

“Study Of Farmer’s Perspective Towards Cost of Cultivation and Yield of Sugarcane In Maharashtra State”

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Abstract:

Sugar cane farmers should take several precautions to ensure the health and productivity of their crops. Sugar cane farmers should keep up with the latest studies and best practices in their area and adjust their safety measures accordingly. Local agricultural extension services and industry groups can help farmers take these precautions successfully by giving them valuable advice and support. The cultivation cost is an accumulation of seed, fertilizers, manure, machinery owned or hired, and labor costs. The productivity of the soil and the rotation of crops are also important factors in increasing the productivity of sugar cane. The study is to understand the changes in components of cultivation cost and overall cost. The study is also extended to understand fair and remunerative pricing (FRP). It is the minimum price at which sugarcane is to be purchased by sugar mills from farmers. The actual price received by farmers may be better. It is also observed that there is a difference in the price paid by cooperative sugar mills and private sugar mills. The study is based on secondary data from 10 years and develops a model to determine the FRP according to changes in the components of the cultivation cost for sugar cane.

Key Words: Sugar cane, Cultivation cost, Productivity, FRP

Introduction:

The cultivation of sugarcane is of major importance, both economically and from an agricultural standpoint. It is an important cash crop that helps support the livelihoods of millions of farmers around the world. Sugarcane is the principal source of both sugar and ethanol, both of which are key components of the global food industry as well as the renewable energy industry. In addition to this, it results in the creation of employment possibilities at every stage of the supply chain, from cultivation to processing, making it an essential agent in the advancement of rural areas. In addition, the cultivation of sugarcane can assist in the prevention of soil erosion and contribute to the sequestration of carbon, underscoring the importance of sugarcane agriculture to the environment. In many parts of the world, sugarcane production is essential because of the crucial role it plays in ensuring food safety, fostering economic expansion, and promoting environmentally responsible agriculture.

Cultivation of sugarcane

Sugarcane farming is a form of agriculture that entails the methodical and labour-intensive cultivation of sugarcane plants for the purpose of producing sugar and different by-products such as molasses and ethanol. Sugarcane is a plant that comes from the sugarcane family. This tropical and subtropical crop is predominantly cultivated in areas that have climates that are conducive to its

growth, such as some sections of Asia, the Americas, and Africa. The method of cultivating sugarcane normally begins with the selection of sugarcane stalks or setts that are in good health. These are then planted in fields that have been adequately prepared throughout the planting season. Sugarcane cannot be grown without a soil that is rich in nutrients, has good drainage, and contains the right amount of moisture. In addition, the cane must be exposed to a lot of direct sunlight.

After being planted, sugarcane goes through a protracted growth cycle that is comprised of numerous stages, including germination, tillering, grand growth, and maturation, among others. It is essential to irrigate the soil on a consistent basis in order to maintain proper moisture levels throughout these stages. Sugarcane is a crop that is very high in energy, and in order to get the most out of it, it needs to be properly nourished. This is typically done by applying fertilizer. Controlling weeds and pests is also vital for preventing competition for nutrients and protecting the crop from any potential dangers that may arise.

When the sugarcane has reached its maximum level of sucrose, which normally occurs between 12 and 18 months after planting, depending on the variety and the environmental conditions in the area, the harvesting process can begin. The harvesting procedure can be done by hand or mechanically, with machines chopping the stalks and putting them onto trucks for shipment to sugar mills or processing facilities. After the juice has been removed from the sugarcane, it is processed to obtain sugar, and the

fibrous material that is left over, known as bagasse, is utilised for a variety of uses, including the generation of bioenergy.

The production of sugarcane is an important business that not only contributes to the economies of a number of different nations but also supplies a sizeable amount of the world's sugar supply. Sustainable agricultural practices, including crop rotation and water management that are both effective and efficient, are becoming increasingly vital to ensure the long-term financial viability of sugarcane production while also reducing its negative effects on the environment.

Opportunities for sugarcane farmers

Sugarcane farmers have various opportunities to enhance their livelihoods. Firstly, the global demand for sugar and sugarcane-based products remains consistently high, providing a stable market. Additionally, sugarcane can be used for ethanol production, offering a renewable and environmentally friendly source for biofuels. Moreover, the byproducts of sugarcane processing, such as bagasse and molasses, can be used for generating electricity, producing animal feed, or even creating biodegradable packaging materials. Furthermore, diversification into value-added products like specialty sugars or organic sugarcane can open up premium markets and increase profitability. Finally, sustainable and eco-friendly farming practices can lead to certifications and access to markets that prioritise sustainability, ensuring a long-term future for sugarcane farming.

Factors affecting the yield of sugarcane

Sugarcane production is affected by a number of elements, including climate conditions, the quality of the soil, agricultural practices, and crop management. A favourable environment for growth requires the right amount of rainfall, temperature, and sunlight. The fertility of the soil, the pH level, and the drainage capacity all have an effect on the availability of nutrients. The health of the crop can be improved by the use of effective planting methods, appropriate spacing, and disease control. In addition, the quantity of sugarcane that is harvested, the type of seeds that are used, and when they are harvested all have vital roles in deciding how much sugarcane is produced. Yields can be increased even further by careful management of pests and weeds, as well as through the application of fertiliser in a measured manner. In the end, getting high sugarcane yields requires the proper integration of these components within the production process.

Review of Literature

1. Kshirsagar, K. G. (2008), Impact of Organic Farming on the Economics of Sugarcane Cultivation

in Maharashtra "Maharashtra's sugarcane productivity rose to 95.15 metric tonnes per ha in TE 1982–1983 from 70.95 metric tonnes in –1973. After that, productivity dropped to 80.98 metric tonnes per hectare in TE 1992–1993 and 78.33 metric tonnes in TE –2003. 2 The state had 18.10% of its gross cultivated area under irrigation in 2002–2003, compared to 40.20 percent nationally. Thus, Maharashtra is a water-scarce state. Despite this, the state has 100% sugarcane irrigation. Sugarcane requires a lot of water to grow since it takes a long time and produces a lot of biomass.

2. et al. Bhagavat P. et al. (2018), A Study on the Perception of Organic Farmers Towards Organic Farming" found positive perceptions of organic farming with significant correlations between age, education, farm size, benefits, and social factors. It means communities will adopt organic farming and other agricultural policy improvements quickly. Recent geopolitical zone studies reveal little organic farming, which is concerning. Understanding the system and government support (e.g., loans, technical training) for farmers helps close this knowledge-practice gap. This study found unexpected results that organic farming costs did not affect farmer attitudes. Farmers may choose production and profit over input costs. Knowledge, environment, and gender do not affect farmer attitudes.

3. Kumar, A., et al. (2015), Climatic effects on sugarcane productivity in India: A stochastic production function application." A study of fourteen states from 1971–2009 examines the impact of climatic and non-climatic variables on sugarcane output and variability during different weather seasons. The Cobb-Douglas-Douglasion function model with the Just and Pope framework was utilized in the study. The regression coefficient is obtained using FGLS. Research indicates that both climatic and non-climatic factors significantly impact sugarcane productivity. Variables such as the average maximum temperature in the rainy and winter seasons and the average minimum temperature in the rainy and summer seasons significantly impact sugarcane production variability. The study confirmed that higher average maximum and minimum temperatures in the summer and winter seasons lead to lower mean yield levels.

4. Clark, D., et al. (2003), "Measurement of technical efficiency of climatic and non-climatic factors in sugarcane farming in the Indian States: Use of a stochastic frontier production function approach." This study examined how climatic and non-climatic factors affect Indian sugarcane output and production. It collected state-wise panel data from 14 Indian states from 1971 to 2014. The regression coefficients of climatic and non-climatic components for sugarcane production and yield function were estimated using a stochastic frontier production function approach with a log-linear

regression model. From 1971 to 2014, it measured the technical efficiency (TE) of non-climatic variables and climatic factors in sugarcane production and yield across Indian states.

5. Gulati, A., & Mohan, G. (2018), Towards sustainable, productive, and profitable agriculture: The Case of Rice and Sugarcane " Water is becoming a bigger issue in Indian agriculture than land. India will be the most populous nation by 2024, and its demand for food, feed, and fiber will rise with per capita income, putting a huge strain on land and water. India has about 17 percent of the global population but only 2 percent of the geographical area (11% of global arable land) and 4 percent of the freshwater resources. Given climate change's potential for more droughts and floods, India must focus on increasing its water supplies and managing them more efficiently. Since agriculture uses 78% of fresh water, policymakers must modify their minds about evaluating water productivity. Agriculture's water use is hampered by inequity in irrigation water allocation, with over 60% diverted to sugarcane and paddy. Competing demands on water from growing urbanization and industrialization cannot be satisfied unless agriculture achieves a paradigm shift in water use.

6. Ahmad, N. et al. (2018), Economic analysis of growth, instability, and resource use efficiency of sugarcane cultivation in India: an econometric approach " It may be concluded that sugarcane production, area, and productivity in India increased during the study period. Bihar (3.39%), Maharashtra (2.42%), and Karnataka (0.95%) ranked highest in sugarcane acreage performance, while Bihar (4.35%), Gujarat (3.19%), and Maharashtra (2.63%) ranked most in output growth. Positive and encouraging increases in sugarcane productivity were seen in all investigated states. Stable areas under sugar cane were seen in Uttar Pradesh,

Uttarakhand, and Gujarat, while yields also showed consistency in these states.

7. Nga, N. T. D., & Lantican, F. A. (2011) This document is discoverable and free to researchers across the globe due to the work of AgEcon." both of the above arguments have relevance in a specific context. In states like Punjab and Haryana, where irrigation charges as a percentage of net crop revenue from paddy are in the range of 26 to 30 percent (as of 2002-03) and 20 to 23 percent of operating costs, any rise in volumetric water price would certainly demotivate the farmers to use more water, and along with crop price disincentives, farmers may be induced to replace paddy by other low-water-requiring crops such as cotton, maize, soybean, etc. Alternatively, farmers may reduce the number of irrigation in paddy by changing the time of sowing and transplanting from a high-temperature month of May to mid-June, when the onset of the monsoon is expected to provide the required quantity of water. Nevertheless, the outcome would depend on the interplay of various factors such as technology, infrastructure, the availability of alternative, albeit cost-effective, methods of irrigation, the input-output price policy, the Exim policy, and the consequent overall behavior of input-output markets.

Research Methodology:

It is analytical research, based on secondary data. The information related to cultivation cost (including human, animal and machine), cost of seeds, cost of pesticides and insecticides is obtained from the various government reports. The span of study is from 2013-14 to 2020-21. The purpose of study is to understand the change in various cost and it's impact on the productivity of sugarcane.

Data Analysis:

Total cost of Human, Animal and Machine in sugarcane industries from the year 2013-2021

Note: All cost are in Rs./Hectare

Year	Total Human Labor	Total Animal Cost	Total Machine Cost
2013-14	49022.06	5906.02	20259.99
2014-15	57275.15	7919.26	19852.75
2015-16	60213.61	5481.97	23202.29
2016-17	41968.7	4752.85	16847.54
2017-18	66370.66	8319.22	27348.56
2018-19	50053.49	7922.18	23861.21
2019-20	44696.01	4909.46	26092.61
2020-21	80703.86	4278.02	33427.09

The cost structure of the sugarcane industry has evolved over the years, with significant variations in labor, animal, and machine costs. In 2013-14, the total human labor cost was Rs.49,022.06 Per hectare, while animal cost stood at Rs. 5,906.02 Per

hectare, and machine cost was Rs.20,259.99 Per hectare. Over the subsequent years, there were fluctuations in these costs, with 2017-18 witnessing the highest total human labor cost at Rs.66,370.66 Per hectare and machine cost peaking at

Rs.27,348.56 Per hectare. In contrast, 2016-17 had relatively lower costs, with a total human labor cost of Rs.41,968.7 Per hectare and animal cost of Rs.4,752.85 Per hectare. The most recent data for 2020-21 indicates a significant increase in total human labor cost to Rs.80,703.86 Per hectare and

machine cost to Rs.33,427.09 Per hectare, while animal cost decreased to Rs.4,278.02 Per hectare. These cost dynamics likely reflect shifts in technology adoption, labor markets, and operational efficiency within the sugarcane industry over the years.

Total cost of Seed, Fertilizer and manure and other cost (Insecticides and Irrigation Charges) in sugarcane industries from the year 2013-2021

Note: All cost are in Rs./Hectare

Year	Cost of Seed	Total fertilizer and manure	Other cost
2013-14	5615.31	22591.92	11415.56
2014-15	9034.64	25188.84	17510.1
2015-16	7544.21	22271.40	15,901.17
2016-17	3082.41	16052.27	16082.21
2017-18	10730.2	24976.61	17987.31
2018-19	6709.58	21551.23	14152.33
2019-20	5183.14	19130.91	14095.35
2020-21	12750.9	29309.77	20381.45

The cost of sugarcane cultivation in the given years varies significantly, reflecting the dynamic nature of the industry. In 2013-14, the cost was Rs.5615.31 Per hectare, primarily driven by expenses on seed, fertilizer, and manure, which totalled Rs.22591.92 Per hectare, and additional costs amounting to Rs.11415.56 Per hectare. Over the next few years, we observed fluctuations in costs, with 2015-16 experiencing a relatively lower cost due to reduced

expenses on other factors. However, costs surged again in 2016-17, primarily due to high other costs. The subsequent years witnessed varying expenses, with 2020-21 recording the highest cost, mainly attributed to substantial expenses on seed, fertilizer, and manure. These fluctuations in costs reflect the complex interplay of factors affecting the sugarcane industry, including market conditions, input costs, and agricultural practices.

Fair and Remunerative Price (FRP) and Production (In kilogram per hectare) in sugarcane industries from the year 2013-2021

Year	FRP (Rs. per quintal)	Production(in kilograms Per hectare)
2013-14	210	74,650
2014-15	220	82,072
2015-16	230	82,232
2016-17	230	74,650
2017-18	255	82,524
2018-19	275	92,000
2019-20	275	77,200
2020-21	285	84,280

The FRP (Fair and Remunerative Price) in the context of the sugarcane industry represents the minimum price that sugarcane farmers are guaranteed for their produce by the government or relevant authorities. It is typically set per quintal (100 kilograms) of sugarcane. The production of sugarcane is measured in kilograms per hectare and reflects the amount of sugarcane harvested per unit of land. From the provided data, we can observe that the FRP has been gradually increasing over the years, reaching Rs. 285 per quintal in 2020-21. This increase in FRP is likely an effort to provide fair compensation to sugarcane farmers for their efforts and investments in sugarcane cultivation.

Production, on the other hand, has shown some fluctuations, with variations from year to year. Factors such as weather conditions, agricultural practices, and pest management can impact the production of sugarcane. Despite these fluctuations, the production has generally remained in the range of 74,650 to 92,000 kilograms per hectare.

Objective1: To study the impact of various cost of production of sugarcane on production of sugarcane.

Null Hypothesis H₀₁: There is no significant impact of cost of production of sugarcane on production of sugarcane.

Alternate Hypothesis H₁₁: There is significant impact of cost of production of sugarcane on production of sugarcane.

To study the above Null hypothesis correlation is applied. The results are as follows.

Correlations		
		Production (in kilogram per hectare)
Production (in kilogram per hectare)	Pearson Correlation	1
	N	8
Total Human Labour	Pearson Correlation	.415
	Sig. (2-tailed)	.306
	N	8
Total Animal Cost	Pearson Correlation	.502
	Sig. (2-tailed)	.205
	N	8
Total Machine Cost	Pearson Correlation	.435
	Sig. (2-tailed)	.282
	N	8
cost of Seed	Pearson Correlation	.504
	Sig. (2-tailed)	.203
	N	8
Total fertilizer and manure	Pearson Correlation	.439
	Sig. (2-tailed)	.276
	N	8
Other cost	Pearson Correlation	.310
	Sig. (2-tailed)	.455
	N	8

Interpretation: Above results indicate that p-value is more than standard value of 0.05. Therefore, the correlation test is accepted. Hence null hypothesis is accepted and alternate hypothesis is rejected.

Conclusion: There is no significant impact of cost of production of sugarcane on production of sugarcane.

Findings: The Pearson's correlation value for Human cost is +0.415, for Animal cost is +0.405, for Machine cost is +0.435, cost of seeds is +0.504 and

Total fertilizer and manure is +0.439. All Pearson's values are positive. There is positive impact of all these factors on quantity of production of sugarcane.

Null Hypothesis H₀₂: There is no significant change in production and FRP of sugarcane Industries on.

Alternate Hypothesis H₁₂: There is significant change in production and FRP of sugarcane Industries on.

Correlations				
		Year	Production (in kilogram per hectare)	FRP (per quintal)
Year	Pearson Correlation	1	.407	.977**
	Sig. (2-tailed)		.317	.000
	N	8	8	8
Production (in kilogram per hectare)	Pearson Correlation	.407	1	.547
	Sig. (2-tailed)	.317		.161
	N	8	8	8
FRP (per quintal)	Pearson Correlation	.977**	.547	1
	Sig. (2-tailed)	.000	.161	
	N	8	8	8

** . Correlation is significant at the 0.01 level (2-tailed).

Interpretation:

Above results indicate the Pearson's, correlation value between Year and production of sugarcane is +0.407, corresponding p-value is 0.317. Since p-value is greater than 0.05. There is positive relationship between year and production of sugarcane, but the relationship is not significantly positive. In another result p-value between year and FRP, Pearson's correlation value is 0.977 and corresponding p-value is +0.977. There for there is significant positive relationship between year and FRP. There is significant increase in FRP in last eight years.

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