution for soil erosion on hill slopes (Smyle & Magrath, 1993; Aziz & Islam, 2023). Vetiver grass is exceptionally capable of resisting extreme sodium and alkalinity and may improve soil fertility (Lavania, 2008). Drought stress is particularly severe in countries, where agricultural cultivation is largely rain-fed. Drying stress raises the concentration of solutes in the environment, causing an osmotic water stream to emerge from plant cells. As a result, the solute content in plant cells rises, reducing water availability (Farahani et al., 2013). Utilizing vetiver as an environmental technology tool can have a variety of positive consequences, including preventing soil erosion (Truong, 2000; Smitha et al., 2014). The effectiveness of vetiver extracts against *Meloidogyne* indicates the importance of vetiver (Chauhan et al., 2018). Gnansounou et al. (2017), suggests that vetiver has a variety of socio-economic and environmental advantages. Shabbir et al. (2019), presents the important uses of vetiver in the field of health and wellbeing, but it has been focused on health-related uses of vetiver and does not tell us how farmers can economically benefit from vetiver plantation and increase their income level.

Vetiver is having a traditional usage for its fragrance oil from roots from ancient times. For ages, its hedges have also been used for contour protection (Lavania, 2008). This study found that cultivating fragrant crops like Vetiver may be highly profitable, virtually doubling the net income of typical crops. Crossbreeding of perfume-grade vetiver grass to generate more fragrant also increases oil output, according to

this research. The study focuses on how to make genetically advanced vetiver species, leaving the discussion economic benefits of vetiver (Dhawan et al., 2018). The unusual scent and flavour they emit are most effective in attracting insects and other animals, which are needed for pollination and seed dispersal (Singh, 2018), wherever, the scent in these essential oils (Safari et al., 2022) is mostly employed in perfumery, cosmetics, and medicinal industries.

Organic farming has a lot of potentials and pays well. Farmers must be educated about cultivation methods and their effects on health, the environment, and the economy (Alzaidi et al., 2013). (V Basil Hans & Rao Raghavendra, 2018) investigated what benefits organic farming can bring to India, how conventional farming destroys the soil, adversely affects human beings with chemical fertilizers, and how international demand for organic produce can fetch better economic benefits. (Ponisio et al., 2015). Khan & Verma, (2018) suggested that crop rotation using aromatic plants not only raises farm revenue in the same period, but also improves yield, resulting in high economic returns (Thakur et al., 2014). Previous studies suggest that more research may be conducted to determine the actual impact on the rural economy, because putting money in the hands of poor farmers can benefit the entire economy (Suresh et al., 2012).

Objectives of the Study

The objectives of the Study are to investigate demand and supply gap of Vetiver crops in the world, and to assess the economic potency of vetiver crop, vis a vis traditional crop.

Methods

The study is descriptive and attempted a widespread review of literature from various sources. The article has included journal papers, articles from news and blogs, conference proceedings, working papers, case studies, and reputed databases. The study involves through investigation of available information to explain the complex phenomenon and derive meaningful conclusion. The data is collected from Secondary sources, which are already available on the websites and the agricultural organizations.

Data Analysis

The above figure represents the growth trajectory of the vetiver oil market size, by application from the year 2016 to 2027, vetiver has the highest application in the spa and relaxation industry, with food and beverages coming last. The Vetiver market demand size is projected to get doubled by 2027, and will scale positively over the years (Figure 1).

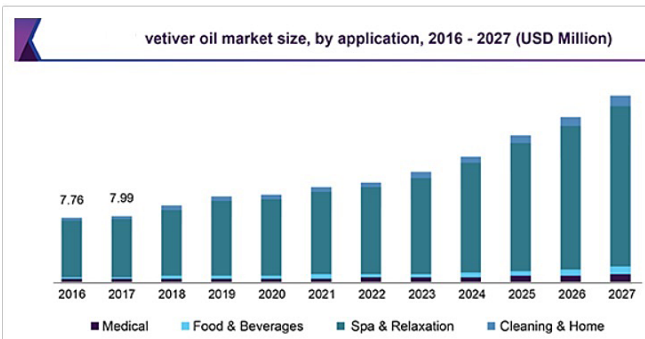


Fig. 1. Global vetiver oil market share by application 2016-27 (USD million) (Forecast)
Source: Granviewresearch.com

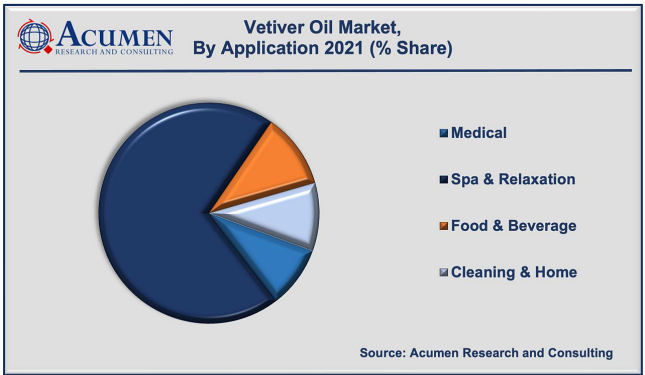


Fig. 2. Global vetiver oil market share by application 2021, %

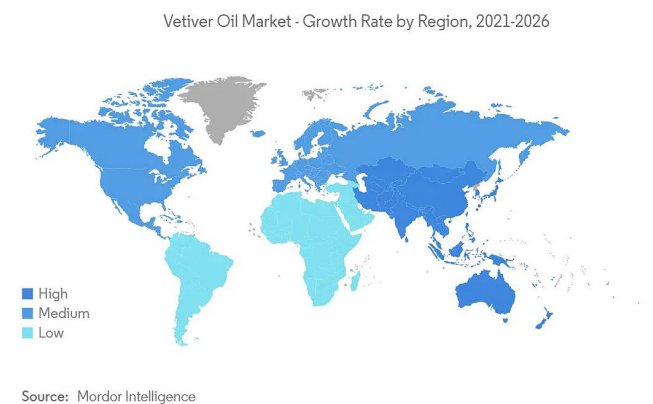


Fig. 4. Vetiver oil market- growth rate by region – 2021-2026

The above figure shows the spa and relaxation dominating market share of vetiver in 2021, followed by Medical, Cleaning and Home, and food beverages respectively (Figure 2).

The above figure shows the global Vetiver market overview. In 2021, Vetiver market size of us USD 59 Million, which is projected to increase in 2022-2030, with a Compound annual growth rate (CAGR) of 9.2%. In 2030, Vetiver is projected to have a market of USD 126 Million. Key drivers for this growth are increasing adaptation of vetiver in the cosmetic industry, and demand from food and beverages industry, the prime challenges, would likely be poor harvesting and dependency of harvesters on investors (Figure 3).

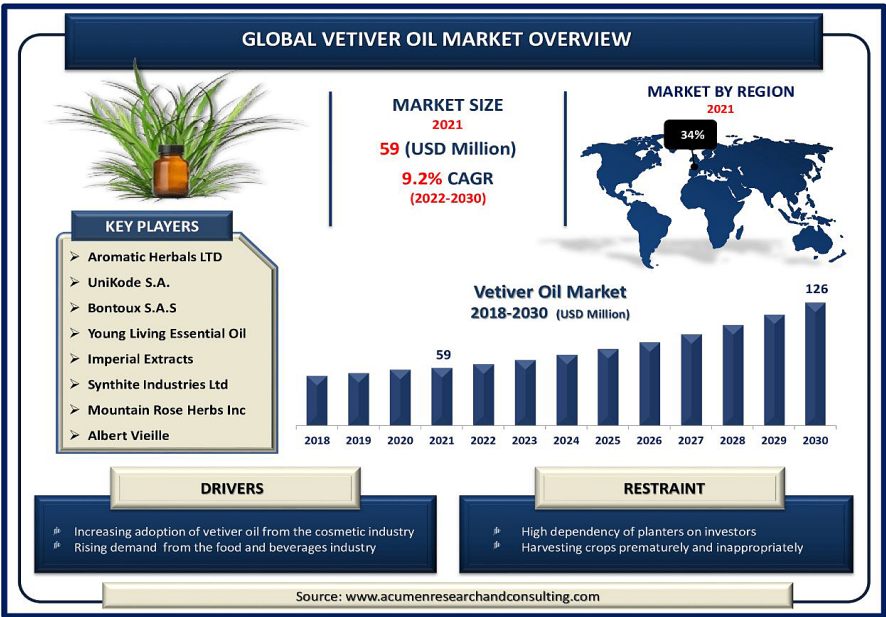


Fig. 3. Global vetiver oil market overview – 2018-2030

Key players in vetiver markets are Aromatic Herbals Ltd (India), Young Living Essential Oils (USA), etc.

This map shows the vetiver market size share in different regions. The highest demand is seen in major economies like the USA, India, China, and ASIAN countries, Africa and South America, will be the areas where low de-

mand exists for vetiver (Figure 4).

Data presented in Table 1 demonstrates that farming of vetiver will provide more economic returns than conventional cash crops. The Vetiver crop is emerging strongly as alternative to the given cash crops that is Potato and Mustard and have better economic opportunities. If we combine the

Table 1. Cost-benefit analysis of vetiver crop V/S other cash crops combination (potato+mustard) in a year

Cost benefit analysis of Vetiver crop V/S other cash crops combination (Potato + Mustard) in a Year			
FARM INPUTS	POTATO (Rs)	MUSTARD (Rs)	VETIVER (Rs)
LAND	20,000	0	20,000
SEED	20,000	1,000	6,000
CULTIVATION	5,000	2,000	2,000
LABOUR	2,500	2,500	2,500
WEEDING	2,500	2,500	2,500
WATER	4,000	4,000	3,000
HARVESTING	2,000	2,000	5,000
COLD STORAGE	31,250	0	0
TOTAL COST OF PRODUCE	87,250	14,000	41,000
PRODUCE PER ACRE (kg)	16,500	1,500	10
PRICE PER KG	8.5	27	25,000
TOTAL PRICE OF PRODUCE	1,40,250	40,500	2,50,000
PROFIT PER ACRE	53,000	26,500	2,09,000
	79,500		2,09,000
DIFFERENCE	1,29,500		

Source: Author's Calculations

Table 2. Cost-benefit analysis of vetiver crop V/S traditional crops combination (paddy+wheat) in a year

Cost benefit analysis of Vetiver crop V/S other traditional crops combination (Paddy+Wheat) in a Year			
FARM INPUTS	PADDY (Rs)	WHEAT (Rs)	VETIVER (Rs)
LAND	20,000	0	20,000
SEED	3,720	1,300	6,000
CULTIVATION	2,500	2,500	2,000
LABOUR	4,500	3,000	2,500
WEEDING	2,500	2,500	2,500
WATER	4,000	2,000	3,000
HARVESTING	2,800	2,600	5,000
COLD STORAGE	0	0	0
TOTAL COST OF PRODUCE	40,020	13,900	41,000
PRODUCE PER ACRE (kg)	2,450	2,000	10
PRICE PER KG	20.4	21	25,000
TOTAL PRICE OF PRODUCE	49,980	42,000	2,50,000
PROFIT PER ACRE	9,960	28,100	2,09,000
	38,060		1,70,940
DIFFERENCE	1,70,940		

Source: Author's Calculations

returns of both the cash crops in the same period, in which a single crop of vetiver is cultivated, we get returns 2.62 times more than the combined profit of both crops. Thus, medicinal plant cultivation is emerging as more profitable ventures.

Data presented in Table 2 demonstrates that vetiver is emerging high economic benefits as compared to traditional crops. Vetiver has a crop cycle of 10 months duration from sowing to harvesting. In the same time two cash crops can be cultivated (that is Paddy and Wheat). If we combine the returns of both the cash crops in the same period, in which a single crop of vetiver is cultivated, we get returns 4.49 times more than the combined profit of both crops.

Results and Discussion

Aromatic and medicinal plants provide greater benefits than other traditional plants since they can get higher returns than others and have a strong demand for exports. Due to their robust nature, they can endure unfavourable environments, and climatic conditions, such as drought, flooding, high temperature, uneven distribution of rainfall, etc. These plants can fit in a pattern of cropping and may reduce the prevalence of oesophageal plague and illness.

India produces 20-25 tons of oil annually. Vetiver, as a crop, is systemically cultivated in Uttar Pradesh, Kerela, Karnataka, Madhya Pradesh, and Andhra Pradesh, in which the oil produced by Uttar Pradesh is considered of the highest quality. In comparison to southern states, oil produced by northern states are of high quality and fetches a very high price in the international market (Jindapunnapat et al., 2018; Ouyang et al., 2021).

Global demand for vetiver oil is on the rise given its vast use in industries, unique aroma, and fixative properties (Balasankar et al., 2013; Durge et al., 2021; Sharmeen et al., 2021). India contributes 20–25 tons of vetiver oil production as against the global production of 250 tons annually (Jindapunnapat et al., 2018; Babu et al., 2021; Singh et al., 2019).

This represents a wonderful opportunity for Indian farmers to tap this domestic supply deficit, they now can move on from traditional cropping patterns and enters into aromatic and mediational plantations.

Conclusion

Vetiver has been utilized in many nations, particularly in Asia, as a medicinal and aromatic plants. It has recently been widely recognized as an ideal plant for the conservation of soil and water, as well as the preservation of the environment, its monetary benefits can be easily seen as its income surpasses traditional farm income, and it can encourage rural

industries like distillation units and handicrafts. It can fulfil environmental objectives, socio-economic implications, and industrial potential. As the world is looking towards going back to nature, to help the cause, vetiver can be used as a natural medicinal herb in modern pharmaceuticals and cosmetics industries. Industries like perfumers and cosmetics offer the considerable potential of a plant like a vetiver. It has a huge potential to increase the income of the farmers significantly.

Findings and Suggestions

The purpose of the present research is to study the vetiver as a potential crop to solve farmers' financial woes. The present study demonstrates how the adoption of vetiver cultivation can positively effect income by a whopping 262% in comparison to traditional crops like potato and mustard.

The study encourages and promotes vetiver farming, which would reap many benefits like an increase in income, and better rural livelihoods, and can promote village-level industry such as extraction of essential oil and handicrafts, as well as the GDP of the economy. The results may help farmers and policymakers to adopt and promote the cultivation of vetiver to increase the income of farmers and contribution to agriculture in GDP.

The findings of the study provide valuable suggestions for the policy maker and agriculture-related organizations. There is huge scope in agriculture if one shifts to high-income crops like vetiver, by encouraging farmers and interest groups to allocate land for such crops. By providing them with a higher income-generating crop like vetiver, as an alternative to traditional crops and giving a boost to the agriculturally based economy like India.

Therefore, related organizations like NGOs and government can educate farmers through agricultural fairs, and print, television, and social media.

Government can distribute planting material free of cost and employ a pilot project, that can help in the easy transition from traditional to vetiver farming. Due to the huge opportunity available in the vetiver market, the farming application of vetivers needs to be applied and researched.

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