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# Economic Evaluation of Ethanol Blending: A Study of Petrol Pricing in India

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**Abstract:** The given research study examines the relationship between the cost components of retail petrol prices, such as crudeoil, ethanol procurement price, price charged to dealers, and taxes levied by the government in India. The given research study compares the two time periods from 2013-14 to 2016-17 and 2021-22 to 2024-25, when ethanol blending with the petrol was minimal and when ethanol blending with the petrol was substantial. Secondary sources of data are utilized from the official websites of respected ministries, OMCs, and international organizations suchas MoPNG (Ministry of Petroleum and Natural Gas), NITI Aayog, Reserve Bank of India, IOC (Indian Oil Corporation), PPAC (Petroleum Planning and Analysis Cell), BPCL (Bharat Petroleum Corporation Limited), HPCL (Hindustan Petroleum Corporation Limited), World Bank, and International Energy Agency (IEA). Thefindings revealed that during the period from 2013-14 to 2016-17 crude oil prices sharply declined but the reduction in petrol price was very low and at the same time government levied higher taxes in the form of VAT and Excise duty on petrol which absorbed the benefit of low price of crude oil that can be passed to the consumer. In contrast,while crude oil prices increased from2021-22 to 2024-25, prices charged to dealersand the price of petrol decreased, while the ethanol procurement prices also increased from ₹ 52.92/L to ₹ 71.86/L, indicating that using ethanol may decrease the price of petrol, but the benefit is not passed to the customer, as it is absorbed through higher government taxes. The findings suggest that a more accurate assessment of the impact of ethanol blending on petrol prices would require detailed data on all cost components included before the price charged to dealers.Availability of such data would allow the individual contribution of ethanol procurement and blending to be separated from other components of petrol pricing and would therefore provide a more accurate estimate of its effect on the final petrol price.
**Keywords:** Cost Components of Petrol; Crude Oil Price; Ethanol Blending Policy; Ethanol Price; Ethanol Procurement Price; Excise Duty; Fuel Policy; Government Ethanol Policy; India; Petrol Price; VAT.

**Introduction -** India is one of the largest importers of crude oil in the world, and their import demand for crude oil is increasing year by year, like 234262 metric tonnes in 2023-24, 243225 metric tonnes in 2024-25, 245769 metric tonnes in 2025-26, and 60481 metric tonnes in the 1st quarter of 2026-27. Generally, from the 100 tonnes of crude oil, typical types of products we yield are LPG 4-6%, naphtha 8-10%, motor spirit (petrol) 14-18%, ATF 9-11%, high-speed diesel 38-42%, 3-6% fuel oil, 12-18% petroleum coke, bitumen and others. India imports a significant amount of crude oil because of limited crude oil production in some regions of Assam, Maharashtra, Rajasthan and Gujarat. However, after refining the imported crude oil, India exports a significant amount of petroleum products. In 2025-26 petroleum product exports (61,427 million tonnes) exceeded the petroleum product we import (46,193 million tonnes). Blending of ethanol into the petrol is not an overnight program, although it was formally launched in 2004 by the government of India, named the 'Ethanol Blended Petrol (EBP) Programme,' with the objective to reduce greenhouse gas emissions and crude oil imports and to improve farmers' income and energy security and to promote sustainable development. Ethanol is an eco-friendly biofuel produced from sugarcane juice, maize, sugarcane molasses, rice grain, damaged food grain, and other agricultural feedstocks. Indian ethanol industry shows remarkable progress in the production of ethanol over the last 10 years. Ethanol production capacity increased from 421 crores ltr to more than 2000 crore ltrs from 2014 to 2026, supported by the government implicit subsidies, interest subvention scheme and expansion of distillery capacity. In the same way, ethanol supply to OMCS (Oil Marketing Companies) increased from 38 crore L to over 1200 crore L from 2013-14 to 2025-26. As per the data available on the PBI report, it revealed that with the increasing supply of ethanol to OMCs, the blending of ethanol in petrol also increases, such as 8.1%

ethanol mixed with petrol in 2020-21; 10% ethanol-blended petrol in 2021-22; 12.1% ethanol-blended petrol in 2022-23; 14.60% ethanol-blended petrol in 2023-24; and 19.20% ethanol mixed with petrol in 2024-25. By April 1, 2026, the target date for 20% ethanol-blended petrol was 2030, but it was achieved 5 years earlier, by 2026. Today, in every 1 L of gasoline, 20% ethanol is blended, and Ethanol is procured at the price of 71.00 per L for domestically produced ethanol[1]. Ethanol blending reduces the import demand for crude oil (major factor), supports farmers' income, contributes to a clean environment, and promotes cleaner fuel. Despite this benefit, questions remain about whether ethanol blending in gasoline is actually beneficial for the consumer, who is the major stakeholder of this ethanol policy, as their cars are at the risk of a drop in fuel mileage, early malfunction of engine parts, and other components of the car. This study investigates who the real beneficiary of this blending policy is, whether it's the government, the ethanol distillery, or the common customer of blended petrol.

**Review of literature**

**Kutas et al. (2007)** examined government support provided to biofuels in the European Union through blending mandates, subsidies, tax concessions, and other incentives. The study highlighted that changes in blending mandates and fuel taxation can influence biofuel markets and may shift costs between governments and consumers. The study provides a useful policy perspective for examining the relationship between government interventions, ethanol blending, taxation, and petrol prices.

**Pohit et al. (2009)** examined international experiences of ethanol as a transport fuel and identified policy lessons relevant to India, with particular emphasis on Brazil. The study highlighted the potential of ethanol blending to reduce dependence on imported petroleum and improve energy security. However, challenges related to feedstock availability, land, infrastructure, institutional arrangements, and food-fuel competition were also identified. The study provides an important foundation for understanding the economic and policy implications of ethanol blending in India.

**Babcock et al. (2010)** analysed the effects of US ethanol policies, particularly the blenders' tax credit and import tariff, on taxpayers, consumers, producers, and fuel blenders. The study found that withdrawal of the blenders' tax credit could reduce ethanol production and shift the cost of meeting blending requirements from taxpayers towards fuel blenders and consumers. The findings demonstrate that fiscal incentives and ethanol policies can have significant implications for fuel markets and consumers.

**Pokrivèák and Rajèaniová (2011)** investigated the relationship among crude oil, gasoline, and ethanol prices using weekly data from 2000 to 2009. The study found a strong positive relationship between gasoline and ethanol prices, while the relationship between crude oil and gasoline prices was considerably stronger. The findings indicated that crude oil prices have a major influence on gasoline prices and are also transmitted to ethanol prices. This study provides a useful basis for examining the interaction between crude oil prices, ethanol prices, and petrol prices in India.

**McPhail and Babcock (2012)** examined the impact of US biofuel policies on corn and gasoline price variability. The study found that ethanol policies could reduce the price elasticity of demand for corn and gasoline, potentially increasing price volatility during supply shortages. The study indicates that biofuel policies can affect not only fuel prices but also their stability, which is relevant to the analysis of petrol prices under India's ethanol blending programme.

**Knittel and Smith (2015)** examined whether increased ethanol production resulted in lower gasoline prices in the United States. The study found limited evidence that ethanol use substantially reduced gasoline prices and questioned the strength of the commonly observed relationship between ethanol production and gasoline prices. The findings suggest that the effect of ethanol blending on fuel prices may depend on broader market conditions and policy mechanisms.

**Lundberg et al. (2023)** examined the impact of biofuel blending mandates on biofuel consumption, emission reductions, and fuel prices in EU member states during 2009–2020. The study found that blending mandates increased biofuel consumption and contributed to reductions in transport-sector emissions. However, no clear relationship was identified between biofuel consumption and fuel prices after excluding taxes, while crude oil prices had a substantially greater influence on fuel prices. The study suggests that the effect of ethanol blending on petrol prices should be assessed along with other major determinants of fuel prices.

**Janda et al. (2024)** examined the effect of different ethanol blending levels on gasoline prices in the United States. The study found that higher ethanol blending levels generally resulted in lower gasoline prices. The findings indicate that ethanol blending policies can influence fuel prices and may benefit consumers, retailers, producers, and policymakers. The study provides a contemporary basis for examining whether increased ethanol blending has a similar impact on petrol prices in the Indian market.

**Statement of the Problem:** Although ethanol blended with petrol is able to reduce the crude oil demand, enhance the energy security, improve the foreign reserve, improve the environment, and increase the farmers' wealth, despite all these benefits, one point remained unanswered about the real benefit of ethanol blending: whether the ethanol blending policy is really beneficial for the consumer.

**Objectives of the Study:** To examine whether the ethanol blending policy is really beneficial for the consumer

**Sources of Data:** Secondary sources information utilizes from various sources available on the official websites of respected ministries, OMCs, and international organizations. They are as follows: Ministry of Petroleum and Natural Gas (MoPNG), Petroleum Planning and Analysis Cell (PPAC), NITI Aayog, Reserve Bank of India, Indian Oil Corporation, Bharat Petroleum Corporation Limited, Hindustan Petroleum Corporation Limited, World Bank, International Energy Agency (IEA).

**Methodology and Tools for Data Analysis:** The given research study is descriptive and analytical in nature and Collected data from various official website of government about the policy of ethanol blending in petrol, price calculation of ethanol blended petrol will be analysed with the help of statistical tool like percentage analysis, average analysis, ratio analysis.

**Crude Oil → Refinery → Refined Petrol → Ethanol Procurement → Ethanol Blending (E20) → Depot Price → Marketing Margin → Dealer Commission → Central Excise Duty → State VAT → Retail Petrol Price**

**Data Analysis and Interpretation**

**Table 1 & 2 (see in last page)**

The tables, table no. 1 and table no. 2, represent the data related to the petrol price composition of two different time periods. Table one represents the data from 2021-22 to 2024-25, when the ethanol blending policy is implemented up to 20% ethanol with gasoline, and Table two represents the data from 2013-14 to 2016-17, when the ethanol blending amount is negligible with gasoline. Both the tables show the same component of the cost of petrol and show how the retail petrol price is derived from different cost components and charged to the customers. The cost components of petrol are as follows: cost of crude oil, price charged to dealers, dealers' commission, excise duty on petrol, and VAT on petrol. The cost component between crude oil and the price charged to dealers is not given officially by the government in the public domain. Some third-party data is available on the internet, which is as follows: crude oil, refinery, refined petroleum, ethanol procurement, ethanol blending (E20), depot price, and marketing margin. As this data is not available officially on any government reports, therefore, we are not including these costs in the calculation of retail prices of petrol. The one of the objectives to introduce the ethanol policy is to reduce the price of petrol and give its benefit to the consumer. The above two tables compare the retail prices of petrol charged by the government to the customers when EBP is implemented up to 20% and the ethanol amount blended with the petrol is minimal. Table no. 1 shows Crude oil cost per liter from 2021-22 to 2024-25 are ₹ 37.1, ₹ 47.1, ₹ 43.01 and ₹ 41.7; highest in 2022-23 while the table 2 shows the crude oil cost from 2013-14 to 2016-17 are ₹ 65, ₹ 51.5, ₹ 30.3 and ₹ 31.9; highest in 2013-14. According to data given in the above table, when ethanol blending in petrol is minimal, crude oil prices are highest in 2013-14, ₹ 65/L, and on the other hand, when blending is 12.10%, crude oil prices are highest in 2022-23, ₹ 47.1/L. But the retail petrol prices of both time periods have a significant difference: when crude oil is ₹ 65/L, the retail petrol price is ₹ 72.40/L, and when the crude oil price is ₹ 47.10/L, then the retail petrol price is ₹ 96.72/L. Cost component price charged to the dealer when the crude oil prices are highest during both the period is ₹ 49.06 in 2013-14 when ethanol blending is minimal and ₹ 58.07 when ethanol blending is 12.10%. Data shows that even after blending 12.10% of ethanol with the petrol, the price charged to the dealer is more in comparison when ethanol blending is minimal. In percentage terms, the crude oil cost is 38.29% lower when the Ethanol Blended Petrol (EBP) level reaches 12.10%, compared with the period when ethanol blending was minimal (up to 1.5%). However, the price charged to dealers is 18.36% higher at the 12.10% EBP level than under the minimal ethanol-blending policy. Thus, instead of decreasing with the increased blending of ethanol, the price charged to dealers actually increased. This indicates that, up to the 12.10% EBP level, there is no apparent reduction in the dealer-level cost of petrol attributable to ethanol blending. Now we compare the cost of petrol after price charge to dealer. Again, we consider the year 2022-23 and 2013-14 when crude oil trading at their highest price. Between retail price of petrol and price charged to dealer there are three components named as dealer commission, state VAT on petrol and center excise on petrol. In 2022-23, when EBP 12.10% was implemented, the dealer commission was ₹ 3.76/l, state VAT on petrol was 19.30% on base price, and excise duty was ₹ 19.28/l, which will increase the cost by 66.55% on price charged to dealer and constitutes almost 36.18% of the retail price of petrol. In 2013–14, when ethanol blending under the EBP programme was at a minimal level, the dealer commission was ₹ 1.94 per litre, state VAT on petrol was 20% of the base price, and central excise duty was ₹ 9.48 per Liter. These components together increased the price by ₹ 47.57 per litre and accounted for 32.23% of the retail price of petrol. In comparison, when the EBP level increased to 12.10%, the total cost added to the price charged to dealers increased by 66.55%, compared with 47.57% under the minimal EBP level. This comparison reveals that, at the 12.10% EBP level, more proportion of the price charged to dealers was added through taxes, dealer commission, and other applicable charges. Consequently, the higher EBP level was associated with a higher retail price of petrol, making petrol more expensive for consumers than during the period of minimal ethanol blending.

**Finding and conclusions-** The given research study examines the relationship between the cost components of retail petrol prices, such as, ethanol procurement price, crude oil, dealers commission, price charged to dealers, and taxes levied by the government in India, which changed significantly over the study period. Data shows that from 2013-14 to 2016-17 crude oil prices declined sharply from ₹ 65/L to ₹ 31.9/L, which is an approx. 50% decrease in crude oil price, but the petrol price does not fall to the same extent, declining only by 9.39% from ₹ 72.40/L to ₹ 65.60/L. Data also reveals that the price charged to dealers fell by 43.19% with the fall in crude oil prices, but the benefit of cheaper crude oil does not pass to the consumer, but this excess benefit is absorbed by the state and center government by way of taxes such as VAT on petrol increasing by 35% and excise duty levied by the center increasing by 126%. During this period, ethanol blending

was minimal, but OMCs were bearing the cost of ethanol blending with the petrol during the given period. The table representing data of the time period from 2021-22 to 2024-25 shows that crude oil prices increased from 37.10/L to 41.70/L, indicating a 12.39% increase in crude oil, but the price charged to dealers falls by 5.14% from 58.16 to 55.17, and gasoline prices decrease by 4.48% from 99.16/L to 94.72/L. That shows that even crude oil became costlier during the period, but the petrol price fell about 4.48%. When blending increases with petrol, it will make it cheaper, but the benefit does not directly pass to the consumer but is absorbed through higher government taxes. From the data interpretation, two periods are compared: the period when ethanol blending was minimal and the period when ethanol blending increased to 12.10%. When crude oil was at its highest point in both periods, the price charged to dealers had no significant difference, but the retail price of petrol showed a higher cost difference. India has increased ethanol blending substantially, especially after 2021–22, but this expansion has not been accompanied by fall in price of petrol. Study also highlighted that cost component before price charged to dealer have no significant effect on retail price of petrol but cost component may have greater role in deciding the retail petrol price whether follow minimal ethanol policy or E10, E20 ethanol blending policy.

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**Table1**

| ESY/ Year | Crude Oil Price (₹/ Lequivalent)* | Pricecharged to dealers (₹/L) | Dealer Commission ₹/L | VAT on Petrol | Excise Duty On Petrol(₹/L) | Petrol Price(₹/L) | Ethanol Procurement Price (₹/L) | Blending %/ Status |
|---|---|---|---|---|---|---|---|---|
| 2013–14 | ≈₹65.0 | ≈49.06 | 1.94 | 20% | 9.48 | ≈72.40 | Marketdetermined | ≈1.5% |
| 2014–15 | ≈₹51.5 | ≈35–40 | 2 | 20% | ≈10.70 | ≈63–67 | ₹ 48.50 | 2.30% |
| 2015–16 | ≈₹30.3 | 35.71 | 2.07 | 20% | 17.46 | 66.29 | ₹ 48.50 | ≈3.5% |
| 2016-17 | ≈₹31.9 | 27.87 | 2.3 | 27% | 21.48 | 65.6 | ₹ 39.00 | ≈2.1% |

**Table2**

| Ethanol Supply Year | Crude Oil Price (₹/litre) | Pricecharged to dealers (₹/litre) | Dealer commission on petrol (₹/L) | VAT on Petrol on Basic Price | Excise Duty on Petrol (₹/L) | Average Petrol Price (₹/Liter)/ | Ethanol procurement price (₹) | Blending Percentage/ Status |
|---|---|---|---|---|---|---|---|---|
| 2021-22 | 37.1 | 58.16 | 3.85 | 30% | Rs 27.98 | 99.16 | 52.92 | 10.00% |
| 2022-23 | 47.1 | 58.07 | 3.76 | 19.40% | Rs 19.98 | 96.72 | 66.07 | 12.10% |
| 2023-24 | 43.01 | 55.17 | 3.77 | 19.40% | Rs 19.98 | 96.72 | 71.86 | 14.60% |
| 2024-25 | 41.7 | 55.17 | 4.30 | 19.40% | Rs 19.98 | 94.72 | 71.86 | 19.20% |