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THE NATIONAL TEAM FOR
THE ACCELERATION OF POVERTY REDUCTION

Australian Government

Policy Brief: Improving the Rice Production Calculation Method

KEY MESSAGES

- Food security, including rice security, requires good planning based on accurate and timely data on the area under cultivation and harvest size.
- The Eye Estimation method that was used until 2017 for determining the size of the rice harvest has proven unreliable.
- The Area Frame Sampling (AFS) Method has proven to be a more reliable mode for determining rice harvest more accurately.
- The AFS method has been completed and verified the accuracy of data in 16 rice production centres. This policy brief recommends that it be completed in all 18 remaining centres.

Background

As rice is one of Indonesia's staple foods, the government needs accurate statistical data to help its policy making. Line ministries and agencies, particularly BPS (*Badan Pusat Statistik*: Statistics Indonesia), therefore, need to regularly improve the quality of the data collected. Refining the accuracy of food statistics, particularly rice, is one of the challenges faced by BPS and other relevant line ministries and is essential for maintaining national food resilience for both production and consumption.

Successful food resilience is strongly determined by good planning based on accurate and timely data, however, it is suspected that the methodology for calculating the area of ricefields under cultivation and rice production data produced inaccurate outcomes for a long time. A Study carried out by BPS and the Japan International Cooperation Agency in 1996 indicated an overestimate of harvest size by 17.07 percent which was caused, among others, by the eye estimate method applied at that time.[1] eye estimation is an estimation of land area based only on the estimation of the surveyor, this method is used because of limited budget and equipment as well as human resources.

The calculation showing an increase in ricefield area also needs to be reviewed as wetlands (ricefields) have been converted for use in industry, housing, and infrastructure.

Goals

Refining the national rice calculation method aims to improve rice production and consumption data to produce more accurate statistics. The provision of accurate information on rice is crucial as it determines the volume and value of imports and fertilizer subsidy needed. Both are important for policy makers in Indonesia as the basis for policy reform needed in the agriculture and trade sectors.

[1] BPS. 1996. "Survey on Paddy Plant with Household Approach in Java, 1996/97." Jakarta.

Overview of Current Rice Statistics

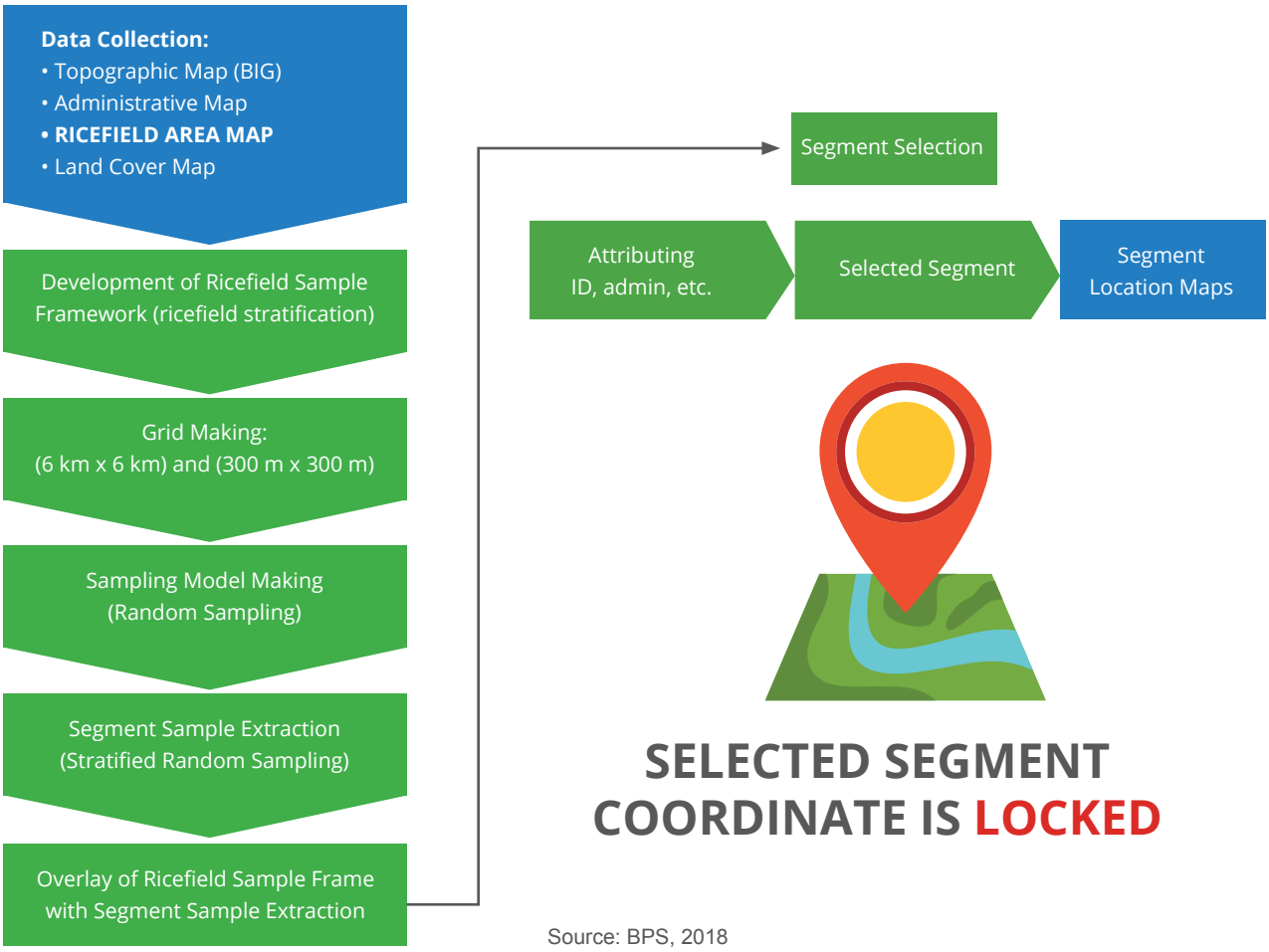
The Ministry of Agriculture's 2017 data stated that the production of dry milled grain (DMG) was 81.38 million tons, while rice production was 45.57 million tons. The vice president's office has estimated the daily rice need as approximately 300 grams or 109.5 kg/capita/year. Assuming that the current population is 262 million, consumption is estimated to be 28.69 million tons/year. This figure is much lower than the ministry's production data. The gap of 16.88 million tons is questionable as Indonesia is not a net rice-exporting country. Given that those under 15 years of age and over 65 years of age consume less rice than the overall average, actual rice consumption is lower than 28.69 million tons.

Improvement Instrument through the Area Frame Sampling (AFS) Method

AFS is defined as a sampling technique that uses land area as an enumeration unit. The system is based on the Geographic Information System (GIS), remote sensing, information technology, and statistics that are currently being implemented in Indonesia to generate data and information on food crops. The AFS approach is expected to provide accurate and timely data and information to support National Food Resilience Program planning.

The AFS is a collaboration between BPS and BPPT (*Badan Pengkajian dan Penerapan Teknologi*: Agency for the Assessment and Application of Technology) while the statistical unit that is set as a target for the activity is the subdistrict. The food crop is rice, however, it is still possible to expand the methodology to other food crop commodities in the future. AFS was officially implemented in 2018 and, to date, has been implemented in 18 provinces. The AFS was developed in stages (Figure 1) and, for food crop statistics, uses spot observation AFS.

Figure 1: Stages in Development of the AFS

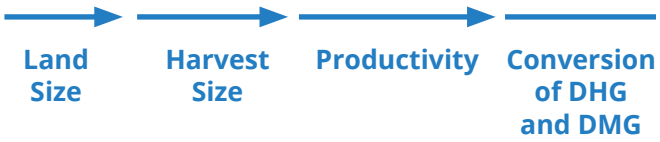


Source: BPS, 2018

Application of AFS Methodology to Calculating Rice Field Area and Production

In general, the steps involved in calculating rice production are as follows: (1) determining the size of the national ricefield area; (2) determining harvest size with AFS; (3) determining per hectare productivity; and (4) determining conversion rate from dry harvest grain (DHG) to DMG and from DMG to rice.

Determining the National Ricefield Area Size



Since 2017, calculation of the ricefield area has been refined through a two-step verification process. The first step applies a high-resolution satellite image to calculate ricefield area, while the second step validates the calculation in the field. To date, the two-step verification has been conducted in 16 rice production centres (granary) provinces that constitute 87 percent of the overall ricefield area in Indonesia. For the remaining 18 provinces, the two-step verification is expected to be completed by the end of 2018.

Determining Harvest Area Size

Ricefield area size is the main input in the calculation of harvest size. The calculation of harvest size, which previously was conducted by using the Eye Estimate method, which is a subjective report, is refined by objective observation (Objective Measurement) using AFS methodology. The monthly observation enables the estimate of potential rice production for the subsequent three months which can be used as the basis for better rice management planning.

Calculating Productivity Level

Both previous steps are the input in determining rice productivity. Refinement is conducted by BPS in calculating the per hectare productivity, from a household-based tile-count method into AFS sample-based tile-count method. The AFS basis used in determining the tile-count sample aims to reduce the risk of past-harvest of rice production, thus making the calculation more accurate.

Calculating the Conversion Rate from DHG to DMG

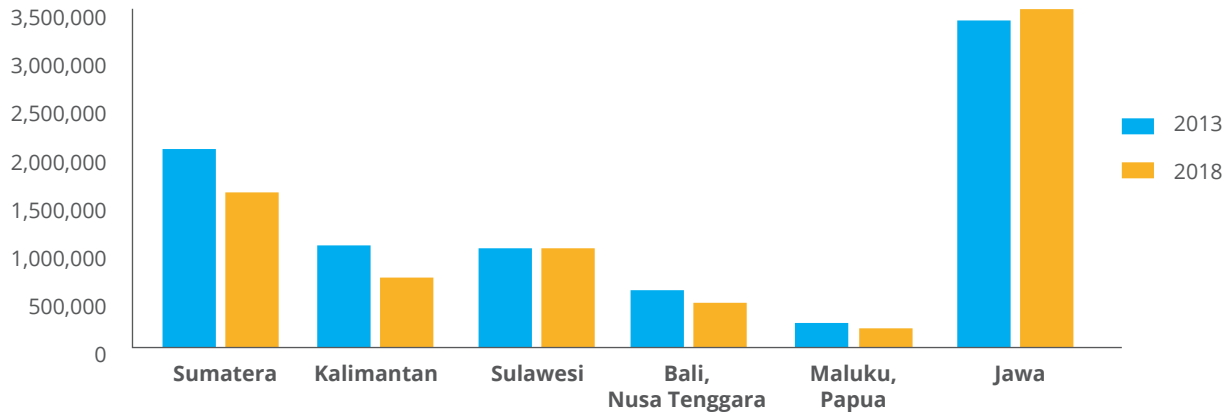
Refinement is also conducted to obtain a more accurate conversion number by conducting the survey in two different periods at provincial level. The conversion was previously conducted based on only one planting season and at national scale.

Result of Calculation Refinement

Data on the national ricefield area in 2018 was validated and verified by BIG (Badan Informasi Geospasial: Geospatial Information Agency) in 2017-2018 for nine provinces while for a further 18 provinces the size was determined from the ricefield spatial data verified in 2013 and, for the remaining seven provinces, was determined from the ricefield spatial data validated in 2018 based upon BIG's baseline ricefield spatial data.

There has been a decrease of 645,854 ha. in ricefield area over the past five years (Figure 2). The gap in ricefield area was caused by several factors, including the use of different calculation methods and an increase of agricultural land conversion for non-agricultural purposes which was not compensated with expansion or creation of new ricefields. In general, the most significant decrease in ricefield area occurred in Sumatra and Kalimantan. While there was an increase in Java and Sulawesi, this is significantly less than the decrease in ricefield area in other regions.

Figure 2: Comparison of National Ricefield Area Size of 2013 and 2018 by Island



Source: Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (BPN). 1998. Material of Meeting on National Ricefield Data Provision on 1 October 2018.

The calculation method refinement shows that, up to September 2018, the total harvest area was 9.5 million ha. while the potential harvest area at 31 December 2018 was 10.9 million ha (Table 1).

Based on this harvest area, the potential DMG production up to December 2018 is estimated as 56.55 million tons or 32.42 million tons of rice after applying the conversion rate. In addition to the revision of rice production, BPS has updated the estimate of rice consumption, both direct (at household level) and non-direct consumption. The calculation result shows that the average rice consumption is 111.58 kg/capita/year or 29.57 million tons/year. The consumption rate was based on the population projection in the middle of 2018.

By considering the rice production estimate during 2018 and per capita consumption in the same period, it is estimated that there would be a rice surplus of 2.86 million tons. By comparison, the Ministry of Agriculture estimated DMG production at 83.4 million tons (equal to 46.50 million tons of rice) for 2018. By using the refined method, BPS estimated DMG production of 56.54 million tons, which shows a discrepancy of 26.86 million tons or about 32 percent.

Table 1: Calculation of Rice Harvest Size, Production, Balance and Productivity in Indonesia (2018)

Month	Harvest Size	Production		Consumption	Balance	Productivity (Average)		Conversion of DMG to Rice (Average)
	Thousand Ha	Million Ton DMG	Million Ton Rice	Million Ton Rice	(Production-Consumption)	DMG Ton/ Ha	Rice Ton/ Ha	%
January	525	2.71	1.55	2.51	-0.96	5.16	2.95	57.20
February	1,040	5.60	3.21	2.27	0.94	5.38	3.09	57.32
March	1,723	9.46	5.42	2.51	2.91	5.49	3.15	57.29
April	1,352	7.32	4.20	2.43	1.77	5.41	3.11	57.38
May	959	4.74	2.72	2.51	0.21	4.94	2.84	57.38
June	870	4.43	2.54	2.43	0.11	5.09	2.92	57.34
July	1,054	5.35	3.07	2.51	0.56	5.08	2.91	57.38
August	1,051	5.21	2.99	2.51	0.48	4.96	2.84	57.39
September	961	4.84	2.78	2.43	0.35	5.04	2.89	57.44
October*	527	2.66	1.52	2.51	-0.99	5.05	2.88	57.14
November*	410	2.10	1.20	2.43	-1.23	5.12	2.93	57.14
December*	431	2.13	1.22	2.51	-1.29	4.94	2.83	57.28
Amount	**10,903**	**56.55**	**32.42**	**29.56**	**2.86**	**5.14**	**2.94**	**57.31**

Source: Monthly report of social and economy data 2018 and 2019, BPS, 2018 and 2019 edition.

Policy Recommendations

1. **Refinement of the ricefield area in 18 provinces that have not been verified in 2018 should be completed.** Refining the data in the other 16 regions that have been verified needs to be continued by using the most updated satellite images.

2. **Observation needs to be conducted periodically on production, distribution, and consumption.** The stock level in every region needs to be regularly monitored as the interim result shows that there are several regions in deficit, while other regions experience a rice surplus. Productivity per area of land unit also needs to be observed periodically as season is a strongly significant factor determining productivity. A periodic observation also needs to be conducted on the inter-regional rice traffic, both at provincial and district levels, with the volume and price of rice as the main objects. A regular observation through Susenas and other surveys is needed to estimate the total of consumption and rice consumption behaviour in Indonesia.

3. **Regular update of ricefield area.** The volume of rice production is inseparable from the land area in Indonesia as the update of land area significantly affects rice production capacity. In addition, land area also determines the amount of subsidy to be allocated annually in the national budget.

4. **Refinement of main food statistics is strongly related to people's need.** Estimating the availability of other staple food commodities such as corn, soy, beef, chicken, and eggs needs to be improved by using accurate statistics.

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