Three decades of agricultural and rural transformation in Indonesia

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Abstract. Structural transformation in Indonesia has been a subject of broad empirical research. However, a minimal study has verified the characteristics of rural transformation. This paper aims to analyze indicators of rural transformation, likely drivers, and their impact on household income and poverty incidence. The analysis utilizes national data covering the period of 1990-2019. The data is analyzed using graphical illustrations and a simple regression analysis. As part of rural transformation, the result shows that there have been changes in the share of agriculture value from staple food to high-value commodities, particularly during the first two decades. This transformation is also complemented by the increase in rural non-farm employment, most notably during the last decade. The results also highlight stages and the likely drivers to those changes, including institution, policies, and investment (IPIs). Finally, this phenomenon leads to rural household income growth and a reduction in rural poverty. The finding of this research implies that to increase rural household income and reduce rural poverty rate, the government should focus not only on increasing agricultural productivity but also on promoting rural non-farm employment.

1. Introduction
Indonesia’s GDP has grown enormously at a rate of 5.96% per year during 1990-20191. Along with the GDP growth, structural transformation (ST) was indicated by a declining share of agriculture from 21.5% in 1990 to 12.7% in 2019. The share of services has increased from 39.7% in 1990 to 49.6% in 2019, whereas manufacturing and construction had increased steadily from 25.4% in 1990 to 30.4% in 2019. On the other hand, agriculture employment had decreased slowly from 51% in 1990 to 33% in 2019. This observation indicated that Indonesia experienced an unbalanced transformation, characterized by a decrease in the agricultural sector’s contribution to GDP much faster than the decline in labor [1]. The gap between the share of agriculture GDP and employment implies that productivity of agriculture labor far below productivity of labor in the non-agriculture sector.

Based on this observation, increasing rural household income and reducing poverty has been a national development priority [2]. Standard views argue that increasing rural household income can be done simply by increasing agricultural production because agriculture is significant employment and

1 Excluding extreme downturn during the economic crisis in 1998/99.
income source of rural households. Given achieving strategic development goals, ST has been extensive empirical research [3]. To analyze economic development more broadly, we also need to verify the characteristics of rural transformation (RT). In the case of Indonesia, there has been minimal study specifically address RT, which underlines the importance of the non-farm sector in promoting rural household income and reducing poverty incidence.

According to IFAD [4], it was shown that rural regions in Asia, including Indonesia, have shown a dynamic rural transformation. This evidence was also confirmed by Huang and Huang and Shi [5,6]. Their analysis showed that RT has direct implications to rural household income and poverty reduction [7]. A micro-study conducted by Susilowati and Sudaryanto [8] reported some indicators of RT at various agriculture ecosystems in Indonesia. To fully understand the dynamic of RT, we need the analysis using time-series data at the national and regional levels. The primary purpose of this paper is to analyze some indicators of RT during the past three decades (1990-2019) at the national level and its relation to rural household income and poverty reduction.

2. Materials and methods

2.1. A concept of ST and RT

Basic economic development theory indicates that economic growth in any country is usually complemented by a ST characterized by the shift of economic sectors from primary to industry and services [9]. Some economists put it more precisely that in the ST model, there is a shift in economic structure from a subsistence farming system to a modern economic system orientated to urban life [10,11]. Changes in an economic structure are marked by a decrease in the agricultural sector's contribution and increased contribution of the industrial sector, both in terms of GDP and employment.

In the case of Indonesia, the classic pattern of ST moved from the agriculture sector to the industry sector, and ultimately to the service sector. However, the economic transition in the last two decades (1996-2015) showed that, Indonesia experienced a notable economic shift from agriculture directly to services, before the industry sector matured. As a result, the industrial sector contributes to GDP but only absorbs relatively tiny employment.

In this process, ST also involves agricultural transformation (AT) characterized by a shift from subsistence to commercial and more diversified production systems. More specifically, AT involves a shift from grain base production toward high-value commodities. Furthermore, ST may also involve RT, which in addition to AT it also includes the existence of productive economic activities in the rural non-farm sectors [12].

Based on the above mentioned concept, one definition of RT is as follows: "a process of comprehensive societal change whereby rural societies diversify their economies and reduce their reliance on agriculture; become dependent on distant places to trade and to acquire goods, services, and ideas; move from dispersed villages to towns and small and medium cities; and become culturally more similar to large urban agglomerations” [13,14]. Inline with this definition, Reddy et al. [15] defines RT as a process of comprehensive change in the society, which involve (i) diversification of rural economies, (ii) increasing dependence of distant places to trade goods, and (iii) movement to town and small or medium cities, and assimilation into urban agglomerations. A much more straightforward concept defines RT “as a process that gradually shifts the structure of agricultural production from grain-based (or low-value agriculture) to more diversified and commercial oriented high-value agriculture and the rural labor employment from farm to non-farm sectors” [6,16].

2.2. Data sources

The scope of this paper includes an analysis of indicators, drivers, and impacts of RT. The analysis focuses on the national level, using secondary data collected from Statistic Indonesia, the Central Bureau of Statistics (BPS), Ministry of Agriculture (MoA), and other Ministries/Agencies, both domestic and international. To better capture the RT over time, the data covers the period of 1990-2019. Description on the stages and drivers of RT was drawn on various policy documents, in particular various series of Five Years Development Plan (Repelita) and National Midterm Development Plan (RPJMN) [2].
2.3. Data analysis
The data is analyzed using graphics and charts to indicate changes of variables over time. Drivers of the RT are discussed qualitatively following the corresponding stages of RT. Following [6], to verify the relationship between RT and rural household income as well as poverty rate, in addition to a graphical illustration, we also conduct a simple regression analysis, as follows:

\[(1) \ Y = a_0 + a_1RT1 + a_2RT2 + e_1\]
\[(2) \ P = b_0 + b_1RT1 + b_2RT2 + e_2\]

where:
- \(Y\) = per capita household income;
- \(P\) = poverty rate (%);
- \(RT1\) = share of gross value on high-value commodities production;
- \(RT2\) = share of rural non-farm employment (%);
- \(a_0\), \(a_1\), \(a_2\) and \(b_0\), \(b_1\), \(b_2\) are parameters, \(e_1\) and \(e_2\) are error terms.

The parameters are estimated using Ordinary Least Squares (OLS). More precise definition of variables are presented in Table 1.

### Table 1. Definition and measurement of variables.

| Variables | Definition                                                                 | Measurements                                                                 | Time period |
|-----------|---------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------|
| RT1       | Share of gross value of high-value commodities                            | Gross value on production of horticulture, perennial crops, and livestock of total agriculture excluding fishery and forestry. Total value of agriculture includes 15 commodities with 70% share to grand total [17]. High value commodities include: palm oil, coffee, cocoa beans, rubber, sugar cane, spices, beef, poultry meat, pig meat, eggs, and milk. Lower value commodities are: rice, maize, soybean, and cassava. | 1990-2019   |
| RT2       | Share of rural non-farm employment                                        | Share of rural non-farm employment to total rural employment.                | 1990-2019   |
| Y         | Rural household income                                                   | Average expenditure of rural household per capita, in constant 1996 value (thousand Rupiah) | 1990-2019   |
| P         | Poverty rate                                                              | Percentage of people under poverty line based on official poverty line       | 2009-2019a  |

*We exclude data poverty before 2009 due to different definition and lead to relatively low figure.

3. Results and discussions
3.1. Indicators of RT
Following the framework of Huang and Shi [6], we use two indicators of RT, namely (i) share of high-value commodities to the total value of agricultural production, and (ii) share of rural non-farm employment in total employment. The trend on the share of high-value commodities in the total value of agricultural production has indicated a marked increase from 1990-1999 to 2000-2009 (Figure 1). This observation was consistent with Huang [5] who compared the trend of RT across several countries in Asia. However, the share was almost stagnant from 2000-2009 to 2010-2019. Priority of government policies toward development of food crops production during the last two decades contributed to slow development of high value commodities.

This observation indicates that during the first two decades, the composition of agricultural production has moved from staple food and low-value agriculture (food crops) toward the production of high-value and more commercialized commodities, such as horticulture, perennial crops and
livestock. This transformation also changes farmers’ orientation from mere subsistence toward more commercialized and market-oriented [18].

Agricultural transformation, as mentioned earlier, was driven by an accelerated increase in agricultural productivity. Over the past three decades, the growth of high-value commodities production was higher than that of food crops. For example, egg production showed the highest growth of around 13% per year, followed by beef (10%), palm oil (9%), and orange (5.5%). On the contrary, the production of staple food showed lower growth during the same period. Most notably, rice production only grew at 1.8%, but maize production grew strongly at 5%, driven by accelerated maize demand for animal feed. Furthermore, during 2007-2016 agricultural output growth in Indonesia was estimated at 3.2% per year and was contributed from Total Factor Productivity (TFP) growth at 2%, primary factor growth at 0.5% and intermediate input growth at 0.7% [19].

The process of AT usually involve land consolidation which end up with larger average farm size (5). However, agricultural census data of Indonesia showed that the percentage of small farmers (farm size <0.5 ha) increased from 50% in 1993 to around 55% in 2003 and 2013 [20,21]. Furthermore, the percentage of larger farmer (farm size >0.5 ha) almost stagnant during 1993-2013.

The second indicator of RT is the share of rural non-farm employment. Again, a comparison of this variable across three periods of time offers an attractive figure. From 1990 to 1999, agriculture was still the primary source of employment. However, during 2000-2009 the structure has been reversed, when the non-farm sector was accounted for 58.1% of total employment and continued steadily to reach 66.1% in 2010-2019 (Figure 2). In addition, rapid urbanization and the development of non-farm sectors have contributed to opening up new employment opportunities, particularly in the service sector.

![Figure 1](image1.png) **Figure 1.** Change on the share of high-value commodities production value (%), 1990/1999-2010/2019.

![Figure 2](image2.png) **Figure 2.** Change on the share of the farm and non-farm employment (%), 1990/1999-2010/2019.

### 3.2. Stages and primary drivers of RT

In the case of China, major drivers of RT included Institutions, Policies, and Investment (IPIs), which will vary according to the stages of RT [6]. Furthermore, RT in China followed four stages, but countries in the Southeast Asia regions, including Indonesia, at most have only reached the third stage [5,6]. In what follows, we briefly describe major IPIs in the corresponding stages of RT in Indonesia.

**Stage I:** Primary focus on staple food production to achieve self-sufficiency on rice. Indonesia experiences this stage before the 1990s until the country declared self-sufficiency on rice in the mid-1980s. However, promoting domestic food production (rice in particular) continues until the current period. During the early stage of the green revolution, major IPIs in place were: adoption of high-yielding varieties of rice, implementation of various schemes of rice intensification programs, construction of irrigation network, development of fertilizer industry, and farm credit [18].

**Stage II:** Diversification to high-value commodities, oil palm in particular. This stage characterized Indonesia started in the 1990s, when the government launched three strategies on agricultural
development, namely intensification, diversification, and extentsification. The share of high-value commodities production has increased from 40.6% in 1990-1999 to 49.8% in 2000-2009. The increasing export market of palm oil has motivated rapid expansion of palm oil production by the private sector. Major IPIs during this period were: support to smallholders on access to land, improve seed and financing scheme, a partnership between smallholder and large corporation to enhance (nucleus estate model), market development for the domestic and international market.

Stage III: Agricultural specialization, sustaining high-value agricultural commodities, and expanding non-farm employment. While the share of high-value commodities production was almost stagnant at 49.8%, rural non-farm employment has increased significantly from 48.1% in 1990-1999 to 58.1% in 2010-2019 % and finally reached 66.1% in 2010-2019. In addition, the growth of the industry and services sector during this stage creates new employment opportunities in the non-farm sector and hence raises rural income and reduces poverty. The primary drivers of this stage are small and medium enterprises (SMEs) development, provision of village fund promoted the development of basic infrastructures at the village level, easy on private sector investment.

3.3. Impact of RT on household income and poverty rate

As mentioned earlier, the RT causes impacts to many different elements of the economy. However, this paper limits our analyses to the most important variables, namely rural household income and poverty rate. During 1990-2019, rural household income (constant 1996 IDR) increased by 4.3% per year. An Accelerated increase in rural household income was observed in particular during the 2010-2019 period compared to the corresponding two periods earlier (Figure 3). Accelerated non-farm employment during this period contributed to rapid rural household income.

![Figure 3. Growth of rural household income/capita (constant 1996 IDR) (%), 1990/1999-2010/2019.](image1)

![Figure 4. Changes on the source of farmers’ income (%), 1990/1999-2010/2018.](image2)

In line with the indicator on RT, there has been a shift of income sources from agriculture to non-agriculture. Based on BPS data, income arising from agriculture has consistently decreased by 2.8% per year, and conversely, income originating from non-agriculture sectors has increased by 2.44% per year during the period 1990-2019. For example, in 1990-1999, farmers’ income deriving from the agricultural sector was 61%, while non-agriculture was only 39%. However, in 2010-2019 the share of household income from non-agriculture increased sharply to 71%, whereas agriculture decreased to only 29%. This observation indicates that RT impacts not only the level of income but also its structure, with the increasing role of the non-farm sector.

The changes in the structure of rural employment, have also changed the structure on sources of farm household income. In the 1990-1999 to 2000-2009 period, agriculture still dominated farmers’ income, which accounted for more than 57% of total income (Figure 4). However, in 2010/2018, the share of agriculture income has decreased sharply to 31%, and conversely, the share of the non-farm income has reached 69%. This observation indicates that the non-farm sector has played a significant role in both employment has sources of income.
The development of high-value agriculture and the non-farm sector has also contributed to reducing the rural poverty rate. The poverty rate has declined clearly from 2000-2009 to 2010-2018 in both rural and urban (Figure 5). However, rural poverty has declined much more significant compared to the urban poverty rate, from 12.7% in 2000-2009 to 8.2% in 2010-2018. In addition, the poverty depth index decreased from 1.9 in 2012 to 1.75 in 2020.

Figure 5. Changes in the poverty rate (%), 1990-1999 to 2010-2019.

The result of a regression analysis on the relationship between household income (or poverty rate) and indicators of RT is presented in Table 2. The model is fairly robust with an R2 of 0.76 and 0.74 for the Y and P model respectively. As might be expected, RT2 is positively affecting rural household income, but the impact of RT1 is not significant, indicating the important of diversification to high value commodities and expansion of the non-farm employment. On the relationship between poverty rate and indicators of RT, both RT1 and RT2 are negatively affecting poverty rate. This result implies that promoting agricultural diversification and rural non-farm employment should be considered as two major strategies to alleviate poverty.

Table 2. The regression analysis of income and poverty rate.

| Variable | Rural household income (Y) | Poverty rate (P) |
|----------|----------------------------|-----------------|
|          | Coefficient | t  | P>|t| | Coefficient | t  | P>|t| |
| Constant | -10.5969     | -4.33 | 0.000 | 67.19942 | 9.09 | 0.000 |
| RT1      | 0.0110843   | 0.13  | 0.894 | -0.3153795 | -2.45 | 0.000 |
| RT2      | 0.3116627   | 5.94  | 0.000 | -0.5443491 | -5.67 | 0.025 |
| R2=Y     | 0.759       |      |      |             |      |      |
| R2=P     | 0.735       |      |      |             |      |      |

4. Conclusions
Along with structural transformation, the Indonesian economy has experienced rural transformation during the last three decades. The rural transformation was observed based on two indicators. First, the share of high-value production has increased, in particular during the last two decades. These changes involved higher growth of high-value commodities production compared to the growth of staple food. Second, the share of rural non-farm employment has also increased, notable during the last decade. Some drivers were contributed to this transformation process, namely institution, policy, and investments (IPIs). Strengthening farmers’ groups and partnership between smallholders and large

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Poverty rate data for the 1990-1999 period was not presented because the figure showed a lower poverty rate than data during subsequent periods, which was counter-intuitive.
companies were among major institutions contributing to RT. Significant government policies involved in this process were price policy, input subsidy, and market development. The government also has played a significant role in promoting public investment, particularly on irrigation, road, and R&D, which drive the growth of agriculture and rural non-farm sectors.

The rural transformation has a notable impact, particularly on rural household income growth and poverty reduction. The relationship of these two variables to two indicators of RT was shown clearly from both graphical illustration and a simple regression analysis.

This research implies that promoting rural household income and reducing poverty can be done by diversifying agriculture toward high-value commodities and promoting rural non-farm sectors. Major policy areas which should be prioritized by the government are an investment in infrastructure, technology innovation through R&D, and market development. For further research, a similar analysis should include data at the province level since the characteristics of RT will vary significantly across provinces.

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