

The Role of Mineral Fertilizers in Transforming Agriculture in Indonesia

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INTRODUCTION

Indonesia is an archipelago consisting of 13,466 islands, which are divided into 33 provinces. Java, Bali, and Nusa Tenggara are the inner islands and contain 62 percent of the total population of 246 million, but only accounts for 8 percent of the total land area. The inner islands are naturally more fertile than the outer islands that have nutrient-poor, acidic soils. In theory, fertilizer use should be higher on the outer islands, but in reality outer island fertilizer use is generally lower, making crop yields lower, especially when compared to Java. There are approximately 15 million farmer households in Indonesia cultivating rice and 6.7 million cultivating maize. Approximately 68 percent of rice farmers and 37 percent of maize farmers use chemical fertilizers, according to the 2009 Agriculture Census.

Productivity of rice, the main staple, is higher than the world average, but the country still struggles to meet domestic demand. Raising agricultural productivity and achieving national food security is one of the main goals of the government though this is challenging because of soil fertility depletion. The government has addressed these constraints through the provision of fertilizer subsidies in order to increase consumption and improve productivity.

FERTILIZER SUBSIDIES

A fertilizer pricing policy has existed in Indonesia since the 1970s. Although the policy was revised in 2003, the basic concept has remained essentially the same (Table 1). From 1970 to 1998 the subsidy system was provided through the state budget and imported and domestic fertilizers were subsidized. From 1999 to 2001 there were no direct fertilizer subsidies, due to a devaluation of the Rupiah relative to the US dollar. During this period the government indirectly subsidized the fertilizer industry by subsidizing the natural gas industry. From 2003 to 2005 there was a subsidy for gas for urea production and a price subsidy for non-urea fertilizers. Lastly, from 2003 until the present the government has had a price subsidy for fertilizer as well as a Government Purchasing Price (GPP) for dry husked rice at farm-gate.

Table 1—Policy regimes

Period	Regime
1960-1970	Bimas (massive guidance) and Inmas (massive intensification) programs are introduced to alleviate hunger and poverty through the use of fertilizer.
1971-1995	Fertilizer subsidies and government monopoly in production, import, and distribution were introduced in 1971. Under the Rumus Tani Program, fertilizer prices were fixed at one-to-one, i.e., one bag of paddy for one bag of urea. Indonesia achieved rice self-sufficiency in 1985 under these programs.
1996-2002	Economic crisis forces the government to remove the fertilizer subsidy to reduce its fiscal burden. Prolonged drought due to El Nino and lack of subsidy cause rice yields to decrease, leading to increases in rice imports.
2003-2005	Fertilizer subsidies reintroduced in 2003 with the <i>Ciherang</i> high-yielding rice variety, causing both nutrient consumption and rice yields to increase.
2006- present	The 2008 global fertilizer crisis causes a doubling of the budget for the fertilizer subsidy. Yields remain stable and the country is close to rice self-sufficiency.

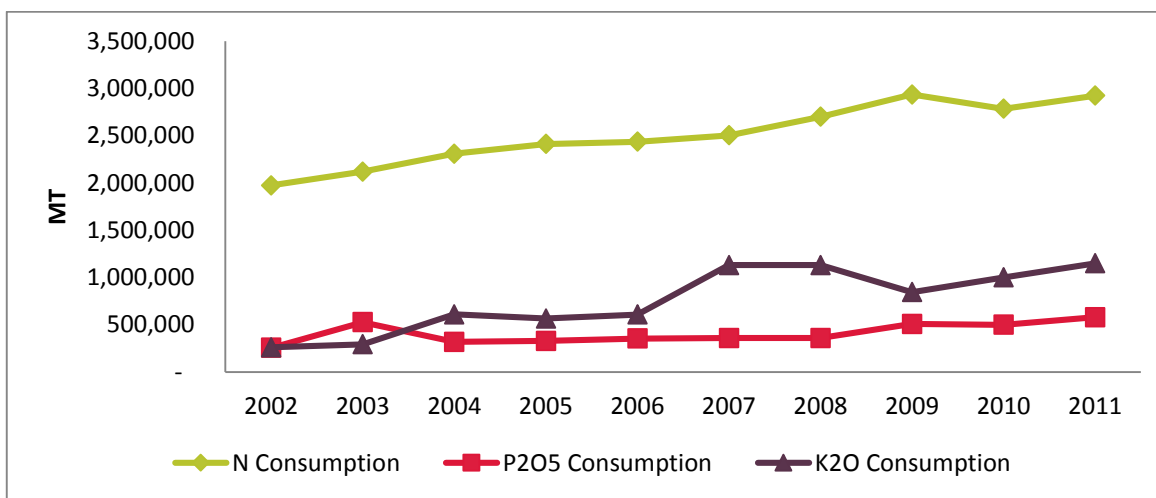
The Ministry of Economic Coordination administrates the subsidy policy but includes other ministries such as the Ministry of Agriculture, Ministry of Finance, Ministry of Trade, the Ministry of State-Owned Enterprises, as well as the National Agency of Drug and

Foods Control (BP-POM) and regional governments. The Commission of Fertilizer and Pesticide Control (KP3) monitors and controls the implementation of policy and prepares monitoring reports for district governments.

Market Structure

Fertilizer nutrient consumption in Indonesia is the highest among Southeast Asian countries in part because of the very low cost of fertilizer due to subsidies. Average nutrient consumption from 2002 to 2012 was 2.5 million MT nitrogen (40 percent of Southeast Asia), 208,000 MT phosphate (25 percent of Southeast Asia), and 759,000 MT potash (30 percent of Southeast Asia) (Figure 1) (FAO 2013). The main fertilizer products in Indonesia are urea, ammonium sulfate, NPK complex, and superphosphate. In 2011 fertilizer consumption was 8.5 million product MT, 59 percent of which was urea, 21 percent NPK, 11 percent ammonium sulfate, and 9 percent superphosphate. The share of total urea consumption has decreased by 70 percent since 2007, while NPK consumption has increased by 9 percent. The ratio of nutrients to products is 0.41.

Figure 1—Fertilizer use by nutrients, 2002-2011



Source: Derived from FAO, 2013a

The major focus of the fertilizer sector in Indonesia has been on macronutrients, but micronutrients such as sulfur have been integrated into NPK products. Data on nutrient quantities of fertilizer for each crop is unavailable, but estimates were obtained by interpolating data from FAOSTAT and are depicted in the following graph. It is estimated that the application mix rates are 100 kg/ha N, 9.5 kg/ha P2O5, and 11.9 kg/ha K2O for rice.

FERTILIZER PRODUCTION

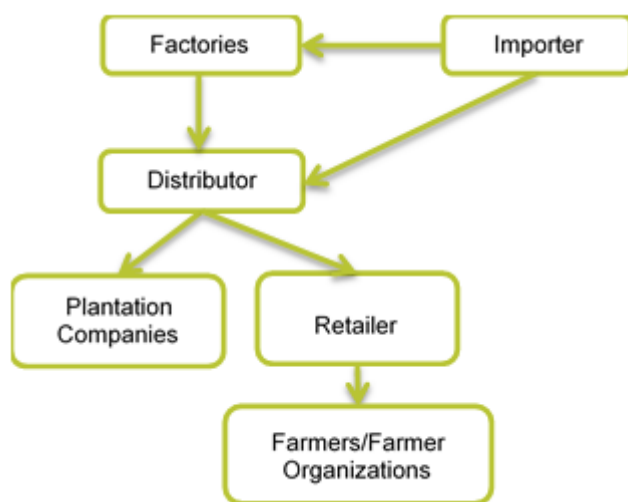
The government plays a dominant role in the production and pricing of fertilizers. Fertilizer manufacturing is dominated by one SOE: PT Pupuk Indonesia (Persero) or Pupuk Indonesia Holding Company (PIHC). Persero operates 14 urea and ammonia factories in 13 different locations in Java, Sumatra, and Kalimantan and has a total production capacity of 12.71 million MT a year. PIHC manufactures and distributes ammonium sulfate (AS), urea, double (DSP-36) and triple superphosphate (TSP), NPK, organic fertilizer, and other chemical industry products though some raw materials are imported. In 2012, state-owned fertilizer plants produced 6.9 million MT of urea and 4.2 million MT of non-urea fertilizer products (ammonium sulfate, triple superphosphate, superphosphate, NPK, and organic fertilizers). Potash and potassium chloride (KCl) are both imported as finished products. In the next 5 years, PIHC intends to increase urea production by 33.26 percent and non-urea fertilizer production by 13.19 percent. Unfortunately, old facilities result in efficient urea production making this ambitious goal a challenge.

The feedstock for all fertilizer plants in Indonesia is natural gas, the production of which is also controlled by the government. Approximately 8 percent of natural gas production (635.2 MMSCFD/year) is allocated for the fertilizer industry but this varies as almost all natural gas contracts are short-term (5 years).¹ Current natural gas prices for the fertilizer industry are US\$5.8/MMBTU, which is significantly lower than the international gas price of \$15.63/MMBTU which may explain the low allocation to the fertilizer industry. The

¹ Recently the government has been reducing natural gas exports, meaning that more natural gas will be allocated towards fertilizer production in the future.

government plans to increase the natural gas prices to \$8/MMBTU in the near future. There are several small scale private fertilizer producers in Indonesia, but these companies have a market share that is so miniscule that it is not included in national fertilizer production data. These small private companies tend to focus on specialized fertilizer for non-staple foods and are mostly involved in blending operations.

Figure 2—Fertilizer supply chain



Source: Author, based on field interviews

Importers supply fertilizers and raw materials to factories and distributors, which then distribute the fertilizers to retailers. Prior to 2003, the government limited imports to 5 companies, but the Ministry of Trade has since allowed private business entities to enter the market. Private importers must register with the Ministry of Trade, obtain a goods registration letter for each batch of fertilizer they import, and ensure that each batch of fertilizer meets national standards. There are currently 76 companies importing fertilizers, but there is no additional data on sales of these imports.

Fertilizer Distribution

Fertilizer factories send supplies to distributors who then sell fertilizer to plantation companies and retailers. Plantation companies are not permitted to purchase fertilizer from retailers; they can only purchase through authorized distributors. Distributors and retailers are competitive, unlike importers and producers. There are 2,485 distributors in Indonesia: 291 public distributors, 1,920 private companies, and 274 cooperatives. Moreover, there are 40,077 authorized retailer kiosks throughout Indonesia, but there is no data on if the kiosks are public or private.

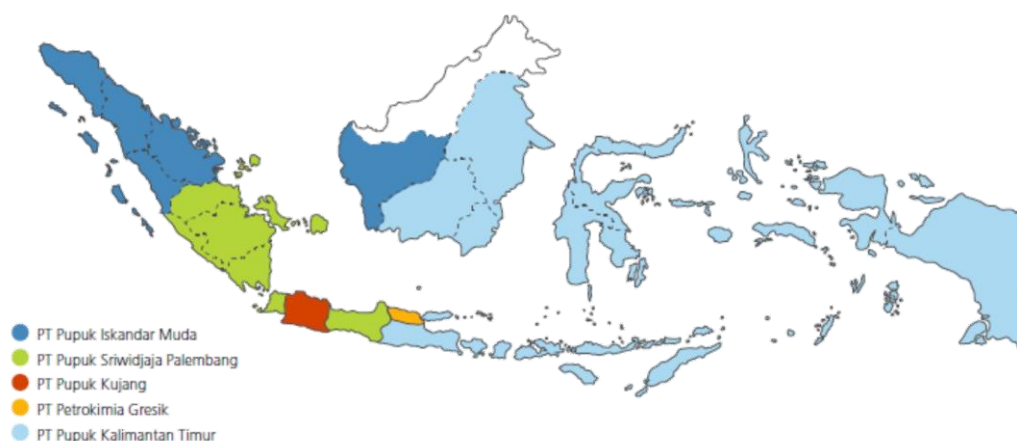
Fertilizer distribution is regulated by the Government of Indonesia through PIHC and its subsidiaries. The policy governing the distribution of fertilizer has changed over time and can be divided into three phases (Table 2):

Table 2—Distribution policy regimes

Period	Regime
1970-1978	<i>Rayonisasi</i> distribution system; one province/municipality's fertilizer need was met by more than one importer or producer. Importers acted as distributors.
1979-2001	PIHC acted as the sole fertilizer distributor and was equipped with fertilizer distribution facilities such as ships, bagging units, train wagons, and warehouses. PIHC also conducted subsidy reallocation.
2002-present	<i>Rayonisasi</i> system and domestic producers (PIHC subsidiaries) distribute fertilizers. Each producer is responsible for fertilizer distribution to their areas, as assigned by the government. RDKK system to better estimate fertilizer need and budget for regions.

From 1970 to 1978 and from 2003 onwards the *Rayonisasi* (Rayon) system has been in place whereby each fertilizer producer is assigned provinces for which it is responsible for distribution (Figure 3).

Figure 3—Map of government fertilizer distribution



Source: PT Pupuk Indonesia, 2013

The process of subsidized fertilizer distribution begins with a proposal from farmer organizations (FOs) outlining their needs, which is written in the form of a Group's Need Definitive Plan (RDKK²). The RDKK is sent to authorized retailers or FO unions where it is aggregated and then sent to authorized distributors, followed by the Provincial Agriculture Agency, and then to the office of the Ministry of Agriculture. The allocation of subsidized fertilizer is calculated by taking into account the recommendation of location-specific balanced fertilizer application, the collective RDKK proposed by the provincial government, and the allocated budget for subsidy in the current year.

PIHC is responsible for procuring and distributing subsidized fertilizers and distributors are responsible for selling to retailers; therefore PIHC must provide the transportation, warehouses, and related costs. If distributors cannot reach retailers, then PIHC must ensure that fertilizers are distributed to farmers.

ISSUES AND WAY FORWARD

Increased fertilizer consumption due to fertilizer subsidies have caused a heavy burden on the government budget³, inefficient fertilizer use at the farm level, and increased fertilizer smuggling (FAO 2005). Others have suggested that the fertilizer subsidy in Indonesia does not lead to efficient outcomes (Osorio *et al.* 2011). The fiscal cost of fertilizer are likely to increase in the future due to raw material price increases and further dilapidation of factories, though PIHC may initiate a factory revitalization program as a part of its long-term strategic plan to increase factory efficiency. Increasing shutdown frequency has already led to a decrease in fertilizer production.

There have also been reports of poor government monitoring and distribution of subsidized fertilizer leading to corruption and smuggling. In an effort to monitor fertilizer availability, PIHC has created a daily fertilizer stock summary report system of all producers by province as well as a daily summary of national stock. Nevertheless, the government must go further to improve the allocation of fertilizer and reforming the RDKK process is necessary. The RDKK process is plagued with double counting and fake cultivated areas and the exclusion of illiterate and remote farmers. The system also offers no legal means to seek redress. As a result, the distribution of subsidized fertilizer is uneven with some areas benefiting far more than others and in some instances, over-application to the detriment of crop productivity.

Given its inefficiency, a subset of costs of the fertilizer subsidy may be put to better use if allocated to other agriculture public goods, such as irrigation, research, and extension services. More appropriate and well-targeted location specific fertilizer recommendations and allocations may improve the issues of fertilizer overuse and underuse.

² Rencana Definitif Kebutuhan Kelompok.

³ 16.9 trillion IDR in 2012 or approx. US\$1.83 billion.

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