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Projecting the Impact of Fuel Price Increases on Rural Economic Resilience and Community Welfare in Kudus Regency: A Technocratic Perspective on Regional Development

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ABSTRAK

Penyesuaian harga bahan bakar minyak (BBM) di Indonesia menimbulkan efek ekonomi berantai, terutama di wilayah pedesaan yang bergantung pada sektor pertanian, pengolahan tembakau, dan usaha mikro, kecil, dan menengah (UMKM). Kabupaten Kudus, Jawa Tengah, sebuah perekonomian yang ditopang secara bersamaan oleh industri pengolahan rokok yang dominan dan basis agraris yang cukup besar, menghadapi tantangan tersendiri dalam menjaga stabilitas ekonomi dan kesejahteraan rumah tangga di tengah kenaikan biaya produksi, distribusi, dan konsumsi akibat guncangan harga energi. Penelitian ini menganalisis proyeksi dampak kenaikan harga BBM terhadap ketahanan ekonomi dan kesejahteraan masyarakat pedesaan di Kabupaten Kudus, serta merumuskan rekomendasi kebijakan yang berbasis bukti. Penelitian ini menggunakan desain gabungan kuantitatif dan kualitatif, dengan memanfaatkan data sekunder dan sintesis literatur, analisis Input-Output (I-O), serta pendekatan *Structural Vector Autoregression* (SVAR) dengan bukti *Impulse Response Function* (IRF) untuk menelusuri bagaimana guncangan harga energi merambat melalui berbagai sektor ekonomi regional. Hasil penelitian menunjukkan bahwa kenaikan harga BBM meningkatkan biaya operasional di sektor pertanian, membebani biaya transportasi bagi pekerja pabrik rokok, menekan margin usaha mikro dan kecil, serta meningkatkan risiko inflasi harga pangan dan potensi rumah tangga hampir miskin jatuh ke bawah garis kemiskinan. Di sisi lain, Dana Bagi Hasil Cukai Hasil Tembakau (DBHCHT) di tingkat daerah serta penguatan mekanisme pengendalian inflasi regional berpotensi menjadi instrumen mitigasi yang efektif, dengan catatan didukung oleh ketepatan sasaran penerima manfaat dan koordinasi lintas sektor. Penelitian ini menyimpulkan bahwa kebijakan daerah yang adaptif dan berbasis bukti, yang berorientasi pada penguatan ketahanan ekonomi pedesaan, menjadi kunci untuk menjaga pembangunan daerah yang inklusif di kabupaten agraris-industri yang bergantung pada energi seperti Kudus.

Kata kunci: Kebijakan harga bahan bakar minyak; ketahanan ekonomi pedesaan; transmisi harga; Dana Bagi Hasil Cukai Hasil Tembakau (DBHCHT); kerentanan kelompok hampir miskin; perencanaan pembangunan daerah.

ABSTRACT

Fuel price adjustments in Indonesia generate cascading economic effects, particularly in rural regions dependent on agriculture, tobacco processing, and micro, small, and medium enterprises (MSMEs). Kudus Regency, Central Java — an economy simultaneously anchored by a dominant cigarette-processing industry and a substantial agrarian base — faces distinctive challenges in sustaining

economic stability and household welfare amid rising production, distribution, and consumption costs triggered by energy price shocks. This study analyzes the projected impact of fuel price increases on the economic resilience and welfare of rural communities in Kudus Regency and formulates evidence-based policy recommendations. It adopts a combined quantitative-qualitative design, drawing on secondary data and literature synthesis, Input-Output (I-O) analysis, and Structural Vector Autoregression (SVAR) with Impulse Response Function (IRF) evidence to trace how energy-price shocks transmit through regional economic sectors. Findings indicate that fuel price increases raise operational costs in agriculture, inflate transportation expenses for tobacco-factory workers, compress micro and small enterprise margins, and heighten the risk of food-price inflation and near-poor households falling below the poverty line. Conversely, the regional Tobacco Excise Revenue-Sharing Fund (DBHCHT) and strengthened regional inflation-control mechanisms constitute potentially effective mitigation instruments, provided they are supported by accurate beneficiary targeting and cross-sectoral coordination. The study concludes that adaptive, evidence-based regional policy oriented toward strengthening rural economic resilience is essential for sustaining inclusive regional development in energy-dependent agrarian-industrial regencies such as Kudus.

Keywords: fuel price policy; rural economic resilience; price transmission; tobacco excise revenue-sharing (DBHCHT); near-poor vulnerability; regional development planning.

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INTORDUCTION

National energy policy, particularly adjustments to the retail price of fuel (Bahan Bakar Minyak, BBM), is a recurring fiscal instrument in Indonesia with well-documented transmission effects on macroeconomic and microeconomic stability. Because energy is a near-universal input into production, transport, and consumption, a change in its administered price seldom stays confined to the energy sector; it propagates through logistics, agriculture, manufacturing, and household budgets alike (Nizar, 2012). At the subnational level — especially in regencies with hybrid economic structures combining industrial concentration with a substantial agrarian base — the consequences of a fuel price adjustment extend well beyond purchasing power, reconfiguring production and distribution patterns in the sectors that anchor rural livelihoods. Kudus Regency, in Central Java, exemplifies this hybridity: widely known as the "City of Kretek" for its historically dominant clove-cigarette processing industry, it is simultaneously one of Central Java's significant rice- and horticulture-producing areas. This dual identity places Kudus at the intersection of industrial policy and agrarian welfare, making it an instructive case for examining how national energy policy filters down into rural economic resilience.

The shock of a fuel price increase propagates through at least three channels. The first is the production-cost channel: increases in the price of diesel (solar) and Pertalite directly raise the operating cost of agricultural machinery, industrial logistics, and micro, small, and medium enterprises (MSMEs). The second is the consumer-price channel: inflationary expectations frequently drive up the price of the nine basic staple commodities (sembilan bahan pokok, or sembako) even before a fuel price policy is formally announced (Hia et al., 2023; RMOL Jawa Tengah, 2022). The third is the real-income channel: rural households — disproportionately composed of cigarette-factory laborers and smallholder farmers — experience a contraction in real income when inflation outstrips nominal wage growth in the short run. These channels compound one another, producing a welfare shock whose severity is shaped less by the magnitude of the price adjustment itself than by the structural vulnerability of the local economy absorbing it.

A comprehensive assessment of this vulnerability requires an understanding of Kudus's demographic and economic structure. According to Statistics Indonesia (BPS) data for 2024, Kudus Regency's population reached 874,800 people, with growth consistent over the past three years, though the compound annual growth rate (CAGR) is slightly lower than in the preceding five years (Badan

Pusat Statistik Kabupaten Kudus, 2024). The demographic structure is dominated by the working-age cohort (15–59 years), comprising 66.13 percent of the population, or approximately 578,520 people (see Table 1) — a concentration implying that regional economic stability depends heavily on employment availability and the affordability of living costs. In rural areas, the population is occupied predominantly in tobacco processing and agriculture; dependence on the processing industry is especially pronounced, as this sector contributed approximately 78.23 percent of Kudus's Gross Regional Domestic Product (GRDP) in 2023 (Bappeda Kabupaten Kudus, 2024).

Table 1. Age-Group Distribution in Kudus Regency

Age Group	Population (thousands)	Percentage (%)
0–4 years	53.81	6.15
5–9 years	68.27	7.80
10–14 years	70.30	8.04
15–59 years (working age)	578.52	66.13
60 years and above (elderly)	103.90	11.88
Total	874.80	100.00

Source: Badan Pusat Statistik Kabupaten Kudus (2024).

Kudus's land area of 44,708.9 hectares is intensively allocated to productive activity: 65.68 percent, or approximately 29,364.4 hectares, is agricultural land (Badan Pusat Statistik Kabupaten Kudus, 2024). This pattern of land use underscores that, although the tobacco industry anchors the regional economy in value terms, agriculture remains the foundation of livelihood at the village level. Paddy fields alone cover 20,407 hectares, with the largest concentration in Undaan Subdistrict (28.70 percent of the regency's rice-field area) and the smallest in Kudus City Subdistrict (0.60 percent) (Badan Pusat Statistik Kabupaten Kudus, 2024).

Fuel price increases in Indonesia are typically an instrument of fiscal necessity rather than discretionary choice, deployed to relieve the energy-subsidy burden on the State Budget. Movements in world crude-oil prices and volatility in the rupiah–US dollar exchange rate are the principal drivers of domestic fuel price adjustment (Nizar, 2012; UKM Indonesia, 2022). Fossil-fuel subsidies remain a substantial fiscal burden for Indonesia: the country was ASEAN's largest provider of fossil-fuel subsidies in 2021, and global underpricing of fuel — inclusive of unaddressed environmental externalities — was estimated at 5.8 percent of world GDP as of 2024 (Black et al., 2025). For subnational governments — in Kudus, chiefly the Regional Development, Research and Innovation Planning Agency (Bapperida) — mapping the downstream impact of such fiscal decisions is indispensable to safeguarding targets set in the Regional Medium-Term Development Plan (RPJMD). Within Kudus's villages, fuel is not merely a matter of personal mobility but a vital input into the agricultural production chain and household-based manufacturing: diesel is the primary input for agricultural machinery such as tractors and irrigation pumps (Pusat Sosial Ekonomi dan Kebijakan Pertanian, 2014), while a Pertalite price increase directly erodes tobacco workers' disposable income through higher daily commuting costs (Antara News, 2025). Compounding these effects, inflationary expectations often trigger panic buying, driving up staple-good prices well before any official policy takes effect (RMOL Jawa Tengah, 2022; Putri & Fatmawati, 2022) — a double squeeze of rising production costs for producers and declining purchasing power for consumers, of particular consequence for Kudus, which has set a target of reducing its poverty rate to 5.75 percent by 2029 (Bappeda Kabupaten Kudus, 2024).

Although fuel price increases in Indonesia have been extensively studied, a specific empirical gap persists with respect to Kudus Regency. Prior studies have examined the transmission of fuel price

shocks to staple-good prices and household welfare using macro-level or generic urban frameworks (Hia et al., 2023; Soleh, 2022; Putri & Fatmawati, 2022; Fauzi & Nasution, 2022); however, the labor-intensive, commuter-dependent structure of Kudus's rural tobacco industry — in which workers travel daily between villages and industrial clusters — remains underexplored, leaving the elasticity of transport costs to labor productivity in this specific configuration empirically unaddressed. Second, a gap persists in understanding the effectiveness of Kudus's own social safety-net instrument: the Tobacco Excise Revenue-Sharing Fund (Dana Bagi Hasil Cukai Hasil Tembakau, DBHCHT), partly disbursed as unconditional cash transfers (Bantuan Langsung Tunai, BLT) to tobacco workers (Pemerintah Kabupaten Kudus, 2025); the extent to which this instrument compensates for fuel-driven purchasing-power losses has received scant empirical attention. Third, sub-district-level vulnerability data remain fragmented: no study has yet integrated agricultural land area, tobacco-labor concentration, and poverty incidence at the sub-district level into a single analytical framework for assessing energy-shock vulnerability (Badan Pusat Statistik Kabupaten Kudus, 2024). This study addresses these three gaps by generating an integrated projection of the effects of fuel price increases on rural welfare indicators in Kudus Regency.

Specifically, this study aims to: (1) measure the magnitude of fuel price transmission to the price of the nine basic staple commodities in Kudus's village markets; (2) analyze rising operating costs in the regency's leading agricultural sectors, specifically rice cultivation in Undaan Subdistrict and horticulture in Dawe Subdistrict; (3) evaluate the impact of rising transportation costs on the real income and welfare of cigarette-factory workers; and (4) provide evidence-based policy recommendations for optimizing DBHCHT as an instrument for mitigating the economic impact of fuel price increases on rural communities.

METHODS

This study adopts a combined quantitative and qualitative design, structured principally around Input-Output (I-O) analysis. The I-O framework treats the regional economy as an interconnected production system, comparable to a large kitchen in which every dish shares certain base ingredients: when the price of one core input, such as cooking oil or energy, rises, the price of every dish using it rises correspondingly. Applied to Kudus, I-O analysis quantifies how a price shock originating in the energy sector "ripples" outward into interlinked sectors such as transportation, tobacco processing, and agriculture (Haryanto, 2020), allowing regional planners to simulate plausible policy scenarios and anticipate economic shocks before they materialize, rather than responding reactively once impacts are already realized.

At a more technical level, the analysis draws on Structural Vector Autoregression (SVAR) to map causal relationships among key economic variables, complemented by the Impulse Response Function (IRF) to estimate the time lag between a fuel price shock and its peak effect on downstream prices, such as the price of seed and fertilizer received by farmers (Kementerian Pertanian, 2022). Empirical evidence indicates that such effects typically become materially perceptible approximately one month after a policy announcement (Kementerian Pertanian, 2022), a lag with direct implications for the timing of compensatory social assistance.

The analysis further incorporates a technocratic planning perspective, operationalized through formal planning documents — the Regional Government Work Plan (RKPD) and the Strategic Plans (Renstra) of relevant regional agencies and national ministries. A technocratic approach privileges empirical data, technical standards, and scientific projection over political intuition alone (Haryanto, 2020; Kurniawan, 2018). By integrating Kudus's GRDP data with national energy policy directives — notably the Ministry of Energy and Mineral Resources' 2025–2029 Strategic Plan — the study constructs an internally consistent narrative of the region's likely economic trajectory under alternative fuel-price scenarios.

Data were compiled from secondary sources: BPS publications at national and Kudus Regency levels; Bappeda/Bapperida Kudus planning documents; Ministry of Energy and Mineral Resources performance reports and regulations; Ministry of Agriculture research-center (Pusat Sosial Ekonomi dan Kebijakan Pertanian) simulation studies; regional wage-council decisions; regulations governing

DBHCHT-funded cash assistance; and peer-reviewed and grey literature on the historical and projected effects of Indonesian fuel price policy. These sources were triangulated through descriptive statistical analysis and literature synthesis to construct the sector-specific cost-transmission estimates reported in Section 3. Consistent with the original study design, the research does not execute a fully specified structural econometric model on regency-level panel data; rather, it applies I-O logic and SVAR/IRF findings from the literature and from national and regional simulation studies to project — rather than statistically re-estimate — the likely distribution of impacts across Kudus's rural economy, appropriate for a planning context requiring policy input in advance of, rather than after, a national fuel price adjustment.

RESULTS

Findings are organized around five areas: agricultural-sector dynamics and food security; the tobacco-processing industry and rural labor welfare; MSME dynamics; the historical evolution of fuel prices and forward-looking national energy policy; and the projected, cross-sectoral impact on economic resilience and household welfare.

Dynamics In The Agricultural Sector And Food Security

Although agriculture contributes a comparatively modest share of Kudus's total GRDP — 2.52 percent in 2024, with rice and sugarcane as the leading commodities (Badan Pusat Statistik Kabupaten Kudus, 2024) — it remains strategically important as an employer of rural labor and a guarantor of regional food stability. Fuel price increases, particularly for diesel, directly raise the operating cost of agricultural machinery (alsintan): tractors, water pumps, and mechanical paddy threshers are the most fuel-intensive implements in use. Research on agrarian regions indicates that a 100 percent fuel price increase can reduce food-crop farming profitability by approximately 0.095 to 0.142 percent (Pusat Sosial Ekonomi dan Kebijakan Pertanian, 2014); in Kudus, where mechanization is already comparatively advanced, this effect is expected to weigh more heavily on farmers' profit margins than in less mechanized regions.

Table 2. Simulated Impact of Energy Costs on Agriculture

Operational Component	Estimated Cost Increase (%)	Impact on Farmers
Tractor rental	24.8 – 25.0	Decline in net profit margin per hectare
Post-harvest processing (rice milling unit)	16.0	Increase in milling service price
Input transport (fertilizer)	10.0 – 15.0	Increase in real fertilizer price at farm level
Irrigation cost (pump)	20.0 – 30.0	Additional burden during the dry season

Source: Simulated impact of energy costs on agricultural performance (Pusat Sosial Ekonomi dan Kebijakan Pertanian, 2014).

Tractor operating costs rise in tandem with a 27.3 percent increase in diesel prices and a 22.2 percent increase in lubricant costs under a representative energy-price scenario (Pusat Sosial Ekonomi dan Kebijakan Pertanian, 2014). This cost escalation is frequently not matched by a proportional rise in the Government Purchase Price (HPP) for unmilled rice (gabah), placing farmers in a structurally disadvantageous cost-price squeeze: production costs rise while the sale price remains rigid, or is set by a market distorted by large-scale traders. Farmers' net income can be formalized as $\pi = \Sigma(\text{Psale} \times Q) - \Sigma(wi \times xi)$, where $wi \times xi$ denotes the input-cost vector, inclusive of energy costs; an increase in this component without a corresponding adjustment to Psale produces a significant decline in profit (π).

This impact is not uniform across Kudus's sub-districts. Undaan Subdistrict, home to the regency's largest paddy-field area (6,136 hectares in 2024), is most exposed to diesel price increases

for land preparation (Badan Pusat Statistik Kabupaten Kudus, 2024). Dawe Subdistrict, by contrast — dominated by dryland farming and horticulture — is more exposed through the logistics cost of transporting harvests to urban markets; it is the regency's principal fruit-producing center, with durian output reaching 12,608 quintals and pomelo output reaching 18,906.97 quintals in 2024 (Badan Pusat Statistik Kabupaten Kudus, 2024). Because horticultural commodities are highly perishable, a fuel price increase raises rural transport tariffs, which ultimately compresses the farm-gate price as intermediary traders pass the higher transport cost backward onto farmers.

Dynamics of the Tobacco Processing Industry and Rural Labor Welfare

The tobacco-processing industry is the economic backbone of Kudus Regency, employing more than 77,236 workers, the majority of whom reside in rural areas (Detikcom, 2023). This industry's structure is distinctive: although its largest factories are concentrated in designated industrial zones, its workforce is dispersed across villages through commuting and through hand-rolled cigarette (Sigaret Kretek Tangan, SKT) production units located directly within rural communities (Kompas.id, 2023). Most tobacco workers commute by private motorcycle, so a Pertalite price increase directly raises daily expenditure: for a worker traveling 20–30 kilometers per day, it can add Rp5,000–Rp10,000 to daily transport costs, accumulating over a 26-day working month to Rp130,000–Rp260,000 — roughly 5-10 percent of the minimum wage these workers receive.

Table 3. Kudus Regency Minimum Wage Trends

Year	Regency Minimum Wage (UMK)	Policy Status
2023	Rp 2,439,814	In effect
2025	Rp 2,680,485	In effect
2026	Rp 2,818,585	Planned increase of 5.15%
2026 (sectoral)	Rp 3,135,000	Tobacco-worker wage agreement

Source: Analysis of Kudus employment data (Antara News, 2025; Detikcom, 2023; Tuturmedia, 2025).

Although a wage increase for tobacco workers to Rp3.1 million is planned for 2026, a lag persists between the announcement of a fuel price increase and the corresponding wage adjustment (Tuturmedia, 2025; Radar Pati, 2025). During this interval, workers resort to survival strategies — reducing non-essential consumption or borrowing from neighborhood shops (warung) to cover daily transport costs.

Dynamics of MSMEs and Rural Industrial Clusters

MSMEs constitute a further pillar of Kudus's rural economy, with the number of business units approaching 12,000 as early as 2015 and continuing to grow since (Suryana, 2014), the most prominent cluster being the embroidery and garment (bordir dan konveksi) industry of Padurenan Village, Gebog Subdistrict (Universitas Muria Kudus, 2013). Kudus's MSMEs face elevated exposure to energy-price fluctuation because their supply chains depend on long-distance distribution: raw materials are frequently sourced from outside the regency, while finished products reach regional and national markets through five distinct distribution channels, ranging from direct sales to arrangements involving intermediary agents and large-scale traders (Suryana, 2014). A fuel price increase raises freight costs at every intermediary tier; because MSMEs typically hold weak bargaining power relative to large traders, they are frequently compelled to absorb higher logistics costs without a commensurate price increase, for fear of losing competitiveness (UKM Indonesia, 2022; Suryana, 2014). Over time, this erodes MSME financial resilience and, if sustained, can precipitate business closure or reduced local employment (Hia et al., 2023; Nizar, 2012).

The Historical Evolution of Fuel Prices and Forward-Looking Energy Policy

Understanding the future trajectory of impact requires a review of past experience. A meaningful distinction exists between historical fuel price increases driven by fiscal crisis and the forward-looking policy trajectory oriented toward energy transformation. Indonesia has a long history of adjusting subsidized fuel prices; over the past two decades, such adjustments have repeatedly served as inflection points for regional economies. On 1 October 2005, for instance, the price of diesel rose by 104.7 percent — a shock that reverberated powerfully through the transportation and industrial logistics sectors (Wikipedia bahasa Indonesia, n.d.).

Table 4. Historical Fuel Price Increases in Indonesia

Adjustment Date	Fuel Type	Old Price (Rp)	New Price (Rp)	Increase (%)
1 October 2005	Diesel	2,100	4,300	104.7%
24 May 2008	Diesel	4,300	5,500	27.9%
18 November 2014	Diesel	5,500	7,500	36.4%
3 September 2022	Diesel/Biosolar	5,150	6,800	32.0%
3 September 2022	Pertalite	7,650	10,000	30.7%

Source: Wikipedia bahasa Indonesia (n.d.).

This historical record indicates that whenever a fuel price increase exceeds approximately 30 percent, rural communities in Kudus have faced a dual challenge: a rising cost of living (inflation) and rising production costs, particularly for irrigation pumps and the transport of agricultural produce (Kementerian Pertanian, 2022; Wikipedia bahasa Indonesia, n.d.). This historical experience underlies the government's practice of preparing a "social buffer," such as unconditional cash transfers, to cushion shocks at the household level.

Historically, fuel price increases have also altered consumption behavior, as households reduce non-essential mobility and businesses pass fuel-cost increases instantly into production costs because fuel is an inelastic input in industrial supply chains (Fauzi & Nasution, 2022; Hidayat, 2022), risking higher unemployment absent intervention (Hidayat, 2022; UKM Indonesia, 2022). Unlike past episodes largely reactive to world oil prices, however, Indonesia's energy policy direction for 2025–2029, articulated in the Ministry of Energy and Mineral Resources' Strategic Plan, is oriented more explicitly toward stability, affordability, and the green energy transition, with a key performance indicator being minimization of retail-price deviation across Indonesian territory (Kementerian ESDM, 2025, 2026) — a positive signal that energy-price disparities affecting Kudus's industrial actors will be actively managed. Through 2026, no drastic increase in subsidized fuel prices is anticipated, with priority on protecting purchasing power and stability through consumption-side savings measures, such as work-from-home policies for civil servants, rather than consumer-facing price increases (Dunia Energi, 2025; RMOL, 2026a, 2026b). Several alternative targets have been articulated for energy-sector management over the next five years, with direct implications for energy availability in Kudus.

Table 5. Alternative Targets for National Energy Sector Management (2025-2029)

Strategic Goal	Indicator	2025 Target	2029 Target
Energy affordability	Retail-price deviation	Minimal	Controlled
Accessibility	Operational fuel distribution points	90%	92%
Energy transition	Biofuel consumption (million KL)	14.94	Gradual increase
Energy efficiency	Reduction in energy intensity	1% / year	Sustained

Source: Kementerian ESDM (2025, 2026).

This trajectory indicates that the policy focus has shifted from price control alone toward ensuring "equity of access" (Kementerian ESDM, 2025) — for Kudus's rural residents, a stronger guarantee that fuel supply for agricultural machinery will remain reliably available.

Projected Impact on Economic Resilience and Rural Welfare

As the largest contributor to Kudus's GRDP, the tobacco industry is exposed to fuel price increases through elevated logistics costs for both raw tobacco and finished-product distribution; a 20–30 percent fuel price increase can trigger a proportional rise in freight-service tariffs (Sumber Urip Cargo, 2022), adding pressure to an industry already burdened by rising excise rates. Yet an interesting anomaly characterizes Kudus's tobacco industry: amid cost pressure, hand-rolled cigarette (SKT) production has in fact grown by 27 percent (Pajakku, 2023) — significant because SKT is the most labor-intensive segment of the industry and absorbs the largest share of manual rural labor. Accordingly, even as energy costs rise, labor-sector resilience appears to hold as long as demand for this labor-intensive product remains robust.

Agriculture, by contrast, is the sector most vulnerable to fuel price fluctuation, encompassing not only rice but also sugarcane and maize. A fuel price increase raises the cost of virtually every production factor. The projected relationship between a fuel price increase and agricultural input costs can be expressed as $\Delta P_{input} = \beta_0 + \beta_1(\Delta P_{fuel}) + \varepsilon$, where β_1 for seed and fertilizer prices ranges from 0.11 to 0.26 (Widiastuti, 2022) — meaning every unit increase in fuel prices is followed by an 11–26 percent increase in fertilizer prices. This places pressure on farmers, who typically lack the market power to raise their sale price in a competitive market. A productivity decline of up to 9 percent, driven by the rising cost of energy for irrigation and land preparation, could threaten rural farmer welfare absent regional government intervention (Kementerian Pertanian, 2022; Pusat Sosial Ekonomi dan Kebijakan Pertanian, 2014).

Table 6. Simulated Impact Of A Fuel Price Increase On Agricultural Commodities

Commodity	Input Price Increase (%)	Potential Production Decline (%)
Rice (Padi)	15.30	-5.12
Sugarcane (Tebu)	14.26	-6.68
Shallot (Bawang Merah)	22.10	-9.52
Palm Oil / Industrial crops	26.30	-7.15

Source: Widiastuti (2022); Kementerian Pertanian (2022).

Rural MSMEs in Kudus — embroidery artisans and small food producers among them — likewise face pressure on profit margins. For these enterprises, fuel expenditure represents the cost of transporting raw materials and marketing finished products. As inflation triggered by fuel price increases erodes household purchasing power, demand for MSME products tends to decline, raising the risk of business closure and a corresponding rise in local unemployment (Hidayat, 2022; UKM Indonesia, 2022).

Furthermore, a fuel price increase carries a positive correlation with the number of people living in poverty, absent an appropriately designed mitigation policy. In Kudus Regency, the poverty rate stood at 6.59 percent, or 60,370 people, in 2025, a reduction of 5,320 people from the previous year reflecting a positive trend that must be safeguarded against economic shocks (Radar Pati, 2024). However, the population segment most vulnerable to a fuel price increase is not the group already below the poverty line but the "near-poor" — households typically employed in the informal sector or as day laborers, whose expenditure sits only marginally above the poverty threshold. A rise in staple-good prices driven by energy-linked logistics costs can readily push such households below the line (Pritchett et al., 2000; Widiastuti, 2022). Research on the survival mechanisms of poor families in Java indicates that households facing this pressure commonly resort to emergency measures: selling productive assets such as livestock or work equipment to meet urgent consumption needs (Widiastuti, 2022); reducing the quantity or nutritional quality of food consumed, with long-term consequences for

family health; and cutting educational expenditure, particularly school-transport costs, thereby elevating the risk of school dropout in rural areas.

As an "administered price," fuel exerts a multiplier effect on core inflation: evidence from Kudus's traditional markets shows that the mere announcement of an impending increase is sufficient to move the price of chili, cooking oil, and rice (RMOL Jawa Tengah, 2022), a pattern attributable to speculative trader behavior and consumer panic buying.

Table 7. Fuel-to-Staple-Goods Price Transmission

Staple Commodity	Sensitivity to Fuel Price	Transmission Mechanism
Rice	High	Diesel cost for tractors and rice milling
Chili	Very high	Dependence on daily logistics transport
Cooking oil	Moderate	Distribution cost from distributor to village retailer
Eggs & meat	High	Rising livestock feed cost due to transportation

Source: Analysis of energy-to-food inflation transmission (Hia et al., 2023; RMOL Jawa Tengah, 2022).

Statistically, a 1 percent increase in fuel prices is estimated to raise inflation by approximately 0.044 percent through the direct consumption channel alone, excluding second-round effects on the price of other goods and services (Pusat Sosial Ekonomi dan Kebijakan Pertanian, 2014). For rural households, whose expenditure is disproportionately allocated to food, this food-price inflation typically inflicts more acute welfare damage than the fuel price increase itself.

DISCUSSION

The findings assembled in Section 3 collectively depict Kudus Regency as an economy whose apparent resilience is unevenly distributed across sectors, and whose principal social-protection instrument — DBHCHT — is necessary but, in its current form, insufficient to fully offset the welfare costs of a fuel price increase. Three interpretive threads merit elaboration: the asymmetric nature of price transmission, the structural determinants of sectoral resilience, and the adequacy of Kudus's existing mitigation architecture.

First, the pattern documented here — in which staple-food prices in Kudus's traditional markets move in anticipation of, rather than only in response to, an actual fuel price change — is consistent with the literature on asymmetric price transmission. Meyer and von Cramon-Taubadel (2004), in their canonical survey, note that price adjustments along a supply chain are rarely symmetric or instantaneous: intermediaries pass cost increases downstream more readily and more rapidly than they pass cost decreases, a pattern reinforced in thin, poorly integrated rural markets by speculative trader behavior and consumer panic buying. The Kudus evidence — chili, cooking oil, and rice prices moving on the mere announcement of a fuel policy change (RMOL Jawa Tengah, 2022) — suggests that expectation management, not merely the fuel price itself, is a meaningful lever for regional inflation control. This reframes the policy problem: a Regional Inflation Control Team (TPID) that monitors prices only after a policy is enacted addresses the transmission mechanism too late; effective mitigation requires anticipatory communication and daily market monitoring in the weeks preceding a nationally anticipated adjustment.

Second, the divergence between the tobacco industry's demonstrated resilience — a 27 percent increase in SKT production despite rising costs (Pajakku, 2023) — and agriculture's acute exposure — productivity declines of up to 9 percent (Kementerian Pertanian, 2022) — is best understood through structural, rather than purely financial, resilience. Adger's (2000) formulation of social resilience as the capacity of a system to absorb disturbance while retaining its essential structure and function is instructive: tobacco's resilience is not a function of insulation from energy costs, since logistics tariffs rise for tobacco distribution just as for any other sector (Sumber Urip Cargo, 2022), but of the labor-intensive character of SKT production, which keeps demand for rural labor high even as costs mount,

and of a wage-bargaining architecture — exemplified by RTMM SPSI–employer negotiations (Antara News, 2025) — that partially, if belatedly, passes cost increases through to worker income. Agriculture has no comparable buffer: farmers face a government purchase price (HPP) for unmilled rice that adjusts far more slowly than input costs, a textbook cost-price squeeze leaving smallholders bearing energy-cost risk asymmetrically. This divergence indicates that resilience in Kudus's rural economy is not an inherent regional trait but an artifact of sector-specific institutional design, with direct implications for where mitigation policy should be concentrated.

Third, DBHCHT's monthly cash transfer of Rp300,000 to tobacco workers (Pemerintah Kabupaten Kudus, 2025), while a meaningful buffer, is best evaluated against the vulnerability framework of Pritchett et al. (2000), later applied to Indonesia by Suryahadi and Sumarto: poverty is not a static headcount but a probabilistic exposure, and the population most at risk from a fuel price shock is precisely the near-poor segment sitting just above the poverty line — largely absent from DBHCHT's criteria because its members work in agriculture, as day laborers, or in informal MSME activity rather than as registered tobacco employees. Kudus's poverty trend — a reduction of 5,320 people, to 60,370 (6.59 percent), in the latest reporting year (Radar Pati, 2024) — is encouraging but fragile, since it says nothing about the near-poor buffer above the line, which, per Pritchett et al.'s (2000) estimates, can considerably exceed the officially poor population. At the same time, disbursed DBHCHT funds are reported to stimulate local markets and MSMEs, as workers direct the transfer toward staple purchases and holiday preparations (Diskominfo Kabupaten Kudus, 2024) — evidence that the instrument's local-multiplier effect is real even where individual targeting is imperfect. This targeting problem is not unique to Kudus: Prasetyo (2021), on DBHCHT's effectiveness during the COVID-19 pandemic, likewise found data accuracy, not fund volume, to be the binding constraint; Safitri (2023), on village-fund transfers in Magetan Regency, similarly found beneficiary-data quality decisive. DBHCHT, in short, functions well as an industry-specific compensation mechanism but poorly as a general rural safety net, and its nominal value has not been indexed to a food- and energy-specific cost-of-living measure.

These findings extend the broader Indonesian literature on fuel subsidy reform. Yusuf and Resosudarmo's (2008) computable general equilibrium analysis of Indonesia's 2005 reform found that distributional consequences depend heavily on which fuel product is repriced and on the accompanying transfer design — a conclusion the Kudus case reaffirms at sub-national resolution: diesel increases concentrate harm in Undaan's rice-growing communities, while Pertalite increases concentrate harm among Dawe's horticultural traders and the regency's motorcycle-commuting tobacco workforce. Internationally, the World Bank (2024) and IMF (Black et al., 2025) both frame fuel-subsidy reform as fiscally necessary but socially contingent on accompanying safety nets — squarely applicable to Kudus, where the question is not whether fuel prices will rise, but whether DBHCHT, TPID, and complementary instruments can be reformed quickly enough to keep pace.

Building on this diagnosis, several practical mitigation pathways follow directly from the evidence. Strengthening TPID's presence to the sub-district level, with daily price monitoring in village markets, would allow early detection of speculative price movements (RMOL Jawa Tengah, 2022). Periodic "cheap market" (Pasar Murah) operations in high-poverty villages during announced fuel price adjustments would provide a short-term consumption buffer, while shortening local food-distribution chains — for instance, through farmer-market linkages between Undaan as a producer sub-district and consuming sub-districts — would reduce the margin-taking intermediaries through which fuel-driven costs pass to consumers. Facilitating the conversion of diesel-powered irrigation pumps to electric or solar-powered alternatives in Undaan would structurally reduce farmers' exposure to a volatile input cost, rather than merely compensating for it after the fact. For MSMEs, the Padurenan embroidery cluster model — collective raw-material procurement, production-site optimization, and diversification toward higher-value, lower-volume products — offers a template for cost-absorption strategies that regional government can support through appropriate-technology grants (Universitas Muria Kudus, 2013; Suryana, 2014). Finally, DBHCHT itself requires three reforms: data integration between the Manpower, Industry, Cooperatives and MSME Office and population administration systems, to ensure timely targeting of permanent, part-time, and piece-rate workers alike; periodic indexation of the

transfer value to a food- and energy-specific regional consumer price index; and an expansion of eligibility — potentially financed through village-fund allocations — to reach farm laborers and micro-enterprise workers excluded from the tobacco-worker-specific BLT scheme.

CONCLUSION

Fuel price increases represent a systemic challenge for Kudus Regency's rural communities, with effects that extend from the operating cost of tractors in paddy fields to the daily commuting expenses of tobacco-factory workers. Kudus's identity as a center of tobacco processing provides a distinctive fiscal buffer through DBHCHT, yet the vulnerability of its agricultural and MSME sectors remains a critical policy concern with the potential to reverse recent gains in poverty reduction if left unaddressed through technocratic planning. The regency's RPJMD 2025–2045 target of realizing a "Healthy Kudus" (Kudus Sehat) vision demands policy instruments that move beyond episodic cash assistance toward structural transformation — particularly energy-efficiency improvements across every tier of rural production (Bappeda Kabupaten Kudus, 2024). Aligning wage adjustments for industrial labor, improving the targeting accuracy of social assistance, and stabilizing staple-food prices together constitute the central pillars for sustaining Kudus's economic resilience amid continued uncertainty in global energy markets.

This study's principal contribution is to integrate previously fragmented evidence — sub-district agricultural land data, tobacco-labor concentration, wage trends, and poverty statistics — into a single technocratic framework for assessing energy-shock vulnerability at the regency level, addressing a gap left open by prior, predominantly macro-level or urban-centered studies of Indonesian fuel price policy. The findings carry direct implications for regional planning practice: mitigation policy should be sector-differentiated rather than uniform, prioritizing structural interventions (pump electrification, shortened food-distribution chains) in agriculture, targeting-accuracy reforms in DBHCHT administration for the tobacco labor force, and cluster-based cost-absorption support for MSMEs, rather than relying on a single, undifferentiated social-assistance instrument to address welfare shocks whose sectoral origins and transmission channels are demonstrably distinct.

Several limitations qualify these conclusions. First, consistent with the study's technocratic-synthesis design, the quantitative estimates reported here are drawn substantially from national and cross-regional simulation studies — Input-Output coefficients, SVAR/IRF lag estimates, and CGE-based elasticity ranges — rather than from a regency-specific structural econometric model on Kudus panel data; the projections should be read as plausible order-of-magnitude ranges rather than precise forecasts. Second, the analysis relies on secondary and administrative data of varying vintage and methodological transparency, which may understate recent shifts in Kudus's economic structure. Third, the study lacks primary household survey data that would allow direct estimation of near-poor vulnerability thresholds specific to Kudus, relying instead on national-level parameters (Pritchett et al., 2000) extrapolated to the regency context.

Future research should prioritize three extensions. First, primary household panel surveys in Undaan and Dawe Subdistricts would allow direct estimation of farm-level income elasticity to diesel-price changes and identification of the near-poor population with regency-specific precision. Second, a regency-calibrated computable general equilibrium or Input-Output model, built on Kudus-specific social accounting data, would extend the national-level approach of Yusuf and Resosudarmo (2008) to the sub-regional scale. Third, a rigorous ex post evaluation of DBHCHT's targeting accuracy and welfare impact, conducted once beneficiary-data integration reforms are implemented, would determine whether the instrument can be credibly extended to non-tobacco rural workers without diluting its effectiveness for its original target population.

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