Journal of Authentic Research
https://journal-center.litpam.com/index.php/jar/index

Agustus 2026 Vol. 5, No. 3
e-ISSN: 2828-3724
pp. 6805-6821

Disaggregated Household and Agricultural Expenditure Inequality among Orange/Tangerine Farmers in Punten Village, Batu City

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Received: June 2026; Revised: July 2026; Published: August 2026

Abstract

Batu City has experienced a marked shift from apple to orange/tangerine cultivation, yet little evidence is available on how expenditures are distributed within farming households undergoing this agricultural transition. This study analyses household consumption and agricultural production expenditures among orange/tangerine farmers in Punten Village, Batu City, and identifies the expenditure categories in which inequality is most pronounced. A cross-sectional survey was conducted from February to April 2024 using a census of all 43 eligible farmers who had converted from apple to orange/tangerine cultivation. Expenditures for food, non-food items, annual lump-sum household needs, and agricultural production were recorded for the preceding 12 months. Distributional inequality was assessed using descriptive statistics, Lorenz curves, Gini coefficients, and Palma ratios. Combined annual expenditure averaged IDR 57.77 million per household. The Gini coefficient for combined expenditure was 0.31, while category-specific coefficients were 0.24 for food, 0.49 for non-food expenditure, 0.42 for agricultural production, and 0.46 for annual lump-sum expenditure. The overall Palma ratio was 1.018. These results show that inequality is substantially higher for non-food, lump-sum, and farm-production spending than for food consumption. The findings provide a descriptive baseline for understanding expenditure disparities in a horticultural community, while causal explanations and policy prescriptions require larger, comparative, and multivariate studies.

Keywords: Orange/tangerine farming; household expenditure; agricultural expenditure; Gini coefficient; Palma ratio

How to Cite: Syalwani, M. P. ., & Soseco, T. (2026). Household and Agricultural Expenditure Inequality among Orange/Tangerine Farmers in Punten Village, Batu City. *Journal of Authentic Research*, *5*(3), 6805-6821. https://doi.org/10.36312/nycpye54.

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INTRODUCTION

Horticulture is an important component of Indonesia's agricultural economy because high-value crops can generate income, employment, and local value added (Seran & Kune, 2016; Soseco et al., 2024). Orange/tangerine production is particularly relevant because citrus is cultivated across diverse agroecological zones and has established domestic demand (Sugiyatno et al., 2013; Wijaya, 2016). In Batu City, East Java, agricultural development has increasingly favoured orange/tangerine cultivation alongside the city's long-standing apple economy. The Ministry of Agriculture's commodity-development agenda and local planning have positioned Bumiaji District, including Punten Village, as an important citrus-production area (Gusti & Kusuma, 2022; Qurania & Mardiani, 2023). National orange/tangerine production rose from 2.4 million tons in 2021 to 2.8 million tons in 2023, while East Java contributed 1.4 million tons in 2023 (Badan Pusat Statistik, 2024). At the same time, Batu City's apple production fell from 505,254 quintals in 2019 to 140,285 quintals in 2024, whereas tangerine production increased from 238,436 to 337,112 quintals (Badan Pusat Statistik Kota Batu, 2025; Table 1; Figure 1). Local studies

attribute this shift to declining apple productivity, pests and diseases, rising production costs, changing climate conditions, and the relative attractiveness of citrus cultivation (Sitepu et al., 2022; Ibrahim et al., 2022; Talitakum et al., 2025). This transition provides the economic setting for examining how farm households allocate resources between consumption and production.

Table 1. Production of Apple and Tangerine in Batu City, 2019–2024

Year	Apple (quintals)	Tangerine (quintals)
2019	505,254	238,436
2020	430,357	251,336
2021	350,091	303,066
2022	299,963	323,484
2023	218,622	329,340
2024	140,285	337,112

Source: Badan Pusat Statistik Kota Batu (2025)

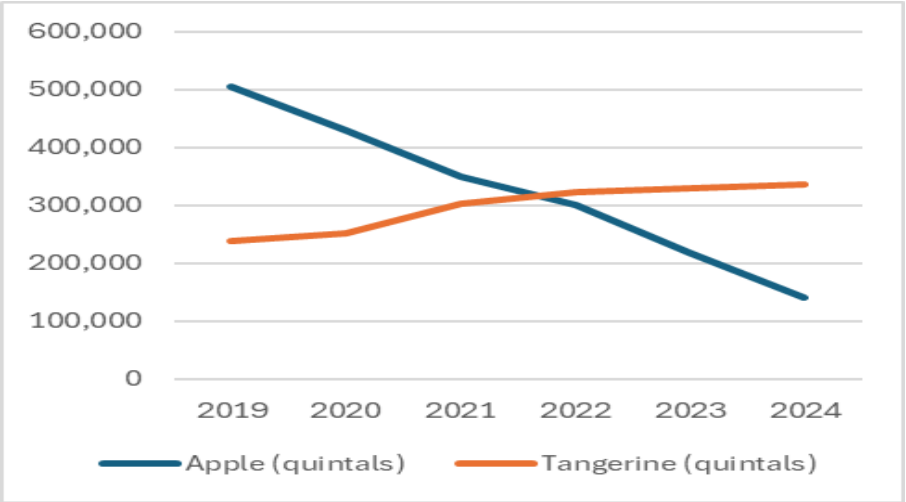


Figure 1. Production of Apple and Tangerine in Batu City, 2019–2024
Source: Badan Pusat Statistik Kota Batu (2025)

Household expenditure provides a useful lens for assessing economic well-being in agricultural communities because farm income can be seasonal, volatile, and difficult to measure accurately. Consumption generally changes more smoothly than current income and therefore can capture longer-term living standards more consistently (Attanasio & Pistaferri, 2016; Yusuf et al., 2014). This consideration is especially important for farming households whose cash flow depends on harvest cycles, input purchases, price fluctuations, and off-farm opportunities. Indonesian studies commonly distinguish food from non-food expenditure when assessing farmer welfare, while production costs are analysed separately because they represent farm investment rather than household consumption (Shiska & Wahyuni, 2021; Sahara et al., 2023; Cahyani et al., 2023; Dirgantari et al., 2024). Evidence from rural Indonesia also shows that consumption is associated with income, financial access, market access, assets, and household characteristics (Wardhono et al., 2022), and access to productive resources can alter total farmer-household expenditure (Samosir & Moeis, 2023). Household composition and wealth also vary spatially within Indonesia (Soseco, 2022), while historical macroeconomic crises demonstrate that household economic conditions can be exposed to large aggregate shocks (Tambunan,

2010). Studies of expenditure inequality in Indonesia have mainly used national or provincial data (Sagala et al., 2014; Yusuf et al., 2014), whereas farm-household studies elsewhere show that consumption gaps vary with farm size, livelihood structure, education, and household composition (Kaur et al., 2021; Pham et al., 2024; Saini et al., 2022). These findings underscore the need to examine not only average expenditure but also its distribution within specific farming communities.

Despite the growing literature on citrus farming in Batu City, most local studies focus on production, farm income, sustainability, climate risk, or the decision to shift from apples to oranges/tangerines (Gusti & Kusuma, 2022; Qurania & Mardiani, 2023; Sitepu et al., 2022; Ibrahim et al., 2022; Talitakum et al., 2025). Recent evidence from Punten Village likewise examines factors associated with citrus-farm income, including land area and input costs, rather than the distribution of household expenditure (Aprilia & Bakhtiar, 2026). Conversely, studies of rural consumption inequality generally use broader samples and do not separate household consumption from agricultural production expenditure in a community experiencing crop conversion (Pham et al., 2024; Kaur, Ravita, & Singh, 2022). This creates two related gaps. First, there is little village-level evidence on whether expenditure disparities among citrus farmers are concentrated in basic food needs, discretionary non-food spending, irregular annual expenses, or farm-production outlays. Second, combining production costs with household consumption can lead to misleading welfare interpretations because a farmer may spend more on labour, fertiliser, or pesticides simply because the cultivated area or production intensity is larger. The novelty of this study therefore lies in its disaggregated distributional approach: it separately evaluates food, non-food, annual lump-sum household expenditure, and agricultural production expenditure among all 43 eligible orange/tangerine farmers identified in Punten Village, and it compares inequality using the Lorenz curve, Gini coefficient, and Palma ratio. This design provides a focused descriptive baseline without attributing observed disparities to the apple-to-citrus transition itself.

The study addresses two research questions: (1) how are household consumption and agricultural production expenditures distributed among orange/tangerine farmers in Punten Village; and (2) which expenditure categories display the greatest inequality? Its objective is to describe expenditure allocation and quantify distributional inequality across food, non-food, annual lump-sum, agricultural production, and combined expenditure. The analysis evaluates two descriptive expectations derived from the literature. First, food expenditure is expected to be more evenly distributed than non-food and irregular household expenditure because basic food needs impose a consumption floor, whereas education, transport, communication, recreation, housing improvements, and ceremonial spending can expand more strongly with household resources (Attanasio & Pistaferri, 2016; Kaur et al., 2021; Kaur, Ravita, & Singh, 2022). Second, agricultural production expenditure is expected to show substantial dispersion because production costs vary with farm scale, input intensity, labour use, and management choices; consequently, this expenditure should not be interpreted as a direct welfare indicator (Sahara et al., 2023; Aprilia & Bakhtiar, 2026). The study is deliberately descriptive and cross-sectional. It does not test whether crop conversion causes inequality, nor does it estimate the effects of farm size, technology, market access, or household demographics on expenditure. Instead, the Gini coefficient summarises

overall dispersion, the Lorenz curve visualises concentration across the distribution, and the Palma ratio compares the expenditure share of the highest 10% with that of the lowest 40%. Together, these measures identify where expenditure disparities are most pronounced and establish questions for subsequent causal research.

METHODS

Research Design and Setting

This study used a cross-sectional descriptive survey to examine expenditure allocation and inequality among orange/tangerine farming households in Punten Village, Bumiaji District, Batu City, East Java, Indonesia. Primary data were collected through field interviews from February to April 2024. The design was selected because the research questions concern the distribution of observed expenditures within a defined farming population rather than causal effects of crop conversion. To reduce the influence of short-term seasonality, respondents reported expenditures incurred during the preceding 12 months; recurring weekly or monthly expenses were converted to annual values. Punten Village is located in the highland agricultural zone of Bumiaji District, where horticulture is a major livelihood activity. Bumiaji had 63,759 residents in 2023, including 5,439 residents in Punten Village (Badan Pusat Statistik Kota Batu, 2024; Table 2). The village covers approximately 281.935 hectares and includes the hamlets of Gempol, Kungkuk, Payan, and Krajan. Farming systems include apples, oranges/tangerines, vegetables, and other horticultural crops, while agrotourism and small household enterprises have also developed alongside tourism. This setting is relevant because the local agricultural economy has been changing from apple dominance toward a more diversified horticultural structure. The survey therefore captures expenditure patterns among orange/tangerine farmers within a clearly defined place and period, but the cross-sectional design does not permit inference about changes before and after conversion or about causal mechanisms behind inequality.

Table 2. The population of Bumiaji District, 2023

No.	Village/Sub-district	Male	Female	Total
1.	Pandanrejo	3,112	3,086	6,198
2.	Bumiaji	3,744	3,690	7,434
3.	Bulukerto	3,455	3,375	6,830
4.	Gunungsari	3,701	3,663	7,364
5.	Punten	2,722	2,717	5,439
6.	Tulungrejo	5,020	4,875	9,895
7.	Sumbergondo	2,185	2,164	4,349
8.	Giripurno	5,667	5,655	11,322
9.	Sumberbrantas	2,512	2,416	4,928
	Bumiaji	32,118	31,641	63,759

Source: Badan Pusat Statistik Kota Batu (2024)

Participants

The target population comprised farmers in Punten Village who were registered as orange/tangerine growers and had converted agricultural land previously used for

apple cultivation. Eligible households were identified from the farmer registry maintained by the local agricultural extension office. The registry contained 43 eligible farming households. Because this population was small and geographically concentrated, the study used a census or total-population approach rather than drawing a probability sample; all 43 eligible farmers participated. This procedure eliminates sampling error within the identified registry population, although it does not remove coverage error if eligible farmers were absent from the registry and does not support statistical generalisation beyond Punten Village. Respondent characteristics are summarised in Table 3. All respondents were male. The largest age group was 46–50 years (20.93%), followed by the 41–45 and 56–60 year groups (18.60% each). Formal education was generally limited: 34.88% had completed elementary school, 25.58% junior high school, 30.23% senior high school, 4.65% had no formal schooling, and 4.65% held a bachelor's degree. Most households reported one to three dependents (51.16%), while 44.19% reported four to six dependents and 4.65% reported seven to nine. These characteristics are reported to describe the census population rather than to explain expenditure inequality, because no multivariate model was estimated in this study.

Table 3. Demographic Profile of Orange Farmers in Punten Village

Criteria	Number	Percentage
Age		
<40	3	6.98
41-45	8	18.60
46-50	9	20.93
51-55	6	13.95
56-60	8	18.60
61-65	6	13.95
>65	3	6.98
Gender		
Male	43	100.00
Female	0	0.00
Education		
No School	2	4.65
Elementary School	15	34.88
Junior High School	11	25.58
Senior High School	13	30.23
Bachelor's Degree (S1)	2	4.65
Dependents in Family		
1-3	22	51.16
4-6	19	44.19
7-9	2	4.65

Source: Processed by authors

Instrument and Data-Collection Procedure

Data were collected with a structured questionnaire administered through face-to-face interviews. The instrument contained sections on household characteristics, food expenditure, non-food household expenditure, agricultural production expenditure, and irregular annual household expenses. Food items included staple foods, animal-source foods, vegetables, cooking inputs, beverages, and cigarettes/tobacco as recorded in the original survey. Non-food items included education, educational transport, communication, utilities, health insurance, personal-care products, and social expenditure. Agricultural production expenditure covered fertiliser, pesticides, hired labour, and other production inputs. Annual lump-sum household expenditure included clothing, housing improvements, vehicle registration, education-related annual costs, ceremonial expenses, recreation, and other irregular items. Before fieldwork, agricultural economics researchers and local agricultural extension officers reviewed the questionnaire for content relevance and clarity. A pilot survey was conducted with a small number of farmers outside the census population, after which wording and recording procedures were refined. Because the instrument was primarily an expenditure inventory rather than a multi-item psychometric scale, the study did not rely on an internal-consistency coefficient such as Cronbach's alpha. Instead, data quality was supported through content review, pilot testing, enumerator training, standardised interview procedures, separation of household and farm-production expenses, and a common 12-month reference period. Respondents were encouraged to recall regular expenses by payment frequency, after which interviewers annualised the reported amounts where necessary.

Data Analysis

Expenditure was analysed in four categories: food consumption, non-food household consumption, annual lump-sum household expenditure, and agricultural production expenditure. Combined expenditure was calculated as the sum of these components for descriptive comparison; because it includes production costs, it should not be interpreted as a pure measure of household welfare. For each category, the analysis reported the mean, median, standard deviation, minimum, and maximum, followed by expenditure shares across ranked groups. Inequality was evaluated with three complementary measures. The Lorenz curve plots the cumulative share of expenditure against the cumulative share of households and provides a visual indication of concentration relative to the 45-degree line of perfect equality. The Gini coefficient summarises the area between the Lorenz curve and the equality line on a scale from 0, indicating perfect equality, to 1, indicating maximal concentration. A separate Gini coefficient was calculated for each expenditure category and for combined expenditure, with households ranked on the expenditure variable being analysed. The Palma ratio was calculated as the expenditure share of the highest 10% divided by the combined share of the lowest 40%; values above one indicate that the top decile accounts for a larger share than the bottom four deciles combined. Using all three measures reduces reliance on a single summary statistic and makes the upper-versus-lower distributional contrast explicit. The analysis is descriptive; no significance tests or causal models were applied to the inequality estimates.

Ethical Considerations

Participation was voluntary. Before each interview, respondents received an explanation of the study purpose, the information requested, and the intended use of the data. Verbal informed consent was obtained before data collection. Individual responses were kept confidential and analysed only in aggregate form so that reported tables and figures do not identify individual farmers. The study states that research approval was granted by the Faculty of Economics and Business, Universitas Negeri Malang, under approval No. 12.1.12/UN32.4.1/KM/2024 dated 12 January 2024. These procedures are reported as documented in the original study materials.

RESULTS AND DISCUSSION

Aggregate Expenditure Structure

Across the 43 surveyed households, combined annual expenditure averaged IDR 57.77 million, while the median was IDR 49.03 million (Table 4). The higher mean than median, together with a standard deviation of IDR 33.05 million and a maximum of IDR 143.72 million, indicates that a small number of high-expenditure households pull the average upward. Agricultural production was the largest component, averaging IDR 22.49 million per year, followed by food expenditure at IDR 14.55 million, non-food household expenditure at IDR 13.05 million, and annual lump-sum expenditure at IDR 7.68 million. Dispersion differed substantially across components. Food expenditure had the smallest standard deviation (IDR 6.80 million) and the narrowest relative range, whereas agricultural production expenditure and non-food expenditure showed much larger gaps between the mean and median. Agricultural expenditure ranged from IDR 2.29 million to IDR 83.40 million, while non-food expenditure ranged from IDR 2.39 million to IDR 53.02 million. These patterns show that the surveyed farmers did not differ only in the amount they spent overall; they also differed in the composition and regularity of expenditure. Importantly, the combined measure includes farm-production outlays. It therefore captures total resource use recorded by the survey but should not be read as equivalent to household consumption or living standards.

Table 4. Average Expenditure of Orange/Tangerine Farmers per Year (IDR)

	Mean	Median	Std. Dev.	Max.	Min.
Food	14,547,488.37	12,900,000.00	6,799,992.93	31,788,000.00	5,568,000.00
Non-food	13,053,488.37	6,696,000.00	13,051,504.62	53,016,000.00	2,388,000.00
Agriculture-related	22,487,581.12	15,600,000.00	19,299,410.32	83,400,000.00	2,292,000.00
Annual Lumpsum	7,683,348.84	5,620,000.00	7,007,981.59	29,800,000.00	490,000.00
Total Expenditure	57,771,906.70	49,030,000.00	33,050,914.95	143,722,000.00	15,002,000.00

Source: Authors' calculations

The expenditure structure is consistent with evidence that farm households allocate resources simultaneously to consumption and production, so separating these domains is essential for interpretation. In a study of dryland farm households in Wonogiri, Sahara et al. (2023) similarly distinguished food, non-food, and production costs and found that production expenses represented a large share of total outlays. Indonesian studies of rice and cabbage farmers also report meaningful differences between food and non-food expenditure, although the relative shares vary across

crops and locations (Cahyani et al., 2023; Dirgantari et al., 2024). Such variation is expected because production requirements, household composition, market access, and income sources differ across farming systems. The present results therefore should not be compared mechanically with expenditure levels from other regions; the more relevant contribution is the within-community contrast among categories. The large dispersion in agricultural costs may reflect differences in cultivated area, hired labour, input use, and production intensity, while the skewness of non-food expenditure is compatible with the idea that households expand education, transport, communication, and other services when resources permit. Studies of rural consumption also emphasise that household characteristics and market access shape consumption levels (Wardhono et al., 2022; Pham et al., 2024). In this context, the mean values in Table 4 establish the expenditure profile, whereas the subsequent distributional measures are needed to determine whether the observed variation is concentrated among a limited number of households.

Household Consumption Composition

Food expenditure was distributed across a relatively broad basket, but three items accounted for most recorded spending (Figure 2). Rice represented 23.48% of annual food expenditure, followed by cigarettes and tobacco at 17.72% and chicken meat at 17.55%. Beef, eggs, vegetables, fish, cooking oil, coffee, tea, nuts, fruit, milk, syrup, and mineral water accounted for smaller shares. The prominence of rice is consistent with its role as a staple, while the sizable share for cigarettes and tobacco indicates that the food-account category used in the survey also captures a non-nutritive but recurrent household purchase. Non-food expenditure was more concentrated (Figure 3). Educational transport accounted for 34.65% and education costs for 30.59%, meaning that almost two-thirds of recorded non-food expenditure was associated with schooling and access to education. Communication and social expenditure were the next largest items, while health insurance, gas, electricity, soap, shampoo, toothpaste, and laundry products each represented smaller shares. The contrast between Figures 2 and 3 is important: food spending was spread across many routine items that recur throughout the year, whereas non-food spending was dominated by a few services that can vary considerably according to household composition, school participation, travel distance, and purchasing capacity. This compositional difference helps explain why food expenditure later shows much lower inequality than non-food expenditure.

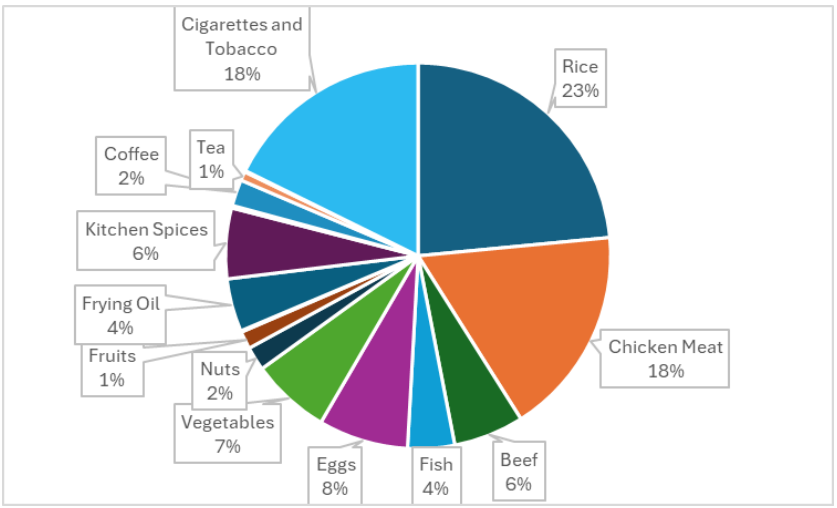


Figure 2. Food Expenditure.
Source: Authors' calculations

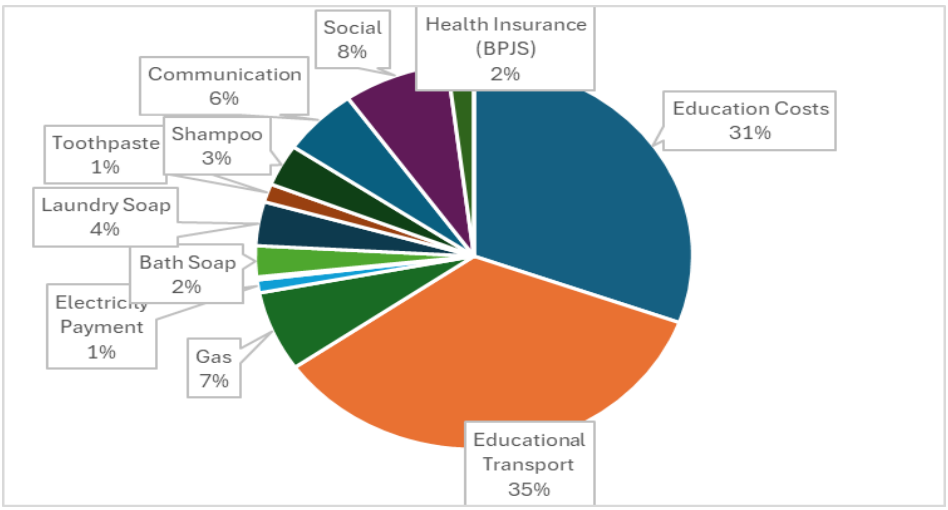


Figure 3. Non-food Expenditure
Source: Authors' calculations

The stronger concentration of non-food expenditure is consistent with the broader consumption literature. Basic food requirements tend to impose a minimum level of spending across households, while non-food consumption can expand more strongly as resources and opportunities increase (Attanasio & Pistaferri, 2016). Among farmers in sub-mountainous Punjab, Kaur et al. (2021) reported that the food share declined and the non-food share increased across larger farm-size groups; Kaur, Ravita, and Singh (2022) likewise found substantial differences in durable and socio-religious expenditure across farm categories. Recent rural evidence also shows that education, income, household composition, and access to non-farm opportunities are associated with consumption gaps (Pham et al., 2024; Ma et al., 2026). In Indonesia, studies of farmer welfare commonly distinguish food and non-food spending because the balance between them provides information about the household's allocation of resources, even though the present study does not use a welfare threshold based on that balance (Cahyani et al., 2023; Dirgantari et al., 2024). The Punten data add a more specific insight: education and educational transport are the main sources of non-food spending, so inequality in this category cannot be interpreted simply as discretionary luxury consumption. Part of the variation may instead reflect differences in the

number and schooling level of dependents, distance to educational services, or transport arrangements. Those mechanisms were not tested here, but they provide concrete hypotheses for future multivariate analysis.

Production and Irregular Household Expenditure

Agricultural production expenditure was dominated by labour and crop-protection costs (Figure 4). Hired labour represented 36.17% of agricultural spending, pesticides 30.14%, fertiliser 18.99%, and other production expenses 14.70%. Thus, labour and pesticides together accounted for roughly two-thirds of the recorded production budget. This composition is economically distinct from household consumption: a household with higher agricultural spending may be operating a larger area, using more hired labour, facing stronger pest pressure, or applying inputs more intensively. Annual lump-sum household expenditure displayed a different pattern (Figure 5). Ceremonial activities accounted for the largest share at 32.01%, followed by clothing at 19.95%, recreation at 19.18%, home improvement at 11.38%, vehicle registration at 11.21%, education-related annual costs at about 4%, and other expenses at about 3%. These expenditures are irregular and can be postponed, accumulated, or triggered by specific household events. Their timing therefore differs from routine food consumption and from production inputs that are tied to the agricultural cycle. The composition shown in Figures 4 and 5 supports the analytical decision to keep production expenditure separate from household consumption and to distinguish regular from irregular household spending. Treating all four categories as a single welfare measure would obscure the different economic processes that generate each type of expenditure.

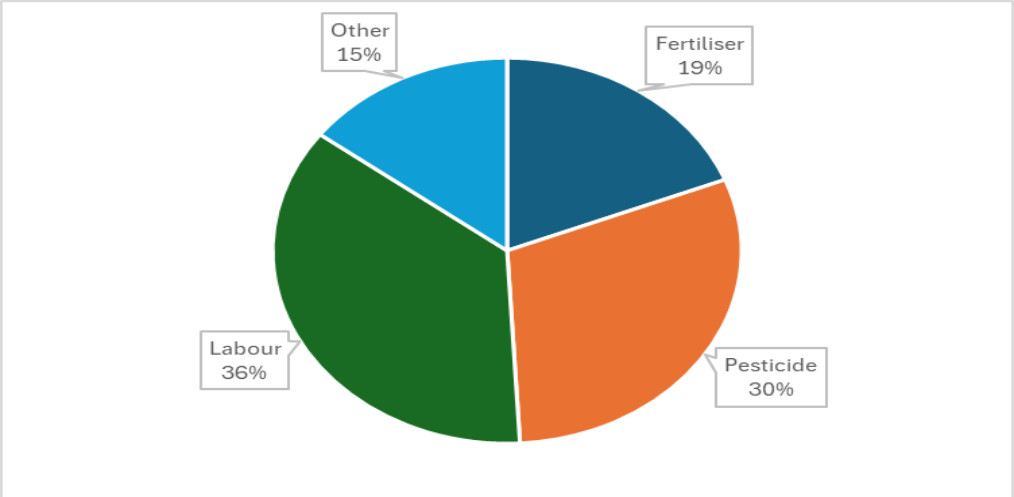


Figure 4. Agriculture-related Expenditure
Source: Authors' calculations

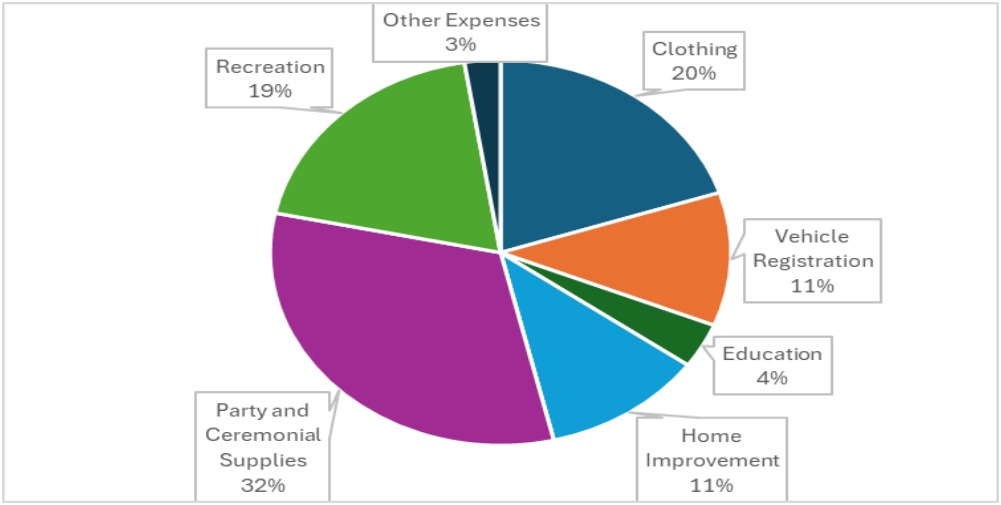


Figure 5. Annual Lumpsum Expenditure
Source: Authors' calculations

The production-cost pattern is plausible in the context of citrus farming in Batu and nearby areas, where labour, fertiliser, pesticides, and other inputs are central to farm performance and risk management. Sitepu et al. (2022) highlight the sensitivity of citrus productivity in Batu City to climatic conditions, while recent research in Punten Village finds that land area and several input-cost variables are associated with citrus-farm income (Aprilia & Bakhtiar, 2026). These studies do not establish the causes of the expenditure distribution observed here, but they reinforce the point that agricultural outlays are linked to production conditions rather than household welfare alone. The distinction also aligns with Sahara et al. (2023), who separate farm-production costs from food and non-food expenditure when analysing Indonesian farm households. For annual lump-sum spending, evidence from rural Punjab shows that socio-religious ceremonies and durable expenditures can differ substantially across farm-size groups (Kaur, Ravita, & Singh, 2022), which is consistent with the relatively large variation observed in Punten. More generally, access to productive assets and land can influence total farmer-household expenditure and economic opportunities (Samosir & Moeis, 2023). Because the present survey did not model farm size, asset ownership, pest incidence, or household life-cycle events, these explanations remain hypotheses rather than tested mechanisms. The main empirical contribution is to show that production and irregular household expenditures are both heterogeneous, but for different economic reasons that should not be conflated in policy interpretation.

Distributional Inequality

Distributional measures confirm that inequality differs sharply across expenditure categories (Table 5). The Gini coefficient for food expenditure was 0.24, the lowest among the four components, while non-food expenditure recorded the highest coefficient at 0.49. Annual lump-sum expenditure followed at 0.46 and agricultural production expenditure at 0.42. The Gini coefficient for combined expenditure was 0.31. Palma ratios show the same ordering at the tails: the top 10% spent 2.54 times the combined share of the bottom 40% for non-food expenditure, 2.27 times for annual lump-sum expenditure, and 1.88 times for agricultural production expenditure, whereas the food Palma ratio was 0.67. For combined expenditure, the Palma ratio was 1.018, meaning that the highest-expenditure decile accounted for a

share only slightly larger than the bottom four deciles together. The decile shares generally become larger toward the top of the distribution, although they are not strictly monotonic because the 43-household census produces unequal group sizes and households are ranked separately for each expenditure variable. The Lorenz curves provide the same visual message. Figure 6a lies closest to the equality line; Figure 6b deviates the most; Figures 6c and 6d occupy intermediate positions. Figure 7 shows a moderate departure from equality for combined expenditure, consistent with the Gini value of 0.31.

Table 5. Expenditure Gini and Palma Ratio for Orange/Tangerine Farmers

Decile Group	Expenditure Share (%)				
	Food	**Non-Food**	**Agriculture**	**Lump-sum**	**Total**
1	5.39	2.36	2.46	1.77	3.7
2	5.45	2.48	2.48	2.26	4.28
3	6.58	2.77	3.79	3.1	5.02
4	11.26	4.73	6.72	5.79	7.79
5	5.9	4.46	6.24	6.38	7.6
6	8.54	5.39	7.54	7.26	9.15
7	11.41	11.32	11.67	11.94	14.09
8	11.68	14.4	12.89	12.72	12.63
9	14.6	20.03	17.07	19.44	14.58
10	19.19	31.27	29.14	29.34	21.17
Gini	0.24	0.49	0.42	0.46	0.31
Palma	0.67	2.54	1.88	2.27	1.018

Source: Processed by authors

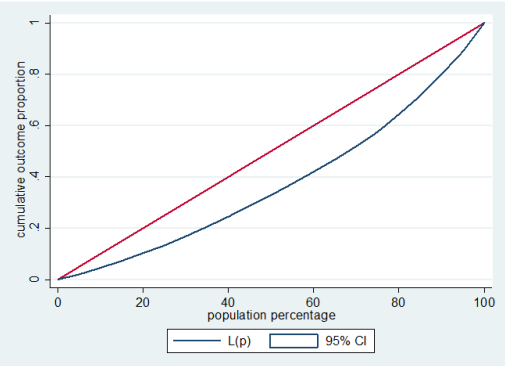


Figure 6a. Lorenz Curve for Food Expenditure

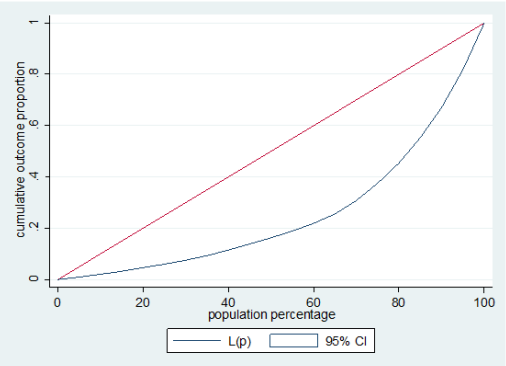
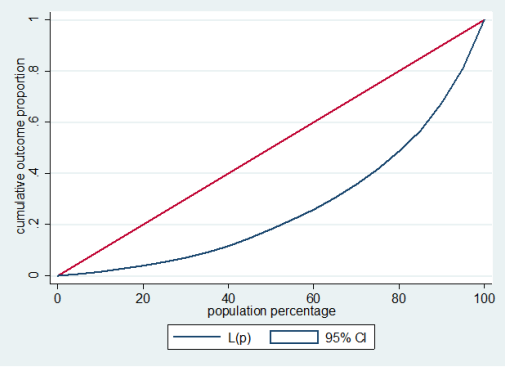


Figure 6b. Lorenz Curve for Non-Food Expenditure



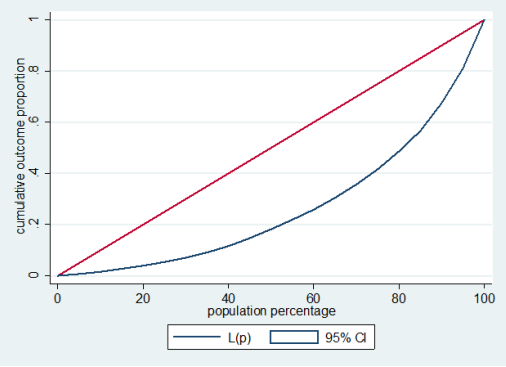


Figure 6c. Lorenz Curve for Agriculture Expenditure **Figure 6d.** Lorenz Curve for Annual Expenditure

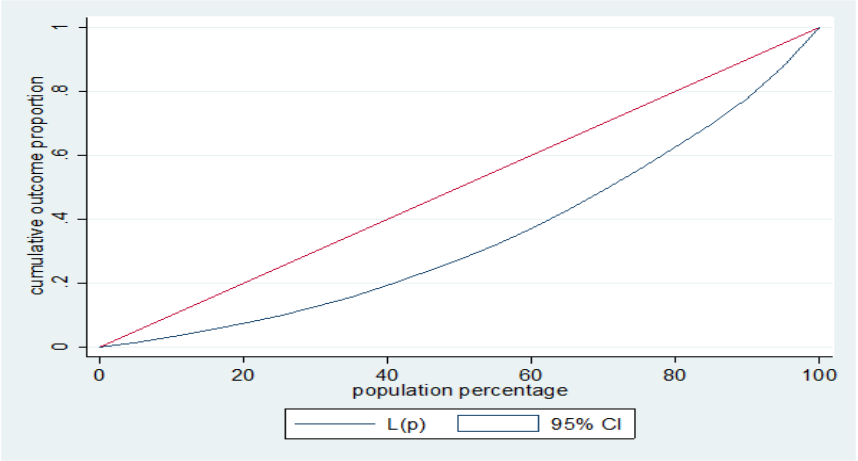


Figure 7. Lorenz Curve for Total Expenditure

These results support the study's first descriptive expectation: routine food spending is more evenly distributed than non-food and irregular household expenditure. They also show why a single aggregate inequality statistic can conceal important differences in household economic behaviour. A combined Gini of 0.31 masks a non-food Gini of 0.49 and a lump-sum Gini of 0.46, while the agricultural Gini of 0.42 reflects dispersion in production investment rather than consumption welfare. Comparable research illustrates the value of this disaggregation. Kaur et al. (2021) reported substantial inequality in farm-household consumption in Punjab, while Pham et al. (2024) found persistent consumption gaps between farm and non-farm households across the expenditure distribution in rural Vietnam. Saini et al. (2022) likewise emphasised within-group inequality among farm households, and recent evidence from China shows that farm and non-farm income can affect both consumption levels and consumption inequality differently across expenditure categories (Ma et al., 2026). For Indonesia, earlier national studies documented meaningful expenditure inequality across regions and over time (Sagala et al., 2014; Yusuf et al., 2014), but the Punten results add a community-level perspective centred on a horticultural transition. The Palma ratios are especially informative because they show that the strongest upper-versus-lower concentration occurs in non-food and lump-sum spending. However, the study cannot identify which socioeconomic characteristics produce those differences; causal interpretation requires larger samples and multivariate or longitudinal designs.

Study Limitations

Several limitations should guide interpretation. First, the study covers a census of 43 eligible farmers in one village. The census is complete for the identified registry population, but the small, localised population limits external generalisation to other citrus-producing areas. Second, the cross-sectional design records expenditures at one period and cannot determine whether inequality increased or decreased after farmers converted from apples to oranges/tangerines. Third, expenditure data were collected through respondent recall for the preceding 12 months and may contain memory or reporting error despite the structured questionnaire, pilot testing, and annualisation procedures. Fourth, combined expenditure includes agricultural production costs; it is therefore not equivalent to household consumption and should not be interpreted

as a stand-alone welfare measure. Fifth, the analysis uses household-level expenditure without an equivalence-scale adjustment in the reported inequality tables, so differences in household size may contribute to observed consumption disparities. Finally, the study is descriptive. Farm size, income, assets, production technology, market access, household composition, education, and off-farm employment were not entered into a multivariate model. The Gini coefficient, Palma ratio, and Lorenz curves identify where disparities occur but do not explain why they occur. These limitations do not invalidate the descriptive estimates, but they define the scope of the claims and indicate the analytical steps needed in future research.

CONCLUSION

The study shows that expenditure inequality among orange/tangerine farmers in Punten Village depends strongly on the type of expenditure being examined. Food expenditure is comparatively even, whereas non-food and annual lump-sum household expenditure are substantially more concentrated. Agricultural production expenditure also varies widely across farmers, but this variation represents differences in production outlays and cannot be treated as direct evidence of household welfare. The combined Gini coefficient of 0.31 and Palma ratio of 1.018 indicate a noticeable but not extreme concentration of total recorded outlays, while category-specific measures reveal disparities that the aggregate figure obscures. The results therefore support the study's descriptive expectation that routine food expenditure is more evenly distributed than more flexible household spending, and they reinforce the methodological importance of separating farm-production costs from household consumption. The main contribution is a village-level distributional baseline for a horticultural community undergoing crop restructuring. Because the design is cross-sectional and descriptive, the study does not establish that conversion from apples to oranges/tangerines caused the observed inequality.

RECOMMENDATIONS

Future research should extend the analysis in four directions. First, larger samples from multiple villages in Batu City and comparable citrus-producing regions are needed to test whether the Punten pattern is geographically robust. Second, longitudinal or panel data should follow households before and after crop conversion so that changes in consumption and production expenditure can be distinguished from pre-existing differences. Third, multivariate models should evaluate whether farm size, land tenure, yields, input intensity, income diversification, education, household size, dependency ratio, market access, assets, and off-farm employment are associated with the Gini-relevant expenditure gaps identified here. Per-capita or equivalence-scale-adjusted household consumption should also be reported alongside household totals. Fourth, a comparison group of farmers who retained apple cultivation would allow future studies to assess whether expenditure patterns differ systematically by production pathway. For local government and rural-development agencies, the present results are best used as a screening baseline rather than as evidence for a specific intervention. The high inequality observed in non-food, lump-sum, and agricultural expenditure identifies domains that merit closer investigation, but program design should follow only after the determinants, affordability constraints, and production-scale effects have been established with stronger analytical evidence.

ACKNOWLEDGMENT

The authors sincerely thank Universitas Negeri Malang (UM) for the financial support of this research under the undergraduate thesis research grant scheme No. 3.4.93/UN32/KP/2024.

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