

GROWTH OF THE INDONESIAN FARMERS' EXCHANGE RATE (NTP) BY SUBSECTOR OVER THE LAST DECADE (2014 - 2023)

Hilmi Arija Fachriyan^{1*}, Lutfi Aris Sasongko¹, Lu'lu'a Ulyn Ni'mah¹, Heri Kustanto¹

¹ Program Studi Agribisnis, Fakultas Pertanian, Universitas Wahid Hasyim

Jl. Menoreh Tengah X/22, Sampangan, Semarang 50236

*Email: hilmiarija@unwahas.ac.id

Abstract

This article analyzes the growth of the Farmers' Exchange Rate (Nilai Tukar Petani, NTP) by subsector in Indonesia over the last decade (2014–2023), using monthly secondary data from Statistics Indonesia (BPS). Because BPS revised the index base year from 2012=100 (2014–2019) to 2018=100 (2020–2023), the two series are not directly comparable; growth is therefore measured separately within each base-year regime using the Compound Annual Growth Rate (CAGR) and Year-on-Year (YoY) rates rather than by adding period percentages. The significance of the observed changes is tested with paired t-tests, one-way ANOVA across subsectors, and linear trend regression. NTP rose in every subsector during 2020–2023, and all increases were statistically significant ($p < 0.01$). The Smallholder Plantation subsector (NTPR) recorded the strongest annualized growth (CAGR 7.17%/yr in 2020–2023), driven largely by the global vegetable-oil and rubber price surge. Horticulture (NTPH) grew rapidly in the most recent period (CAGR 3.33%/yr), while Livestock (NTPT) grew the slowest (CAGR 1.24%/yr). Within Fisheries (NTNP), the Capture subsector (NTN) outperformed Aquaculture (NTPi). Food Crops (NTPP) posted the highest single-year growth (YoY +8.89% in 2022–2023). A one-way ANOVA confirmed that NTP performance differed significantly across subsectors ($F = 81.3$; $p < 0.001$). A rise in NTP cannot by itself be read as improved farmer welfare unless it is matched by real gains in purchasing power; producer-price policy must therefore be coordinated with control of the prices of goods farmers consume.

Keywords: Farmers' Exchange Rate, NTP by subsector, agricultural welfare, CAGR, Indonesia

BACKGROUND

Indonesia is an agrarian and maritime country whose territory of thousands of islands offers extensive farmland, fertile soils, a tropical climate suited to cultivation, and abundant water and marine resources. This large stock of natural capital is expected to play a major role in the national economy and in the livelihoods of its people. A very large share of the population depends on agricultural and agribusiness activities, so raising the welfare of farming communities deserves central attention in national development. At every stage of agricultural development, farmer welfare should be one of the main targets (Nurasa & Rachmat, 2013).

One indicator used to assess progress in farm-household welfare is the Farmers' Exchange Rate (NTP). NTP measures the purchasing power of farm households by comparing the index of prices received by farmers (IT) with the index of prices paid by farmers (IB) (Rachmat, 2013). It reflects the terms of trade between the products farmers sell and the goods and services they buy (BPS, 2023).

BPS interprets NTP as follows: $NTP > 100$ means farmers are better off than in the base year (a surplus prices received rise faster than prices paid); $NTP = 100$ means break-even; and $NTP < 100$ means a deficit relative to the base year.

By subsector, NTP is divided into five: Food Crops (NTPP), Horticulture (NTPH), Smallholder Plantation (NTPR), Livestock (NTPT), and Fisheries (NTNP). NTNP combines two components Capture Fisheries, the Fishermen's Exchange Rate (NTN), and Aquaculture, the Fish Cultivators' Exchange Rate (NTPi). NTP is reported as an index relative to a base year. Although many earlier studies examine a single subsector, a single province, or a short window, few compare all subsectors nationally across a full decade that spans two base-year regimes and the COVID-19 shock. This article addresses that gap by analyzing NTP growth for every subsector over 2014 – 2023 with a base-year-consistent method, thereby offering an up-to-date national benchmark and clarifying which subsectors drove and lagged the recovery.

RESEARCH METHODS

The study uses monthly secondary data from Statistics Indonesia (BPS) the Farmers' Exchange Rate from January 2014 to December 2023. Two base years apply within the period: 2012=100 for January 2014–December 2019 and 2018=100 for January 2020–December 2023.

A base year is the reference period from which index numbers are calculated. BPS changed the NTP base year to widen provincial coverage (from 32 to 33 provinces in 2012, then to 34 with the addition of North Kalimantan in 2018), to expand the commodity coverage of the IT and IB baskets, and to reflect changing rural production and consumption patterns.

Because the 2012=100 and 2018=100 series use different commodity baskets and reference points, an index value under one base year is not continuous with a value under the other; the two series must not be chained or added. Accordingly, growth is measured within each base-year regime rather than across the break. For each subsector we compute the Compound Annual Growth Rate (CAGR) and the Year-on-Year (YoY) rate from annual average indices:

$$\text{CAGR} = [(\text{NTP}_{\text{end}} / \text{NTP}_{\text{start}})^{(1/n)} - 1] \times 100\%$$

$$\text{YoY growth} = [(\text{NTP}_t - \text{NTP}_{t-1}) / \text{NTP}_{t-1}] \times 100\%$$

where n is the number of years in the interval ($n = 5$ for 2014–2019 and $n = 3$ for 2020–2023). CAGR expresses the smoothed annual rate of change and, unlike the sum of two period percentages, remains valid within a single base-year regime. Growth for the two regimes is reported side by side and is not added into a single decade figure.

Statistical Analysis

To move beyond description and test the validity of the findings, three tests were applied to the monthly index data ($\alpha = 0.05$). First, a paired-sample t -test compared each subsector's twelve monthly values in 2020 with the corresponding months in 2023 (paired by calendar month to control for seasonality) to test whether the 2020–2023 change was significant. Second, a one-way ANOVA compared mean monthly NTP across the five main subsectors during 2020–2023 ($n = 48$ each), with the Tukey HSD post-hoc test for pairwise differences. Third, a linear trend regression of NTP on a monthly time index quantified and tested the direction of the trend for each subsector. Computations were performed in Python (SciPy and statsmodels).

RESULT AND DISCUSSION

Recapitulation of NTP Growth by Subsector

Table 1 recapitulates the annual average NTP, CAGR, and YoY growth for all subsectors within each base-year regime, replacing the seven repetitive monthly tables of the earlier draft with a single consolidated table. During 2014–2019 (2012=100), growth was modest and uneven: NTPR and NTPH even contracted (CAGR $-1.29\%/yr$ and $-0.02\%/yr$). During 2020–2023 (2018=100), every subsector expanded, led decisively by NTPR (CAGR $+7.17\%/yr$) and NTPH ($+3.33\%/yr$), with NTPT the slowest ($+1.24\%/yr$).

Table 1. Recapitulation of NTP by Subsector, 2014–2023 (annual average index; CAGR and YoY in %)
¹ base 2012=100; ² base 2018=100; paired t -test compares 2020 vs 2023 monthly values.

Subsector	2014 ¹	2019 ¹	CAGR '14-'19	2020 ²	2023 ²	CAGR '20-'23	YoY '22-'23	t-test p
NTPP (Food Crops)	98.88	105.78	+1.36	101.43	107.61	+1.99	+8.89	0.001
NTPH (Horticulture)	102.54	102.42	−0.02	101.28	111.74	+3.33	+2.83	<0.001
NTPR (Smallholder Plantation)	101.32	94.95	−1.29	104.36	128.47	+7.17	+1.73	<0.001
NTPT (Livestock)	106.65	108.05	+0.26	98.10	101.80	+1.24	+0.56	<0.001
NTNP (Fisheries)	102.73	106.94	+0.81	100.36	105.22	+1.59	−0.50	<0.001
– NTN (Capture)	104.63	113.74	+1.68	100.22	105.41	+1.70	−1.00	<0.001
– NTPi (Aquaculture)	101.53	102.09	+0.11	100.55	104.92	+1.43	+0.29	<0.001

Source: BPS (2014–2023), processed.

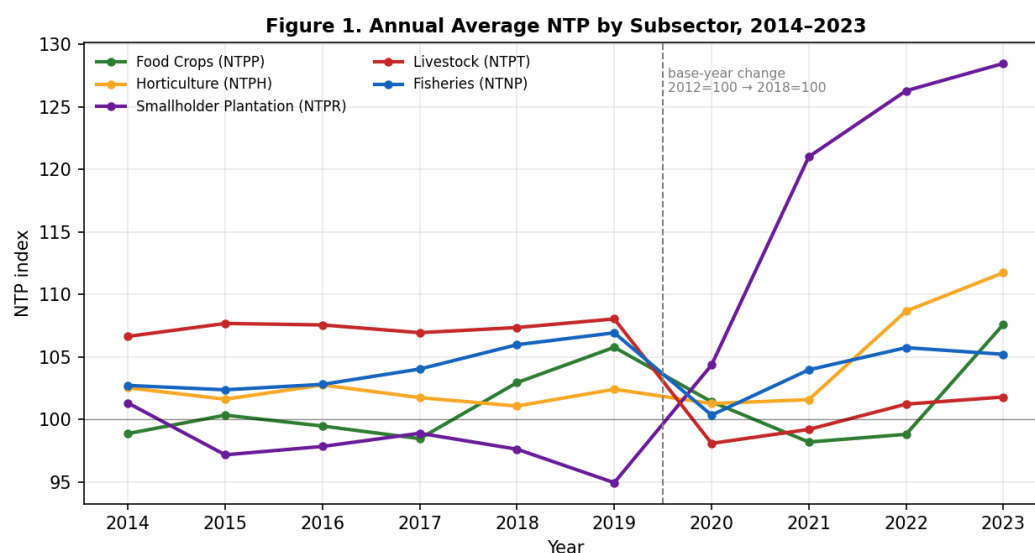


Figure 1. Annual average NTP by subsector, 2014–2023. The dashed line marks the base-year change; values on either side are not directly comparable.

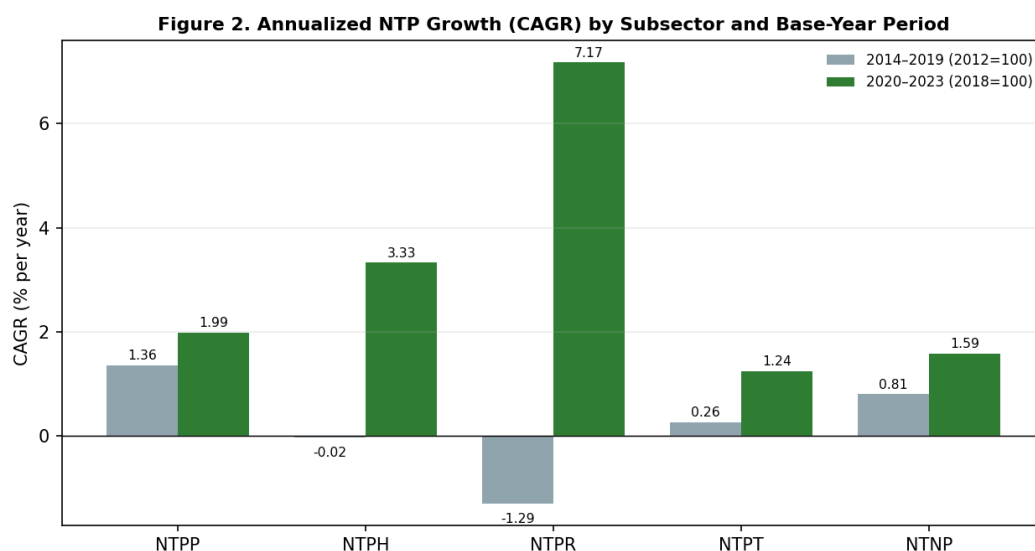


Figure 2. Annualized NTP growth (CAGR, %/yr) by subsector and base-year period.

Subsector Highlights

Food Crops (NTPP) comprise rice and secondary crops (corn, cassava). NTPP grew at CAGR 1.36%/yr in 2014–2019 and 1.99%/yr in 2020–2023, and posted the highest single-year gain of any subsector in 2022–2023 (YoY +8.89%). Fertilizer and labor are the largest cost components (Riyadh, 2015); food-crop GDP growth, corn prices, agricultural credit, and organic-fertilizer realization positively affect NTPP (Afifah & Nalurita, 2022), while the dry-milled paddy price is a key driver (Purba et al., 2023). Rising input costs against low grain prices can depress NTPP and encourage paddy-land conversion (Ayub et al., 2021).

Horticulture (NTPH) vegetables, fruit, and medicinal plants was flat in 2014–2019 (CAGR –0.02%/yr) but rebounded strongly in 2020–2023 (CAGR 3.33%/yr), consistent with the finding that commodity price changes significantly affect NTPH (Soewignyo & Simatupang, 2020).

Smallholder Plantation (NTPR) rubber, oil palm, cocoa fell in 2014–2019 (CAGR –1.29%/yr) but grew fastest of all subsectors in 2020–2023 (CAGR 7.17%/yr). Plantation output and product-price inflation strongly influence NTPR (Nugrahaning Widi, 2021), and production, land area, and labor also matter (Runtunuwu, 2020).

Livestock (NTPT) large and small livestock, poultry, and their products grew the least across the decade (CAGR 0.26%/yr then 1.24%/yr; YoY only +0.56% in 2022–2023). Higher livestock populations do not translate linearly into higher NTPT; input prices (feed, medicine, wages, capital) strongly shape the price index farmers receive (Priyono et al., 2017).

Fisheries (NTNP) combine capture and aquaculture and influence the Human Development Index (Andriyani & Mulia, 2020). Over 2020–2023 the Capture component (NTN, CAGR 1.70%/yr) outpaced Aquaculture (NTPi, CAGR 1.43%/yr), and NTNP was the only subsector to edge down in 2022–2023 (YoY –0.50%).

Statistical Test Results

The paired t-tests confirmed that the 2020–2023 increase was statistically significant for every subsector (all $p < 0.01$; see the final column of Table 1). The largest mean gain was for NTPR (+24.1 index points; $t = 29.2$), followed by NTPH (+10.5; $t = 8.8$); the smallest significant gain was NTPT (+3.7; $t = 8.8$). The one-way ANOVA showed that mean NTP differed significantly across the five subsectors during 2020–2023 ($F = 81.3$; $p < 0.001$). The Tukey HSD post-hoc test placed NTPR far above all others (mean ≈ 120.0), while NTPT (≈ 100.1) and NTPP (≈ 101.5) formed the lowest group; the NTPP–NTPT and NTNP–NTPH pairs did not differ significantly. Linear trend regressions were positive and significant for all subsectors ($p < 0.001$), with the steepest slope for NTPR (+0.63 index points per month; $R^2 = 0.67$) and the flattest for NTPT (+0.11; $R^2 = 0.68$). Together these results establish that the recovery after 2020 was systematic rather than incidental, and that subsector performance diverged in a statistically meaningful way.

Price Index Received by Farmers (IT) and Commodity Contributions

Movements in NTP stem largely from changes in IT as the prices of key commodities rise or fall. Grain has a broad influence on overall NTP; for NTPP, corn and cassava also contribute alongside grain. NTPH is shaped by shallots (vegetables), bananas (fruit), and ginger (medicinal plants). NTPR is dominated by palm oil, NTPT by beef cattle, broiler chickens, and eggs, and NTNP by skipjack and tuna (capture) plus shrimp and tilapia (aquaculture). Table 2 lists the commodities contributing most to annual IT changes by subsector.

Table 2. Commodities Contributing Most to Annual IT Change, by subsector (2014–2023)

Year	NTPP	NTPH	NTPR	NTPT	NTNP
2014	grain, cassava, corn	cayenne pepper, tomatoes, banana, mango, orange, ginger, turmeric	cocoa, coffee, palm oil	beef cattle, purebred chicken eggs, goat	skipjack, tuna, shrimp, tilapia
2015	grain, corn, cassava	tomatoes, cabbage, banana, mango, salak, ginger, galangal	cocoa, coconut, palm oil	beef cattle, broiler chickens, chicken eggs	skipjack, tuna, tilapia, catfish
2016	corn, cassava, sweet potato	petai, red onion, salak, banana, mango, orange, ginger, turmeric	palm oil, coconut, coffee	beef cattle, broiler chickens, chicken eggs	tuna, snapper, tilapia, shrimp
2017	grain, cassava, corn	spring onions, tomatoes, durian, salak, mango, banana, ginger	coffee, tobacco, palm oil	beef cattle, broiler chickens, chicken eggs	tuna, skipjack, tilapia, shrimp
2018	grain, cassava, corn	red onions, tomatoes, banana, orange, durian, salak, ginger	cocoa, candlenut, palm oil	beef cattle, broiler chickens, chicken eggs	skipjack, mackerel, shrimp, tilapia
2019	grain, corn, cassava	red onions, tomatoes, banana, salak, mango, apple, cardamom	palm oil, coconut, cocoa	beef cattle, chicken eggs, broiler chickens	skipjack, tuna, goldfish, tilapia
2020	corn, cassava, peanut	red onions, petai, tomatoes, orange, banana, salak, ginger	palm oil, rubber, sugarcane	chicken eggs, broiler chickens, beef cattle	mackerel, crab, shrimp, milkfish
2021	corn, cassava, peanut	cayenne pepper, red onion, salak, mango, orange, ginger	palm oil, rubber, clove	beef cattle, broiler chickens, chicken eggs	tuna, mackerel, milkfish, shrimp
2022	grain, cassava, corn	red onions, tomatoes, orange, mango, watermelon, cardamom	palm oil, coffee, clove	chicken eggs, broiler chickens, beef cattle	tuna, mackerel, milkfish, tilapia, seaweed, shrimp
2023	grain, corn, cassava	cayenne pepper, red chili, salak, mango, banana, orange, ginger	coffee, cocoa, palm oil	beef cattle, chicken eggs, broiler chickens	tuna, skipjack, seaweed, milkfish, shrimp

Source: BPS (2014–2023), processed.

Combined NTP and the Drivers of Change

Combined NTP for the five subsectors (2018=100) rose every year from 2019 to 2023, for cumulative growth of 11.46% (Table 3, Figure 3). The gain reflects IT rising faster than IB, but the widening IT–IB gap also signals rising costs that farmers must pay.

Table 3. Combined IT, IB, and NTP, 2019–2023 (base 2018=100)

Year	IT	IB	NTP	YoY growth (%)	Cum. growth (%)
2019	104.16	103.24	100.90		
2020	107.46	105.72	101.65	+0.74	
2021	112.94	107.93	104.64	+2.94	
2022	120.67	112.43	107.33	+2.57	
2023	131.59	117.01	112.46	+4.78	+11.46

Source: BPS (2014–2023), processed.

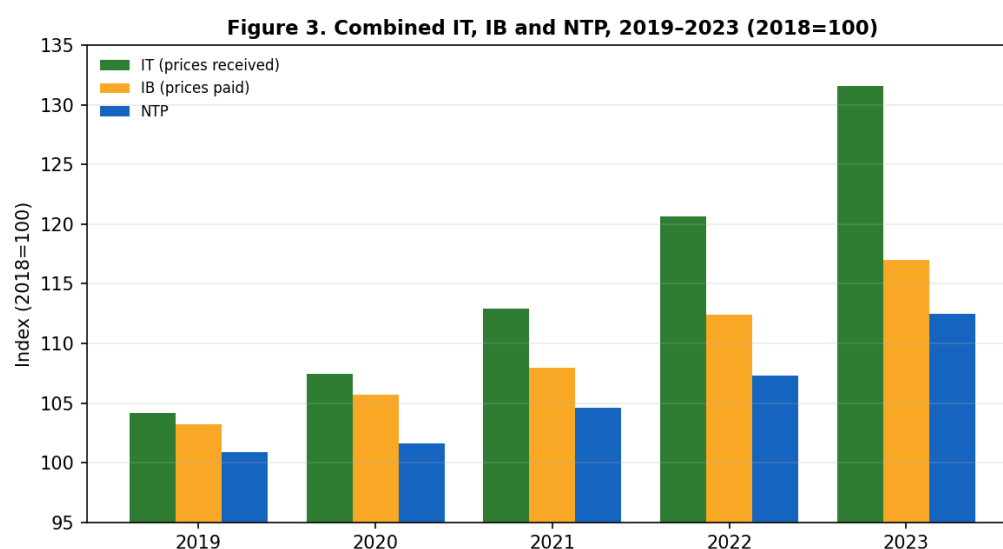


Figure 3. Combined IT, IB, and NTP, 2019–2023 (2018=100)

The decade's turning points align closely with identifiable external shocks. In 2020 nearly every subsector dipped as the COVID-19 pandemic disrupted marketing chains, mobility, and demand. NTPT and NTNP fell below 100, reflecting weak prices for perishable livestock and fish products during lockdowns. The sharp NTPR upswing in 2021–2022 coincided with the global surge in vegetable-oil and rubber prices; crude palm oil reached record highs amid tight world supply so smallholder plantation revenues rose faster than input costs. The 2022 spike in NTPH mirrors the volatile prices of chili and shallots during that year's supply disruptions and elevated food inflation. General inflation and the removal of some subsidies raised IB through higher fuel, transport, and fertilizer costs, damping net NTP gains consistent with evidence that fuel-price increases push NTP down via higher basic-goods prices (Keumala & Zainuddin, 2018). Weather variability, including drought and flooding in horticultural centers, added to the year-to-year swings in NTPH and NTPT. These factors jointly explain why NTPR led and NTPT lagged, and why the recovery, though broad, was uneven across subsectors.

Relative to earlier single-subsector or single-province studies (e.g., Nugrahaning Widi, 2021 for plantations; Priyono et al., 2017 for livestock; Runtunuwu, 2020 for North Maluku), this study's decade-long, all-subsector, base-year-consistent comparison shows that the post-2020 recovery was general but plantation-led, a pattern not visible in narrower analyses.

NTP is often read as a welfare indicator: a low NTP implies farmers cannot comfortably meet their needs, a high NTP the opposite. However, NTP is dominated by price changes rather than by quantities produced or consumed (Asmara & Hanani, 2016). Its determinants include productivity, grain prices, consumer-goods prices, and fertilizer prices (Keumala & Zainuddin, 2018). Maintaining an effective floor-price policy for grain is important for price stability (Nurasa & Rachmat, 2013): farmers as producers want higher output prices, but as consumers they resist higher prices for other goods, so basic prices must be regulated to protect both farmers and consumers (Marshelia et al., 2017).

Government spending on roads, subsidized fertilizer, and machinery significantly raises agricultural production, yet production alone does not necessarily reduce rural poverty; rising productivity and farmer income do (Kharisma, 2020). Higher production is not always matched by higher NTP, because NTP is a price ratio (Nurasa & Rachmat, 2013), and food prices weigh heavily on both IT and IB. A rise in producer-level food prices feeds into the consumption expenditure of farm households, so an initial NTP gain can be eroded by higher prices paid, hence producer-price policy must be paired with consumer-price control (Asmara & Hanani, 2016). Ultimately, NTP is a quantitative price measure while welfare is qualitative (Darwanto, 2005), so NTP should be interpreted with care.

CONCLUSION AND SUGGESTION

Over 2014–2023, NTP generally rose across subsectors, though with month-to-month and year-to-year fluctuation. Measured on a base-year-consistent basis, the strongest annualized growth in 2020–2023 was in Smallholder Plantation (NTPR, CAGR 7.17%/yr) and Horticulture (NTPH, 3.33%/yr); Livestock (NTPT, 1.24%/yr) grew the slowest. Food Crops (NTPP) recorded the highest single-year gain (YoY +8.89% in 2022–2023). Within Fisheries, Capture (NTN) outperformed Aquaculture (NTPi). All 2020–2023 increases were statistically significant, and subsector performance differed significantly (ANOVA $p < 0.001$).

A rise in NTP cannot by itself signal improved welfare unless matched by real purchasing power, which depends on both agricultural and non-agricultural policy. Producer-price policy must therefore be coordinated with control of consumer prices.

Rather than a single general recommendation, policy should be targeted by subsector, with measurable indicators:

- **Food Crops (NTPP):** keep the government grain purchase price (HPP) aligned with production costs and stabilize fertilizer supply; target: IT for grain growing at least in step with rural inflation.
- **Horticulture (NTPH):** expand cold storage and improve market-price information to dampen chili and shallot volatility; target: lower month-to-month price variance in key vegetables.
- **Smallholder Plantation (NTPR):** diversify beyond palm oil and strengthen downstream processing and replanting so revenue is less exposed to single-commodity price swings; target: share of processed-product revenue rising year on year.
- **Livestock (NTPT):** cut dependence on imported feed by developing domestic feed and protecting producer margins for eggs and broilers; target: feed-cost share of IB declining over time.
- **Fisheries (NTNP):** prioritize aquaculture (NTPi), which lagged capture fisheries, through improved seed, feed, and market access; target: NTPi growth converging toward NTN.

This article offers a concise, up-to-date decade-long review of NTP by subsector from the BPS database. It is hoped to inform planning, policy, and the improvement of Indonesia's agricultural development programs, and to motivate further research especially multiple-regression modeling of NTP determinants once external macroeconomic series (inflation, exchange rates, world commodity prices, and policy variables) are incorporated.

REFERENCES

- Afifah, N., & Nalurita, L. (2022). Analisis Determinan Nilai Tukar Petani Tanaman Pangan di Indonesia. *NUSANTARA : Jurnal Ilmu Pengetahuan Sosial*, 9(1), 455–468.
- Andriyani, D., & Mulia, E. (2020). Pengaruh Nilai Tukar Petani Sub Sektor Tanaman Pangan dan Sub Sektor Perikanan terhadap Indeks Pembangunan Manusia di Kabupaten Aceh Utara. *Jurnal Ekonomi Pertanian Unimal*, 3(2), 1. <https://doi.org/10.29103/jepu.v3i2.3185>
- Asmara, R., & Hanani, N. (2016). Tingkat Kesejahteraan Petani Kabupaten Jombang: Pendekatan Nilai Tukar Petani. *Seminar Nasional Pembangunan Pertanian 2016*, 78–83.
- Ayub, A., Noorachmat, B. P., & Yanuar Jarwadi Purwanto, M. (2021). Analisis Alih Fungsi Lahan Sawah dan Keterkaitannya dengan Nilai Tukar Petani (NTP) di Kabupaten Bantul. *Jurnal Ilmiah Rekayasa Pertanian Dan Biosistem*, 9(1), 57–65. <https://doi.org/10.29303/jrpb.v9i1.215>
- BPS. (2014–2023). Statistik Nilai Tukar Petani di Indonesia. Badan Pusat Statistik, Jakarta.
- Darwanto, D. H. (2005). Ketahanan Pangan berbasis Ketersediaan Produk dari Petani Subsisten. *Ilmu Pertanian*, 12(2), 152–164.
- Keumala, C. M., & Zainuddin, Z. (2018). Indikator Kesejahteraan Petani melalui Nilai Tukar Petani (NTP) dan Pembiayaan Syariah sebagai Solusi. *Economica: Jurnal Ekonomi Islam*, 9(1), 129–149.
- Kharisma, B. (2020). Pengeluaran Pemerintah Sektor Pertanian, Pproduksi dan Kemiskinan Pedesaan di Indonesia. *Jurnal Ekonomi Kuantitatif Terapan*, 13(2), 211. <https://doi.org/10.24843/jekt.2020.v13.i02.p01>
- Marshelia, D., Sutrisno, J., & Ferichani, M. (2017). Analisis Faktor-Faktor yang Mempengaruhi Nilai Tukar Petani Padi di Kecamatan Karanganyar Kabupaten Klaten. *Agrista*, 5(1), 163–172.
- Nugrahaning Widi, M. A. I. (2021). Determinan Nilai Tukar Petani Perkebunan Rakyat di Indonesia. *Efficient: Indonesian Journal of Development Economics*, 4(1), 1093–1107. <https://doi.org/10.15294/efficient.v4i1.40420>
- Nurasa, T., & Rachmat, M. (2013). Nilai Tukar Petani Padi di Beberapa Sentra Produksi Padi di Indonesia. *Jurnal Agro Ekonomi*, 31(2), 161–179.
- Priyono, Magrianti, T., & Rinawidiastuti. (2017). Analisis Perkembangan Nilai Tukar Petani Subsektor Peternakan dan Faktor-Faktor yang Mempengaruhinya Pada Sentra Populasi Sapi di Indonesia. *Jurnal Teknologi Dan Agribisnis Peternakan*, 1(1), 118–123.
- Purba, S. F., Yulianti, A., Raphael, Y., & Khotimah, H. (2023). Determinan Kesejahteraan Petani Tanaman Pangan di Provinsi Jawa Barat. *Jurnal Ilmu Pertanian Indonesia*, 29(1), 59–67. <https://doi.org/10.18343/jipi.29.1.59>
- Rachmat, M. (2013). Nilai Tukar Petani : Konsep, Pengukuran dan Relevansinya sebagai Indikator Kesejahteraan Petani. *Forum Penelitian Agro Ekonomi*, 31(2), 111. <https://doi.org/10.21082/fae.v31n2.2013.111-122>
- Riyadh, M. I. (2015). Analisis Nilai Tukar Petani Komoditas Tanaman Pangan di Sumatera Utara. *Jurnal Ekonomi & Kebijakan Publik*, 6(1), 17–32.
- Runtuuwu, P. C. H. (2020). Analysis of Macroeconomic Indicators on the Farmer Exchange Rate of North Maluku Province: A Case Study of Smallholder Plantation Subsector. *Society*, 8(2), 437–457. <https://doi.org/10.33019/society.v8i2.235>
- Soewignyo, F., & Simatupang, N. (2020). The Effect of Changes in Agricultural Commodity Price on The Welfare of North Sulawesi Farmers. *Klabat Accounting Review*, 1(1), 14–26.