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Beyond Fertilizer and Seed Subsidies

Rethinking Support to Incentivize Productivity and
Drive Competition in Agricultural Input Markets

by Aditya Alta, Indra Setiawan, & Azizah Nazzala Fauzi

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GLOSSARY

CAP:

Common Agricultural Policy

COGS:

Cost of Goods Sold

CPCL:

Calon Petani Calon Lokasi (Farmer and Location Candidates)

DPR RI:

Dewan Perwakilan Rakyat Republik Indonesia (The House of Representatives)

EEC:

European Economic Community

e-RDCK:

Sistem Elektronik Rencana Definitif Kebutuhan Kelompok Tani (Digital Farmer's Need Proposals)

EU:

European Union

GKG:

Gabah Kering Giling (Dried Unmilled Rice)

HPP:

Harga Pembelian Pemerintah (Government's Purchasing Price)

IAARD:

Indonesian Agency for Agricultural Research and Development

ICM:

Integrated Crop Management (Pengelolaan Tanaman Terpadu / PTT)

IRRI:

International Rice Research Institute

KPK:

Komisi Pemberantasan Korupsi (Corruption Eradication Commission)

KUR:

Kredit Usaha Rakyat (People's Business Credit)

MOA:

Ministry of Agriculture

MOF:

Ministry of Finance

MRP:

Maximum Retail Price

NPK:

Nitrogen (N), phosphorus (P), potassium (K) (fertilizer nutrient contents)

O&M:

Operations and Maintenance

P3A:

Perkumpulan Petani Pemakai Air (Association of Water-User Farmers)

PSO:

Public Service Obligation

RDKK:

Rencana Definitif Kebutuhan Kelompok Tani (Farmer's Need Proposals)

SP-36:

Superphosphate (a type of fertilizer containing 36% P₂O₅ and 5% sulfur)

UPSUS:

Upaya Khusus (Special Efforts)

ZA:

Zwavelzure Ammoniak (a type of fertilizer containing ammonium sulphate)

EXECUTIVE SUMMARY

This paper highlights several demand-side issues in the use of agricultural inputs by Indonesian farmers. A “scarcity” of subsidized fertilizer is often reported by the media. Because reliance on subsidized fertilizer is so complete for many Indonesian farmers, reduced availability of subsidized fertilizer is commonly conflated with a scarcity of all fertilizer.

Even when cheap inputs are available, challenges remain when it comes to adopting the most appropriate mix of inputs. Fertilizer use in Indonesia is dominated by chemical fertilizers, especially subsidized urea. Overuse of urea and underuse of organic fertilizer can lead to land degradation over time. In addition, only 52.67% of rice farmers have adopted high-yielding seeds, and only 10.07% of lowland rice farming households have used hybrid seed varieties. This approach may make sense from the perspective of an individual farmer, but it perpetuates societal costs of inefficient farming practices.

Government policies, especially fertilizer subsidies and seed subsidies/assistance, have contributed to suboptimal input use. The price gap between subsidized and non-subsidized fertilizer prices created and perpetuates an advantage for subsidized products made by state-owned Pupuk Indonesia. The fertilizer subsidy also encourages overconsumption of chemical fertilizer and has led to the creation of secondary markets. The seed subsidies/assistance program has not improved adoption of high-yielding inbred and hybrid rice varieties. Farmer-driven planning of the seed program, supply-side factors such as import restrictions, low domestic production capacity, and limited research and development, have reinforced rather than changed the seed preferences of farmers.

In short, rather than focusing on the production potential of high-quality input mixes, farmers have focused on costs distorted by government policies, existing cultivation knowledge, and consumer and cultural preferences.

With fertilizer subsidies generally agreed to be ineffective, two broad alternative interventions have been considered by the government. Unfortunately, both of these proposals are flawed. One proposal, to increase the government’s purchasing price of paddy (HPP), may lead to price retaliation from private traders and subsequently, high prices for consumers. And replacing fertilizer subsidies with output subsidies creates a risk of overproduction and comes with a high price tag.

This paper proposes alternative policy recommendations. In the short- and medium-term, the fertilizer subsidy should be eliminated and replaced with direct payments to farmers via the Farmer Card to close the price gap, open up competition, and increase input choices for farmers. The seed assistance program should be eliminated and the government should shift resources to helping develop a better supply of hybrid and high-yielding seed varieties to make them more available to farmers. Interventions should be taken to improve farmer knowledge about input use, especially through widespread extension services—including those that can be provided by the private sector. Measures should also be taken to improve the management and maintenance of rural infrastructure and common resources and to help increase farmers' entrepreneurial capacity. Finally, program graduation should be a part of all interventions. Programs should have goals, indicators, and deadlines that will allow users assisted by the program to become independent of it or allow the government to determine when interventions are unsuccessful. The end goals should be improved agricultural productivity and a transition to full market mechanism in the agricultural input sector.

INTRODUCTION

Agricultural inputs such as fertilizer, seeds, and pesticide, together with fees (such as for irrigation), make up about 16–26% of costs per hectare per planting season for average food crops (Table 1). Although not as considerable a component of costs as labour (47–60% of costs), these variable inputs reflect farmers' perception of the costs and benefits of higher productivity. For some of these inputs, farmers could rely on nature—rain for irrigation, using seeds from the previous planting season—but increasing yields requires investing in high-quality and carefully selected management of inputs. The view of inputs-as-investment prompted the Indonesian government to cooperate with research institutes and extension agents in the 1960s and 1970s to develop and urge the adoption of agricultural technologies such as high-yielding varieties and agrochemicals.

Table 1.
Average Share of Agriculture Inputs in Farming Costs Per Hectare Per Farming Season, 2017

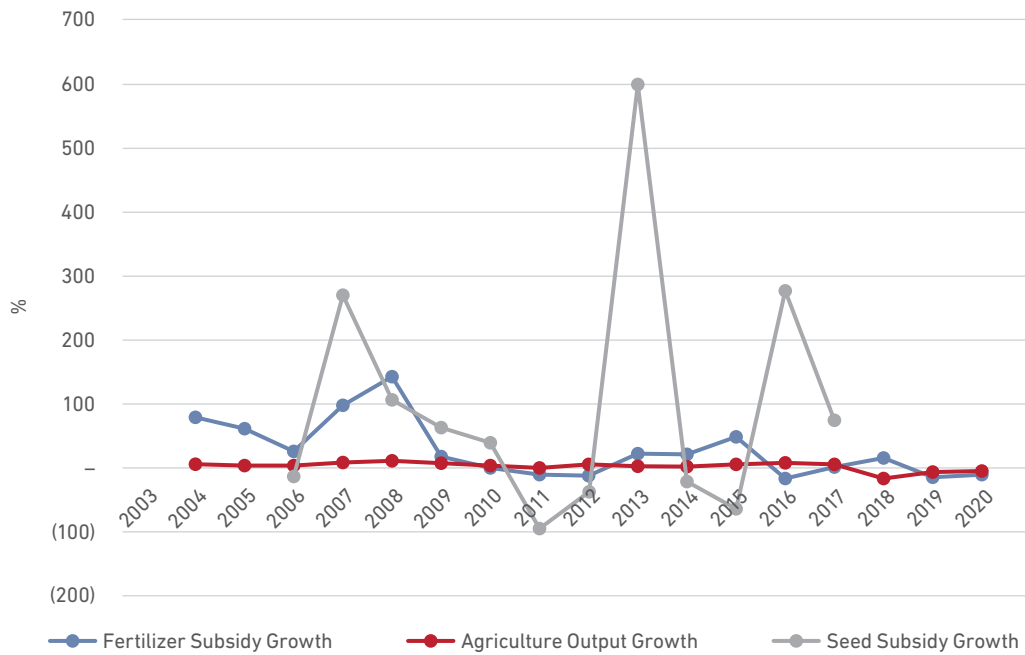
Cost Component	Wetland Paddy		Dryland Paddy		Maize		Soybean	
	Thousand IDR	Share of Total Cost (%)	Thousand IDR	Share of Total Cost (%)	Thousand IDR	Share of Total Cost (%)	Thousand IDR	Share of Total Cost (%)
Fertilizer	1,278.00	9.43	710.59	8.40	1,370.09	13.44	449.18	4.97
Seeds	514.36	3.79	401.96	4.75	899.12	8.82	591.02	6.53
Pesticide	569.55	4.20	296.59	3.51	352.02	3.45	363.57	4.02
Charges and fees (irrigation and others)	78.30	0.58	23.46	0.28	42.19	0.41	52.85	0.58
Total	2,440.21	18.00	1,432.60	16.94	2,663.42	26.12	1,456.62	16.10

Source: (Statistics Indonesia, 2019)

Increasing government subsidies and assistance have also aimed at productivity improvements. Between 2003 and 2020, the government spent IDR 319.77 trillion (USD 22.12 billion) on fertilizer and seed subsidies. This does not include miscellaneous assistance programs, such as those for irrigation rehabilitation, which are funded directly by the Ministry of Agriculture (MOA). But spending on inputs does not seem to have improved agricultural output.

As Figure 1 shows, the year-over-year growth of subsidies for rice, maize, and soybeans has often fluctuated sharply—for example, the fertilizer subsidy by 142% in 2008 and the seed subsidy by 587% in 2013. But output growth (in rice, maize, and soybeans) has been relatively flat—the largest fluctuations were growth of 8.98% in 2008 and a dip of 18.42% in 2018. This strongly suggests that these subsidies have almost no impact on output.

Figure 1.
Year-Over-Year Growths of Input Subsidies and Agricultural Outputs (Rice, Maize, Soybeans)



Source: Fertilizer and seed subsidies: Ministry of Finance (2019); Agriculture outputs: adapted from Statistics Indonesia (2021b) and MOA (2019).

Since these programs have been ineffective, this paper discusses whether such interventions are necessary and, if so, what form they should take. This study focuses on the demand-side of the input market—on farmers’ decisions as input users. While policies on the supply side are undoubtedly important, they entail a closer look at import policy for raw materials for fertilizer and seed breeding; research and development in new, more pest-resistant hybrid rice varieties;¹ investments in irrigation infrastructure and machinery; gas pricing; and so on—topics too wide-ranging to cover in one paper.

This paper focuses mainly on fertilizer and seeds, but proposed recommendations apply to pesticide and irrigation as well. The paper discusses issues in input use and existing policy interventions, then concludes with a call to remove market-distorting input interventions such as fertilizer subsidies, which stifle competition, limit farmer’s choices, and prevent farmers from shifting to more productive and sustainable agricultural practices. Instead, direct payment to farmers and a gradual transition to full market mechanism are proposed as policy recommendations.

¹ For an analysis focused on the supply side of hybrid rice seeds, see Krishnamurti and Biru (2019). The study discusses imports of parental and F1 seeds, research and development of new varieties, and identifies issues such as limited production capacity of private seed producers due to the small number of breeders.

ISSUES IN FARMERS' INPUT USE

Availability

A so-called “fertilizer scarcity” is often reported in the media. This term is misleading. Shortages have occurred only regionally and in subsidized fertilizer. There is not a shortage of all fertilizer. However, the public attention given to input provision for fertilizers contributes to this confusion.

Allocated quantities of subsidized fertilizer cover 37–51% of farmers' reported fertilizer needs.

Allocated quantities of subsidized fertilizer cover 37–51% of farmers' reported fertilizer needs. In 2019 and 2020, the gap between the subsidized quantities provided and those demanded ranged between 1.04 and 5.71 million tonnes (Table 2). The widest gap appears in organic fertilizer, which reflects the subsidy program's concentration in chemical fertilizer. The gap between quantity of fertilizer demanded and quantity subsidized

is seldom recognized in public discourse about fertilizer availability. Farmers, supported by media reporting, appear to expect the government to fully subsidize national fertilizer needs.

Table 2.
Subsidized Fertilizer Quantities Requested vs Provided (tonnes)

Fertilizer Type	2019		2020	
	Quantities Requested	Quantities Allocated	Quantities Requested	Quantities Allocated
ZA	2,203,612.80	996,000	1,892,760.63	850,000
NPK	5,894,354.91	2,326,000	4,399,153.22	2,688,000
SP-36	2,792,945.16	779,000	1,871,674.58	600,000
Urea	5,861,773.41	3,825,000	4,183,263.85	4,025,467
Organic	6,653,792.99	948,000	5,058,738.53	720,000
Total	23,406,479.27	8,874,000	17,405,590.81	8,883,467

Source: MOA (2018b; 2019); MOA Regulation No. 47/2018; MOA Regulation No. 27/2020

Challenges for farmers caused by the shortfall of subsidized fertilizer supplied compared to demand are compounded by misallocations and delays. Misallocations occur when plantation companies and farmers not affiliated with an eligible Farmer Group (*Kelompok Tani* or Poktan)² received subsidized fertilizer, as reported in MOA (2020c). The same report found that subsidized fertilizers available to East Java farmers in July 2020—more than halfway into the fiscal year—were only 50% of the requested amount due to the local government's late submission of the

² According to MOA Regulation No. 67/2016 on Farmer's Institutional Development, a Farmer Group is a group of farmers/breeders/planters formed on the basis of common interests; common social, economic, and resource conditions; common commodities; and cooperation to improve and develop the business of its members. In practice, membership in a Farmer Group has become the basic requirement for farmers to access subsidies, assistance, and extension services.

Farmer Group proposal (known as *Rencana Definitif Kebutuhan Kelompok Tani Pupuk Bersubsidi*—hereinafter RDKK).³ This illustrates how the long bureaucratic process for subsidy planning and allocation contributes to scarcity. When subsidized fertilizers are not available, farmers are faced with choosing to buy non-subsidized fertilizers at higher prices or to reduce their use of fertilizers and risk lower yields.

Availability is an issue facing irrigation as well. In Indonesia, the main irrigation infrastructure consists of government-managed dams that provide irrigation, raw water supplies for industry and households, and electricity generation. The government is responsible for building and managing waterways of the primary and secondary irrigation systems. Primary irrigation systems start with a main headwork (e.g., a dam, a reservoir) located along a body of water (e.g., a river) that diverts water from the source and into the primary canal. The waterways of the secondary system tap into the primary canal. Unlike with water for domestic and industrial use, which is supplied to the end-users by utility companies, farm plots (an area of 25–150ha) are serviced by a tertiary irrigation system managed by farmers. Irrigation at the farm level is managed by the Association of Water-User Farmers (*Perkumpulan Petani Pemakai Air* or P3A)—a semi-formal communal agency that aims:

to increase irrigation efficiency at farm level, to distribute water equally and fairly at tertiary irrigation canals, to check and maintain the tertiary canals and, to plan infrastructure improvement programs, to manage planting schedule and cropping pattern, to manage irrigation services fee, and to dim the potential conflict in water distribution. (Syaukat et al., 2014, p. 164)

Fair access to water from irrigation systems remains a concern. The simple organization and management capabilities of P3As does not equip them to maintain consistent water service delivery across farming areas. A study in Yogyakarta reported that rice farmers in upstream areas could plant up to three times a year, while those downstream, with more restricted water supply, only managed to plant twice (Syaukat & Siwi, 2009). This is a potential source of communal conflict.

The government's role in irrigation is mostly one of infrastructure investment funded through savings from fuel subsidies (OECD, 2020). The government also provides assistance for rehabilitating select irrigation systems at the tertiary level. As with fertilizer and seeds, this assistance is provided based on Farmer Group proposals. The targeted coverage for irrigation is much smaller than for fertilizer and seed assistance. Only 33% of rehabilitation proposals were targeted by the program in 2019 (MOA, 2021). For comparison, in the same year fertilizer subsidies were

Fair access to water from irrigation systems remains a concern. The simple organization and management capabilities of P3As does not equip them to maintain consistent water service delivery across farming areas.

³ An RDKK is a document prepared by farmers in a Farmer Group with assistance from an extension officer that details the expected agricultural input, tools, and machinery needs for a planting season. The document reports types of commodities and area harvested, quantities of inputs (fertilizer, seeds, pesticide, tools, etc.) needed, and source of funding (private expenses, loans, government assistance/subsidies). In the context of this paper, RDKK refers specifically to RDKK Pupuk Bersubsidi, which is a special type of RDKK used in requesting the quantities and types of subsidized fertilizer for farmers in a region in one planting season. Unlike a regular RDKK, which is mainly an internal planning document, RDKK Pupuk Bersubsidi is proposed by farmers and verified and collected in a hierarchical manner by the government's agricultural offices from the local to the national levels. More information is available from MOA Regulation No. 67/2016 on Farmer's Institutional Development.

⁴ Dams are managed by the Ministry of Public Works and Housing and its vertical agencies at the local level.

intended to cover 68% of all fertilizer needs (although the real available quantities are much lower, as discussed in subsequent sections).

Farmers are required to pay irrigation service fees to the P3A, intended to cover operations and maintenance (O&M). The pricing is determined on a per-area basis of the farm rather than by volume of use, which is how water is priced for household and industrial use. However, a study in two villages in Bogor and Kudus districts reported that payment has not been strictly enforced and most farmers (66%) do not pay due to their belief that water delivery and services by the P3A are unsatisfactory (Syaukat et al., 2014). Low payment and dissatisfaction is despite the relatively small fees—ranging between IDR 25,000–350,000 per hectare per planting season with a median of IDR 100,000–120,000 (Interview 6; Rahman et al., 2019; Syaukat et al., 2014). Several studies on farmers’ willingness to pay suggest that farmers are willing not only to pay, but to pay a higher rate if service quality improves (Rahman et al., 2019; Syaukat et al., 2014).

Adoption of High-Yielding and Diverse Inputs

A second problem facing agricultural productivity is failure to adopt high-yielding inputs and a balanced variation of inputs.

Fertilizer use in Indonesia has historically been dominated by chemical fertilizers, especially urea. The popularity of chemical fertilizers in Indonesia began with their intensive introduction to food crop farmers in the 1960s (Suryana, 2019). Three urea factories were established in 1974, followed by nine factories in 1974–1986, and two more in 1986–1994 (Rachman & Sudaryanto, 2010, pp. 194–195). Table 3 illustrates the dominance of urea use by farmers.

Table 3.
Agricultural Use of Chemical Fertilizers in Indonesia (Tonnes)⁵

Fertilizer Type	2010	2011	2012	2013	2014	2015	2016	2017	2018
ZA	731,044	962,970	1,049,898	1,094,742	1,008,525	994,759	1,021,348	979,473	1,004,034
NPK	1,804,413	2,124,474	2,478,399	2,443,456	2,672,052	2,705,807	2,933,716	2,597,586	2,802,246
SP-36	634,883	723,177	858,719	830,638	798,254	829,134	865,434	859,965	861,614
Urea	5,131,287	5,245,493	5,119,133	4,771,070	4,993,060	4,790,930	5,020,625	5,123,183	5,665,007

Source: FAOSTAT (FAO, 2021a).

Urea is the world’s most popular nitrogenous fertilizer. It is cheap to mass produce and transport, has a high concentration of nitrogen (which helps leaf growth), and is instantly absorbed by plants to give quick, observable results. However, urea overuse makes crops vulnerable to pests and diseases, causes plants to collapse (Stevens et al., 1999), and pollutes groundwater (Fageria

⁵ Data on organic fertilizer use are not available.

& Virupax, 1999). Chemical fertilizer overuse over time damages the nutrient balance of soil and leads to land degradation (Darwis & Saptana, 2010), runoff pollution, and increased greenhouse gas emissions (ADB, 2019).

In addition to nitrogen (N), fertilization should ideally introduce other important macronutrients such as phosphorus (P) and potassium (K), which can be provided by compound fertilizers such as NPK.

Organic fertilizer use improves soil structure, micronutrient and microbial composition, water retention, and the efficacy of inorganic fertilizer (Darwis & Saptana, 2010). However, organic fertilizers such as compost, manure, and plant waste are less available commercially. Farmers or small-scale industries can produce organic fertilizers using farm waste, but they are difficult to transport and apply, especially over large agricultural areas. Farmer Group need proposals (RDKK) in recent years (Table 2) indicate huge demand for organic fertilizers, larger than even their requests for urea. Nutrients in organic fertilizers are less concentrated and less precisely composed than chemical fertilizers, and so much larger volumes are needed. Five to six tonnes of fresh rice straw or two tonnes of compost per hectare provide nutrients equivalent to 25–30 kg of urea, 5–10 kg of SP-36, and 50–60 kg of KCl (Rachman & Sudaryanto, 2010). Organic fertilizers are intended as complements to chemical fertilizers, not as substitutes.

In 2021, the government increased subsidized organic fertilizer to 2.27 million tonnes (MOA Regulation No. 49/2020), but this still fell short of the requested amount. The supply gap represents opportunities for the private sector to supply organic fertilizers and develop more nutrient-dense varieties.

Adoption of high-yielding seed varieties is still low. Only 52.67% of rice farmers have used government-certified high-yielding seeds (MOA, 2018a). Adoption of hybrid varieties was even more disappointing, with only 10.07% of lowland rice farming households using the seeds in 2020 (Statistics Indonesia, 2021a). The government has long championed the development of premium and enhanced rice seed varieties, including zinc-biofortified rice, through publicly funded research and development. This support has led to the creation of hundreds of new rice varieties in recent decades.

For maize seeds, farmers perceive a quality gap between the (often-subsidized) government-certified hybrid seeds and those produced by private companies, with the former reportedly capable of yielding 3–5 tonnes per hectare and the latter 7–10 tonnes per hectare (Freddy & Gupta, 2018).

Optimal and Sustainable Use of Inputs

Productivity is determined as much by how inputs are used as by their availability and quality. Beginning in the early 2000s, the Indonesian Agency for Agricultural Research and Development (IAARD) and the International Rice Research Institute (IRRI) developed Integrated Crop Management (ICM) recommendations (in Indonesian, *Pengelolaan Tanaman Terpadu* (PTT)). ICM was designed to reverse declining rice productivity by encouraging farmers to adopt a set of technologies and techniques including new seed varieties, intermittent irrigation, balanced nitrogen fertilization, and introduction of organic matter or compost (Balasubramanian et al., 1998; Wardana et al., 2016).

A few years later, MOA Regulation No. 40/2007 passed. It recommends 175–275 kilograms of urea per hectare as the appropriate dose of urea (based on leaf color charts⁶) and that it be

administered together with two tonnes of manure per hectare. An experimental study by Sholeh and Ringgih (2017) recommends a combination of 200–250 kilograms of urea per hectare and 1–6 tonnes of organic fertilizer per hectare for an optimal yield increase. This regulation also provides location-specific phosphorus and potassium fertilizer recommendations based on macronutrient characteristics of farm plots at the sub-district level. These recommendations serve as a basis for subsidy allocation for different kinds of fertilizer. Many studies have confirmed that location-specific ICM boosts yields and improves efficiency (e.g., Arafah & Sahardi, 2007; Balitkabi, 2016; Las et al., 2004; Nurbaeti et al., 2008). The new crop management system resulted in 20% higher yields and 35% more income for rice farmers (Zaini & Erythrina, 2008).

Farmers' fertilizer use patterns initially indicated an "overdose" of urea, prompting the MOA to promote ICM and balanced fertilization in the early 2000s. Studies indicate a shift in fertilizer administration patterns between 2000 and 2014 for wetland rice farming (Table 4). In 2000, the average urea use among Javanese farmers was 360.1 kilograms per hectare with almost no organic fertilizers (Suryana et al., 2016). In 2007—the year MOA Regulation No. 40 was implemented—urea was applied at lower concentrations, ranging from 36 kilograms per hectare in South Sulawesi to 295 kilograms per hectare in West Java.

Table 4.
Average Use of Urea and Organic Fertilizers in Wetland Rice Farming, 2000, 2007, 2013, 2014 (in kg/ha)

Year	Urea	Organic
2000*	360.10	20.20
2007**	136-295	no data
2007***	170-343	no data
2013****	104.60-252.30	no data
2014*	187.20	593.80

Source: * Suryana et al. (2016); ** Irawan et al. (2007); *** Osorio et al. (2011); **** Statistics Indonesia (2015)

Organic fertilizer use in 2007 was reported at 4.6% of farmers, with negligible use outside Java (Irawan et al., 2007). Osorio et al. (2011) provided higher estimates: 170–343 kilograms of urea were reportedly used per hectare in 2007. The study also shows an inverse relationship between urea use and average land size—in other words, urea use increases as the land size of a farm becomes smaller. This suggests the distorting effect of subsidized fertilizers, especially urea, on farmer's input use decisions. Brief removal of fertilizer subsidies in 1999–2001 "led small farmers to substitute alternative inputs (other fertilizer, better seeds) for urea" (Osorio et al., 2011, p. 7). By 2014, average urea use in Java had fallen considerably, to 187.20 kilograms per hectare, while organic fertilizer use soared to 593.80 kilograms per hectare (Suryana et al., 2016). More recent data were not found.

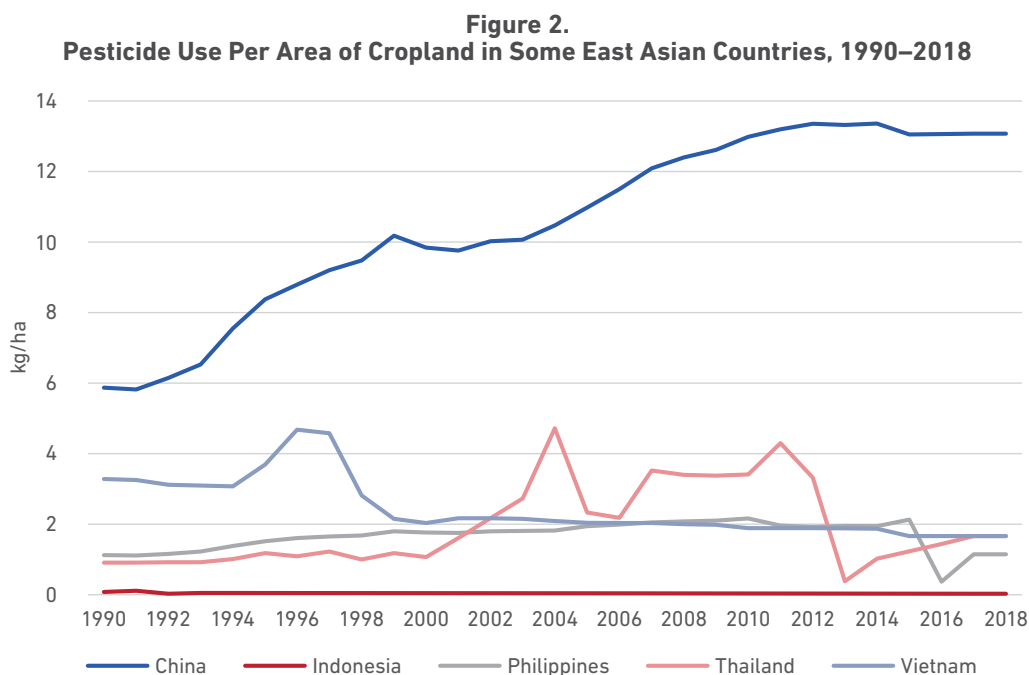
⁶ Leaf color indicates a plant's nitrogen status. The more yellowish green a leaf is, the more nitrogen deficient it is; conversely, a darker green leaf indicates higher rate of nitrogen. The measurement is usually conducted using a leaf colour chart and is an inexpensive way to determine nitrogen fertilizer needs more accurately.

Reduced urea application and increased organic fertilizer use from 2000–2014 indicates that farmers improved their practices, possibly because of improved access to different input types and extension services. However, organic fertilizer use is still far below the recommended level, suggesting insufficient supplies and incentives.

As with fertilizer, the use of pesticide can affect immediate productivity and sustainability in the long term. Chemical pesticides applied excessively and without attention to safety requirements can affect organisms other than pests, such as humans, fish, bees and other pollinators, and the broader environment. Good pest control practices should be encouraged to balance productivity concerns from underuse against potential downsides from overuse.

Pesticide use is tied to several factors. Based on a survey involving 240 Javanese vegetable farmers, Mariyono et al. (2018) show several important takeaways regarding farmers' pesticide use pattern. First, pesticide is a protective, not productive input. Its use reflects farmers' anticipation of or response to pest infestation and varies widely depending on the crops' vulnerability to pests and disease. The study shows that farmers administered almost three times more pesticide for local crop varieties compared to hybrid varieties (p. 13). Moreover, pesticide price does not appear to influence the quantities used—pesticide use is price inelastic: “[a] 10% increase in the price of pesticide can only reduce the use of pesticides by 0.9%” (p. 17). This implies that taxes or subsidies are expected to be ineffective to discourage or encourage pesticide use.

According to FAO, average pesticide use by area in Indonesia has been low (0.04 kg/ha) and stagnant in the past three decades compared to other East Asian agrarian countries (Figure 2). This statistics should be treated carefully as it shows that total pesticide use in Indonesia remains the same at 1,597 tonnes since 1993. Meanwhile, Prihandiani et al. (2021) claim that pesticide has been used nationally at an alarming rate since the early 2000s, though the study provides data from two villages only, each in Indramayu and Klaten.



Source: FAOSTAT (FAO, 2021b).

EXISTING POLICY INTERVENTIONS ON INPUTS

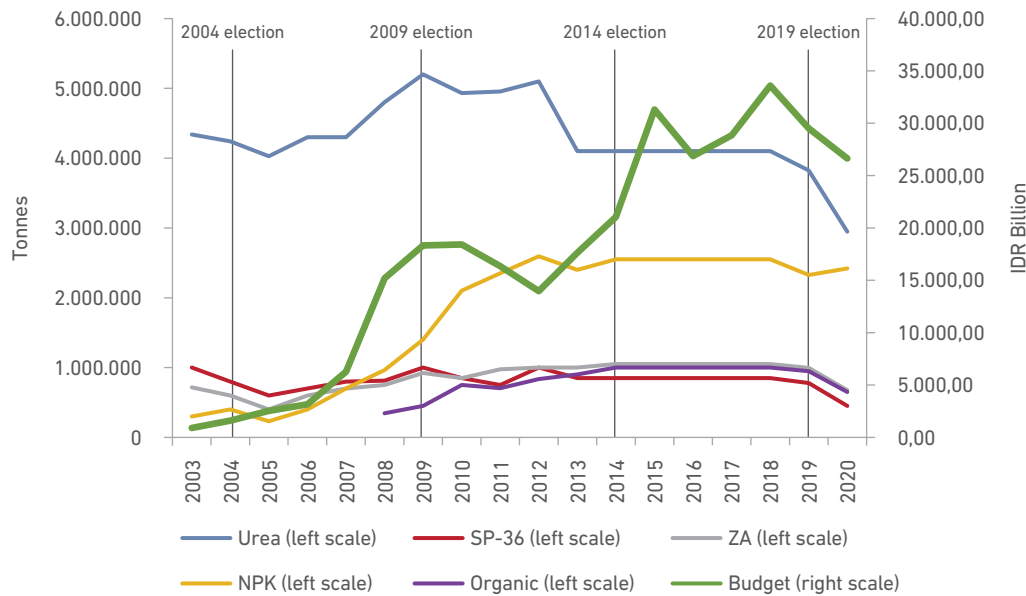
Fertilizer Subsidies

Fertilizer subsidies have become an integral part of Indonesian agriculture policies since their introduction in 1971. Despite a levelling out of outputs in recent years, intensive fertilizer use encouraged by subsidies doubled rice production from 20 million tonnes in the early 1970s to 51 million tonnes in 2002 (FAO, 2005). According to Ruslan (2021), 99% of lowland rice farming households in Java have used fertilizer, but a sizable portion (6.38%) of these households in regions outside Java have not. Applying fertilizer in these lowland rice farming areas outside Java could increase productivity by 48% (Ruslan, 2021). This suggests that some targeted promotion of fertilizer use remains worthwhile. However, subsidies have become a heavy fiscal burden for the government, leaping from IDR 0.90 trillion (USD 62.20 million) in 2003 to IDR 26.63 trillion (USD 1.84 billion) in 2020 (Figure 3).

Fertilizer subsidies are not paid to farmers. Instead, they are paid to Pupuk Indonesia as part of its public service obligation (PSO) contract to lower the production costs of its fertilizer products. Pupuk Indonesia is the holding company of five state-owned fertilizer producers: Petrokimia Gresik, Pupuk Kujang, Pupuk Kalimantan Timur, Pupuk Iskandar Muda, and Pupuk Sriwidjaya. It enjoys a dominant position in Indonesia's fertilizer market and a near monopoly in urea production. On top of receiving subsidies, the fertilizer industry at large also benefits from a government policy that caps natural gas prices at USD 6 per mmBtu (Ministry of Energy and Mineral Resources Regulation No. 8/2020). Natural gas is an important raw material in the production of ammonia and urea.

The fertilizer subsidy is regulated in 2021 by MOA Regulation No. 49/2020, which sets the maximum retail price and the allocation of subsidized fertilizer for the year. The subsidy covers urea, SP-36, ZA, NPK, and organic fertilizer products from Pupuk Indonesia. Figure 3 illustrates how subsidy expenditures have increased over time. Urea has dominated the allocation, with an average of 4.30 million tonnes of fertilizer per year. Meanwhile, the average annual quantities for SP-36, ZA, NPK, and organic fertilizer are 0.81, 0.86, 1.74, and 0.81 million tonnes. Subsidized organic fertilizer has been one of the least available, despite high farmer demand. The greater focus on chemical fertilizers may contribute to the excessive use of urea discussed earlier and supported by interviews (Interviews 5, 6). As with the government's food policy, which aims at domestic self-sufficiency, fertilizer subsidies have a strong populist appeal. The budget for subsidies always rose in the lead-up to an election year, and only in the mid-term has an administration been willing to reduce the allocation.

Figure 3.
Fertilizer Subsidy Budget (Right Scale) and Quantity of Subsidized Fertilizer
(Left Scale), 2003 – 2020



Source: authors' compilation from the state budgets, minister regulations, official statistics, and other relevant sources.

Subsidized fertilizers are reserved for farmers who are members of a Farmer Group and manage up to two hectares of land per planting season for food crops, plantation, horticulture, and animal husbandry (MOA Regulation No. 49/2020). Most (89.09%) of Indonesian farmers manage less than two hectares of land (Statistics Indonesia, 2018). Meanwhile, 68.82% of farmers are members of Farmer Groups (Statistics Indonesia, 2021a). Tenant farmers and laborers may receive subsidies with the land owner's permission (Interview 4). The quantities and types of fertilizer allocated per farmer per hectare are determined by considering requests in the need proposal (RDKK). The long, bottom-up process to request and receive the subsidized fertilizer is illustrated in Figure 4.

Input provision to farmers managing or owning up to two hectares of land is mandated by Law No. 19/2013 on the Protection and Empowerment of Farmers. Any effort to reconsider the protection scope will therefore require an amendment to this Law, especially its Article 12.

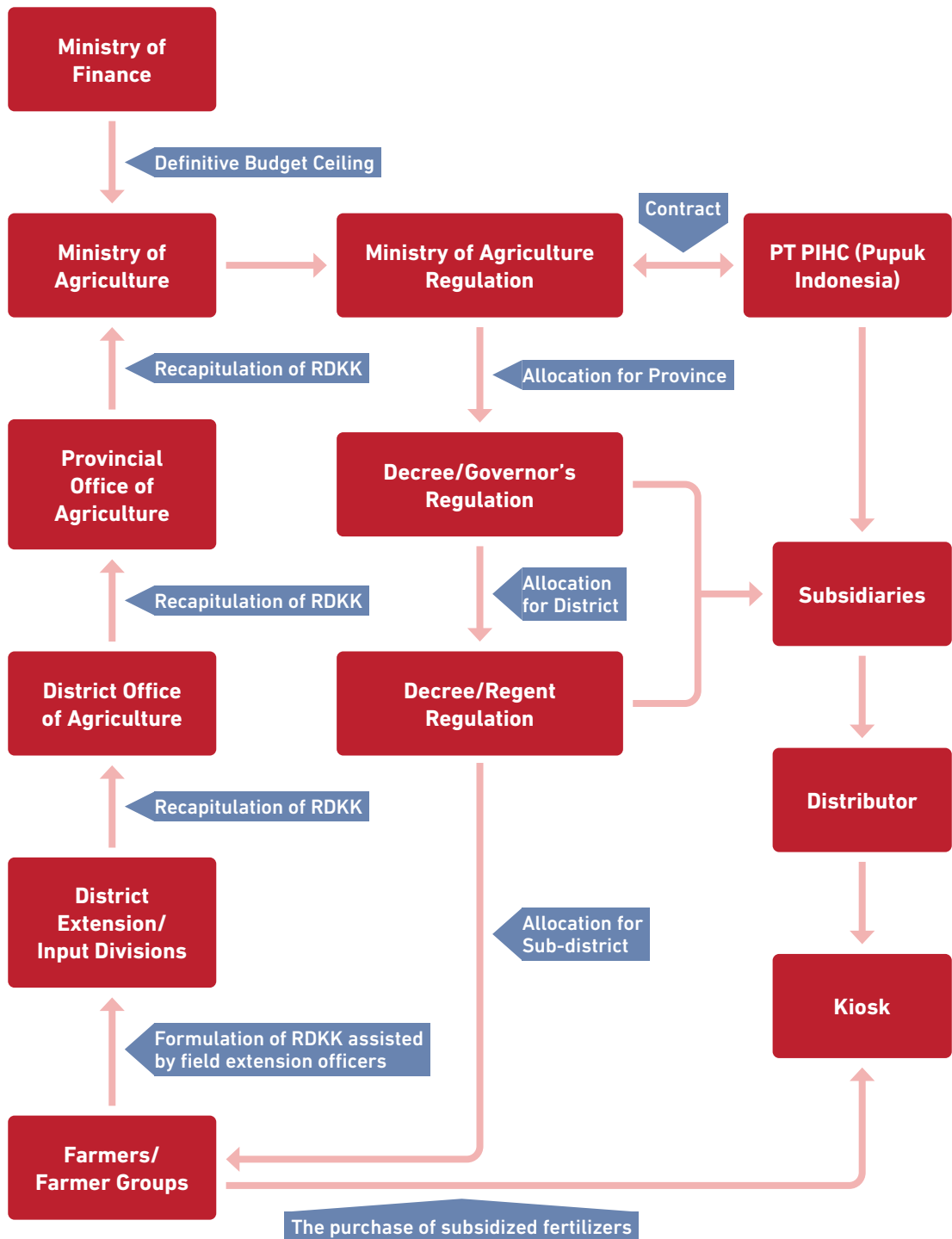
The long, complex application and distribution process has contributed to subsidized fertilizer arriving late into the planting season or becoming available only in limited supplies (Interviews 1, 2, 3). A farmer informant even reported that an official from the local District Office of Agriculture asks for a fee from the Farmer Group for the administration of subsidized fertilizer every planting season (Interview 2).

The long, complex application and distribution process has contributed to subsidized fertilizer arriving late into the planting season or becoming available only in limited supplies

Subsidized fertilizer is still the preferred choice for most farmers. According to the 2013 Agriculture Census (MOA, 2015), 41.71% of farmers rely exclusively on subsidized fertilizer. When subsidized fertilizer is not available, some farmers purchase the non-subsidized brands.

Smallholder farmers, however, cannot afford these products and would rather reduce their fertilizer use or rely on compost (Interviews 2, 3). Such behaviour indicates that cost, not yield potential from optimal fertilization, is still the main factor determining how farmers use fertilizer.

Figure 4.
The Process of Planning and Distribution of Subsidized Fertilizer



Source: Adapted from Director General of Agriculture Inputs and Infrastructure Decree No. 01/2021 on Technical Guideline for the Management of Subsidized Fertilizer, Fiscal Year 2021; Corruption Eradication Commission, 2017.

Subsidized fertilizer cannot be sold above a Maximum Retail Price (MRP), evaluated annually and set in an MOA Regulation. The MRP policy has allowed farmers to purchase fertilizer at an affordable price, but widened the gap between the prices of subsidized and non-subsidized fertilizer. This is especially the case between the price of fertilizer produced by Pupuk Indonesia and private producers' brands. Table 5 illustrates this price gap, which ranges from 2.5 to 6 times subsidized price for chemical fertilizers, and about 4 to 26 times subsidized price for organic fertilizers. The variation is due to the larger number of choices in commercial fertilizer products. For example, there is only one subsidized NPK type: Phonska, which contains 15% nitrogen, 15% phosphorus, and 15% potassium (15-15-15). Other types of NPK in the non-subsidized market offer different ratio, such as NPK 16-16-16, or NPK fertilizers that also contain micronutrients such as boron and zinc. These different formulas suit the needs of different crops and soil.

Table 5.
Subsidized MRP and Non-Subsidized Fertilizer Prices

Fertilizer	MRP 2020 (IDR/kg)	MRP 2021 (IDR/kg)	Non-subsidized prices 2021 (IDR/kg)
Urea	1,800	2,250	5,600 – 5,990
SP-36	2,000	2,400	5,995 – 9,396
ZA	1,400	1,700	3,650 – 4,600
NPK	2,300	2,300	7,000 – 13,500
NPK Special Formula	3,000	3,300	
Organic	500	-	3,300 – 8,000
Organic granule	-	800	3,000 – 21,000
Organic liquid	-	20,000 (per liter)	70,000 – 74,000 (per kg)

Source: MOA Regulation No. 1/2020 & MOA Regulation No. 49/2020; author's compilation from several marketplaces (for non-subsidized prices).

In addition to price gaps between subsidized fertilizer from Pupuk Indonesia and non-subsidized fertilizer provided by the private sector, a significant difference exists between subsidized and non-subsidized fertilizers produced by Pupuk Indonesia itself. Pupuk Indonesia (2021) charged on average IDR 1,465 per kilogram of subsidized fertilizer sold. The corresponding number for its non-subsidized products is IDR 3,771—2.5 times more expensive than the subsidized products.

Total subsidies received by Pupuk Indonesia in 2020 amounted to IDR 25.71 trillion, which made up 35.77% of the company's total revenue. When including the subsidies in the revenue calculation, the per-kilogram revenue from subsidized fertilizer became IDR 4,515, significantly higher than what the company earned per kilogram of non-subsidized fertilizer (Table 6).

The per-kilogram average revenue at IDR 4,515 is more in line with the non-subsidized prices presented in Table 5, suggesting that subsidies contribute significantly to the price disparity.

A 2017 report found that subsidy calculation is based on a full-costing approach that allows the appointed producer to charge all fertilizer production costs, including those incurred in the production of non-subsidized products

From 2015 to 2020, subsidies effectively supported 67.45% of Pupuk Indonesia's subsidized fertilizer.

Subsidies also cover costs that occur in the production process of subsidized and non-subsidized items, such as labor. This is in line with the findings from the Corruption Eradication Commission (*Komisi Pemberantasan Korupsi* or KPK). A 2017 report found that subsidy

calculation is based on a full-costing approach that allows the appointed producer to charge all fertilizer production costs, including those incurred in the production of non-subsidized products (KPK, 2017). According to MOA Regulation No. 28/2020 on the Components of Cost of Goods Sold for Subsidized Fertilizer in the Agriculture Sector, Pupuk Indonesia is allowed to include many indirect cost components, including almost all salaries, in the production cost. According to MOF Regulation No. 68/2016 on the Allocation, Disbursement, and Accountability of Fertilizer Subsidies, subsidies payable is simply cost of goods sold (COGS) minus the maximum retail price (MRP). This encourages the appointed producer to overestimate the COGS, since higher COGS means larger subsidy payment.

Table 6.
Pupuk Indonesia's Revenue Breakdown

Subsidized fertilizer	2015	2016	2017	2018	2019	2020
Sales (IDR trillion)	12.42	13.16	13.22	13.39	12.49	12.35
Subsidies received (IDR trillion)	25.80	26.77	24.97	28.57	28.00	25.71
Total revenue (sales+subsidies) (IDR trillion)	38.22	39.93	38.18	41.96	40.49	38.06
Quantities sold (tonnes)	8,881,084	9,181,396	9,297,956	9,340,238	8,708,912	8,430,114
Revenue per kg (IDR)	4,304	4,349	4,107	4,492	4,649	4,515
Non-subsidized fertilizer	2015	2016	2017	2018	2019	2020
Total revenue (IDR trillion)	10.63	9.15	10.03	14.07	15.85	18.64
Quantities sold (tonnes)	2,880,486	2,913,916	3,207,198	3,460,377	3,897,150	4,943,888
Revenue per kg (IDR)	3,690	3,142	3,128	4,067	4,067	3,771

Source: author's calculation based on Pupuk Indonesia (2021).

“The subsidy has created an unfair advantage for certain products and producers and encourages overconsumption of certain fertilizers. The price gap has also led to the creation of secondary markets in which recipients of subsidized fertilizer sell their allocations to non-recipients.”

To encourage organic fertilizer use, the MOA also provides funding assistance for the development of organic fertilizer plants. Funding is based on proposals from the Farmer Groups, which include a detailed description of the funding needs and spending plan and a commitment to report program implementation and budget use. In 2021, the program targets the establishment of 1100 units of organic fertilizer plants with a budget of IDR 200 million per unit (Director General of Agriculture Inputs and Infrastructure Decree No. 15/2021 on Technical Guideline on Fertilizer Activities Toward Organic Farming Fiscal Year 2021).

Farmer Card (*Kartu Tani*)

The Farmer Card was introduced to combat secondary markets for subsidized fertilizer. This card is used to claim and pay for an individual farmer’s subsidized fertilizer quota. The Farmer Card was first implemented through MOA Regulation No. 47/2017 on the Allocation and Highest Retail Prices of Subsidized Fertilizer for the Agriculture Sector Fiscal Year 2018.

The idea to use a “smart card” to prevent leakage and deliver subsidies directly to eligible farmers was not new. In 2007 and 2008, the MOA conducted “smart card” trials in 15 districts from 12 provinces. The evaluation concluded that the system was promising, but plagued with technical difficulties (Sudjono, 2011).

At the time of writing, distribution and farmer adoption of the cards are inadequate and uneven throughout the country. In 2020, almost three years after introduction, the MOA reported that 9.30 million cards had been printed (66.91% of all 13.90 million eligible farmers) and 6.20 million cards had been distributed (44.60% of eligible farmers), but only 1.20 million farmers (8.63% of eligible farmers) had actually used it (MOA, 2020a). One chili farmer interviewed in Batam claimed that their Farmer Group only received the Farmer Cards in April 2021 after a long application process (Interview 2).

The card also functions as a debit card on which farmers need to maintain a minimum balance in order to keep their account open. To obtain the card, they open a bank account in an appointed state-owned bank. It is not necessary to pay for the allocated fertilizer quota from their balance, since payments with cash while showing the card is also possible. Used this way, the card is reduced to a verification tool and in effect is more like a fertilizer voucher than a smart card, but creates the requirement that farmers maintain a minimum balance with a bank they may not otherwise use.

The card in its current form is redundant and preserves most of the weaknesses of the subsidy system.

1. Despite its payment function and the associated account, farmers do not receive financial assistance for input purchases through the Farmer Card. Instead, each card contains information about subsidized fertilizer quantities (as determined based on the RDKK and the government budget) available for purchase by the cardholder. Farmers still need to pay with their own cash or load the card with a balance.
2. The card preserves the price disparity between subsidized and non-subsidized products and with it the distortionary effects of the subsidy. Not only does this encourage overconsumption of certain subsidized input types, but in the long run subsidies hinder the efforts to raise awareness of optimal fertilization according to soil characteristics and macro- or micronutrient needs and discourage the development of new, more varied, and more affordable private sector fertilizers.
3. The card still limits farmers' options to one input (fertilizer) and then only to subsidized fertilizer produced by Pupuk Indonesia.
4. The card preserves the long, bureaucratic process of applying for and receiving subsidized fertilizer through RDKK.
5. The primary function of the Farmer Card is to identify eligible recipients and prevent non-recipients from accessing subsidized fertilizer. However, so long as the price disparity exists, recipients are free to purchase and re-sell their fertilizer allocation for more than they paid but less than the price of non-subsidized fertilizer. In addition, some kiosks in Boyolali reportedly require farmers to purchase subsidized fertilizer together with other products as a bundle, illustrating how the voucher system is ineffective at deterring gatekeeper corruption:

The distributors usually require [purchase of] other fertilizer for redemption [of subsidized fertilizer]. For example, you want to redeem several kilograms of urea. In order to do that, you have to also purchase several kilograms of Petroganik [a brand of organic fertilizer produced by Pupuk Indonesia]. ... [A farmer said.] "Wait, this is not in the list [of recommended inputs]. Why do I need to purchase this? I have my own organic fertilizer, why do I need to purchase Petroganik?" (Interview 5)
6. Additional functions are being integrated in the Farmer Card. These include facilitating direct offtake agreements with the state-owned logistics company Bulog, access to an Indonesian government-run microlending facility, the People's Business Credit (*Kredit Usaha Rakyat* or KUR), and access to social assistance. By relying on data from the RDKK, the MOA intends to leverage the Farmer Card to integrate data on agriculture, such as farmer identity and harvested area by commodity and region (Balingtan, 2020). However, like the card itself, these features have apparently not been uniformly available and effectively implemented. An interviewed farmer confirmed these functions, but also complained that their effectiveness is limited by middlemen in the farmer's community and complicated KUR application process (Interview 2). Another farmer reported that only the KUR feature has been available among the additional functions (Interview 3).
7. Because of the slow and incomplete rollout, the MOA still allows farmers to purchase subsidized fertilizer without the Farmer Card by simply showing their identity card and verifying against the database (e-RDKK) (Director General of Agriculture Inputs and Infrastructure Decree No. 01/2021 on Technical Guideline for the Management of

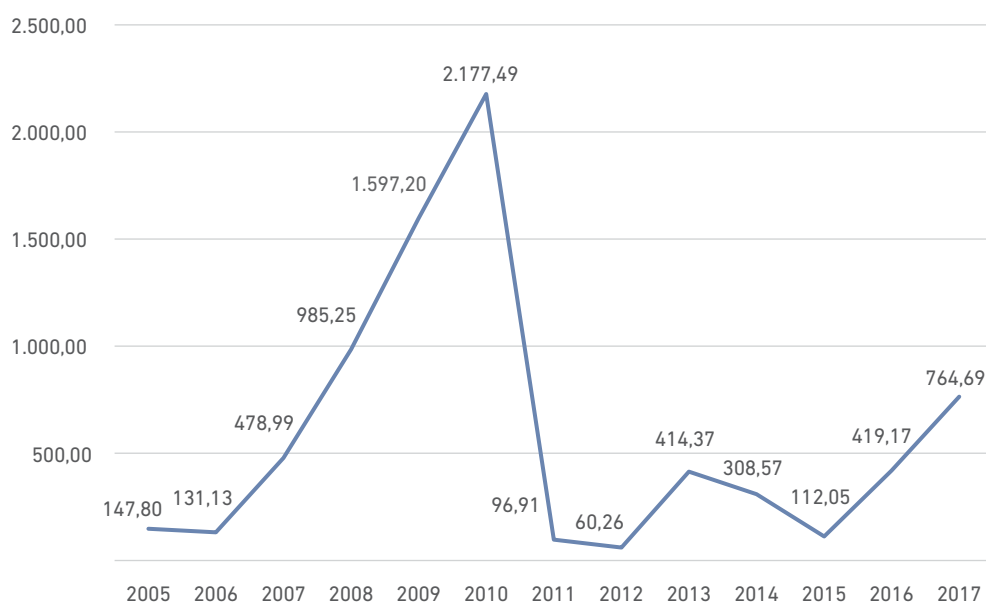
Subsidized Fertilizer, Fiscal Year 2021). This may discourage meaningful progress in the card's adoption and distribution.

Despite these shortcomings in implementation, the Farmer Card and its additional features represent a promising concept and infrastructure for direct input-support targeting and integration of financing options, social assistance, and incentives in one place. Direct subsidies targeted to farmers and integrated services through the Farmer Card would help modernize the Indonesian agriculture. It also has the potential for integrated data collection on land use, production, farmer behaviour, and socioeconomic status, which could be leveraged to develop and improve a direct payment and incentive system and generally improve agricultural statistics.

Seed Assistance Program (*Program Bantuan Benih*)

As with fertilizer subsidies, the Indonesian government has long intervened in seed provision. Intervention started in 1986 (Firdaus, 2018) and is mostly conducted via subsidies and a seed assistance program in cooperation with the state-owned seed producers, Sang Hyang Seri (SHS) and Pertani.⁷ Subsidy values ranged between IDR 60 – 2,177 billion (USD 4 – 150 million) annually from 2005 to 2017 (Figure 5), far below the fiscal burden of fertilizer subsidies. In 2018, the MOA ended the subsidy program and has since relied solely on seed assistance, which provides eligible farmers with free seeds.

Figure 5.
Seed Subsidies, 2005–2017 (IDR Billion)



Source: Ministry of Finance (MOF), 2019.

⁷ In Indonesian public finance, both subsidies and assistance are payments made by the government for the provision of goods or services for public use. By definition, subsidies are paid to state-owned or private producers to reduce the costs of production of goods or services that are deemed essential for public welfare. Assistance is the government's procurement of goods or services provided to specific target recipients. The difference is mostly procedural, where subsidies offset production costs, while assistance programs procure a set of items or services with certain specifications. In the context of the seed subsidies vs assistance, the only relevant difference is that subsidies discounted the price of seeds available in shops, while the assistance program directly provides free seeds to recipients.

The shift from subsidies to assistance as a method for government seed provisions appears to be a response to pervasive inefficiency in seed distribution. A study commissioned by the MOA to review subsidy implementation in South Sumatra reported that subsidized seed uptake in 2016 was extremely low. Only 9% of subsidized inbred rice seeds and no subsidized hybrid rice seeds were actually purchased by farmers (Darwis, 2017). The finding was in line with a statement from the MOA reporting a meagre 5% uptake in 2015 (MOA, 2018c). Low uptake has several causes: the subsidy program was competing with the simultaneous seed assistance program; the bottom-up recipient registration and proposal submission was slow; and farmers sometimes changed their seed preference at the start of a planting season, so that their preferred seeds were different from the ones in their original proposal (Darwis, 2017).

Seed assistance is expected to solve the low uptake issue and simplify the process by giving farmers free seeds. Seed assistance was part of MOA programs to boost productivity, notably the Special Efforts (*Upaya Khusus* or UPSUS) program to provide farmers with high-yielding inbred and hybrid rice seeds, hybrid maize seeds, and soybean seeds. UPSUS included other components, such as improvements to irrigation networks, land optimization, fertilizer provision, and tools and machinery provision. The UPSUS mandate ended in 2018 and seed assistance began to fall under a different program each year.

Despite these programs, adoption of high-yielding inbred and hybrid varieties is still poor, especially for rice. From the MOA's Statistics of Agriculture Infrastructure and Inputs 2020 (MOA, 2020b), the three most planted rice varieties in Indonesia are Ciherang (3.71 million hectares), Mekongga (1.54 million hectares), and miscellaneous local varieties (0.94 million hectares). None of these are hybrid, nor are they new varieties—Ciherang and Mekongga were released in 2000 and 2004. Official figures state that the average yields of Ciherang and Mekongga are

respectively 5–7 and 6 tonnes of dried unmilled rice (GKG) per hectare (Sasmita et al., 2020), though an interview suggests these varieties in reality yield about five tonnes per hectare (Interview 8). In contrast, the hybrid variety HIPA 21, released in 2019, has an average yield of 8.99 tonnes of dried unmilled rice per hectare (Sasmita et al., 2020). The popularity of local varieties might also be a concern for productivity, especially in the case of uncertified varieties with unknown yield potential.

Despite these programs, adoption of high-yielding inbred and hybrid varieties is still poor, especially for rice.

Low adoption of high-yielding and hybrid rice varieties may be explained by several factors on both the supply and demand sides. On the supply side, imports of certified seeds have been made conditional on the availability of domestic supplies, the production capacity of private seed producers is limited, and research and development of new varieties suited to local preferences is limited (Krishnamurti & Biru, 2019).⁸ On the demand side, farmer preference, as demonstrated by the dominant use of old varieties, seems to be driven by consumer preferences and farmers' culture.

Each rice variety has a certain texture, and farmers respond to diverse consumer preferences for rice by planting a variety of seeds. Krishnamurti and Biru (2019) provide an overview of how the

⁸ See Krishnamurti and Biru (2019) for an extensive discussion of hybrid rice availability in Indonesia.

preferred Javanese's texture compares to that in Sumatra, in Kalimantan, and in other parts of the archipelago. Ciherang results in fluffier rice, suiting the Javanese preference. Because Javanese is the dominant ethnic group and thus a large consumer segment, many farmers are probably catering to Javanese customers by growing Ciherang.

Rice farming appears also to be influenced by culture or habits. Some farmers feel culturally obligated to preserve local varieties, planting the same seeds over generations. In these cases, farmers can be reluctant to try new methods (Interviews 1, 3, 7, 8). This stands in stark contrast to maize, for which hybrid seeds make up 80–90% of the cultivated varieties in Indonesia (Syahrudin et al., 2020). Maize has transitioned from a staple foodstuff to industrial raw materials. The industrial use of maize may explain why the market for hybrid maize seeds has been easier to develop (Interview 1).

Most importantly, policy interventions have accommodated and reinforced existing preferences. As with fertilizer subsidies, seed assistance uses bottom-up planning that starts with farmers in a Farmer Group filling in a Farmer and Location Candidate (*Calon Petani Calon Lokasi* or CPCL) form.⁹ Therefore, the low uptake of subsidized seeds and meagre adoption of high-yielding varieties are the result not only of inefficient distribution, but also of the fact that distribution relies on farmers' proposals. Relying on farmer proposals is most likely to result in requests for tried-and-true methods rather than experimentation and education about more varieties.

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⁹ See Freddy and Gupta (2018) for a detailed description of seed assistance planning and distribution process.

ELIMINATION OF FERTILIZER SUBSIDIES

Many studies, including some published by the MOA, have acknowledged the economic and logistical inefficiencies and poor productivity improvements under the fertilizer subsidy (e.g., Armas et al., 2012; Kholis & Setiaji, 2020; Rachman & Sudaryanto, 2010; Rachman, 2012; Susila, 2010). However, the complete elimination of the subsidy remains unpopular. Most reformers have suggested improving the system through tweaks to improve targeting, supervision, and control of the distribution chain.

In 2016, a Special Working Group on Fertilizer Subsidy Policy (*Pokja Khusus Perumusan Kebijakan Subsidi Pupuk*) set up by the Coordinating Ministry for Economic Affairs submitted to the House of Representatives (DPR RI) its recommendation to gradually phase out subsidies over three years. The Working Group presented two scenarios: complete subsidy removal by 2019 or a gradual reduction until only 20% of Pupuk Indonesia's cost of goods sold (COGS) would remain subsidized from 2019 onwards. The removal was to be compensated by increasing the government's purchasing price of paddy (*Harga Pembelian Pemerintah* or HPP) by 5% annually. These recommendations were rejected by the House of Representatives (DPR RI, 2018; Susilowati, 2016).

Compensating for the removal of the subsidy by increasing the HPP may not sufficiently incentivize productivity and may even create other problems. CIPS studies have shown that the HPP is consistently below the market price at the farm gate (Octania, 2021; Respatiadi & Nabila, 2017). An increase in HPP is always matched by an increase in the farm gate price. This suggests that private traders maintain their profit margins by undercutting the government's ability to absorb paddy and rice (Graham, 2020). Increasing the HPP annually may lead to inflation via even higher rice prices for the consumers.

Political difficulties aside, the need to eliminate or phase out fertilizer subsidies is largely understood. The Special Working Group referenced the secondary market created by the price gap and fiscal savings as the main reasons for their recommendation (Susilowati, 2016).

Eliminating fertilizer subsidies will not immediately equalize fertilizer prices. Aside from its advantages as a state-owned company, Pupuk Indonesia enjoys dominant position in the Indonesian fertilizer market. In 2020, its national market shares for urea, ammonia, and NPK were 99.59%, 80.90%, and 54.31% respectively. The company also has a sizable presence in Southeast Asia with the market shares of 51.10%, 25.00%, and 45.00% for urea, ammonia, and NPK (Pupuk Indonesia, 2021). The large investment needed to build fertilizer plants provides a barrier to entry, leading to a highly-concentrated chemical fertilizer market with few big players. With urea sales almost entirely held by Pupuk Indonesia, the other players are left vying for smaller market portions of NPK or other compound fertilizers, usually for plantations rather than food crops.

Pupuk Indonesia's dominant market position motivates smaller producers to constantly innovate by offering different textures and coloring, improved formulas, and varying nutrient composition in order to find their niche in the market. They include importers like PT Meroke Tetap Jaya, which runs a small NPK processing plant blending base fertilizer sourced from Pupuk Indonesia's urea

with imported TSP and KCl. Despite its different size and target market, PT Meroke was confident that subsidy removal and the narrowing of the price gap will help them compete with the bigger players (Interview 9).

More recently, news outlets and official press releases reported that the DPR is calling for the removal of fertilizer subsidies and reallocation of the funds to output or price subsidies (DPR RI, 2021; Koran Sindo, 2020). This represents a change in legislators' position following President Joko Widodo's open discontent over subsidy ineffectiveness in early 2021 (Sandi, 2021). At the Indonesia Food Summit 2021, the West Sumatra Governor also expressed support for reallocating fertilizer subsidies to fund farming output.¹⁰

Details about what form output subsidies would take are scarce. Policymakers understand output subsidies as a price support. The mechanism is understood to take one of the following forms: 1) compensating farmers for the price gap when market price is below the HPP; or 2) rewarding farmers with payments per kilogram of output. Both mechanisms are flawed and unlikely to incentivize farmers to improve productivity.

Based on analysis from Susilowati (2016), compensating farmers for the price gap may have little effect since the market price of paddy is rarely below the government's HPP, as discussed above.

Similarly, rewarding farmers for each kilogram of output would only provide farmers with a small margin (about IDR 97,000 per farmer per hectare of harvest, according to Susilowati (2016)) since the additional earning per kilogram of paddy would be offset by higher fertilizer prices. This assumes that the per-kilogram payments are financed exclusively with savings accrued from the elimination of the fertilizer subsidy. Increasing output subsidies would mean increasing the overall fiscal cost and would introduce the danger of overproduction.

The European Union saw farm supplies exceeding domestic consumption, especially in the 1980s, as a result of state interventions under the Common Agricultural Policy (CAP). Since then, the CAP has abandoned market price supports in favour of direct payments. The CAP and its lessons are explained in Box 1.

¹⁰ A recording of the full-day event is available here: <https://www.youtube.com/watch?v=4xvze9ZUMew>. The governor's statement starts at around 02:14:00 mark.

Box 1

The European Union's Common Agricultural Policy: From Market Price Support to Direct Payments to Producers

The Common Agricultural Policy (CAP) represents the largest single budget item in the EU (Scown et al., 2020). Launched in 1962, the Common Agricultural Policy (CAP) aims to support farmers, improve agricultural productivity, ensure a stable supply of affordable food, tackle climate change, establish sustainable natural resources management, and maintain rural areas and landscapes while keeping the rural economy alive by promoting jobs in the agriculture and food sector. (European Commission, n.d.).

The CAP has undergone several reforms. During its early implementation, the policy guaranteed domestic prices to encourage production. This successfully boosted food production via public buy-in at a guaranteed target price (European Commission, 2015). However, since prices were guaranteed regardless of market demand, the policy resulted in huge commodity surpluses, with essential food stocks piling up from the late 1970s until the early 1980s. Dairy surplus stocks reached 32.70 million tonnes of whole milk equivalent by the end of 1983, or 35% of total milk production (Trostle et al., 1986). In Britain, the "butter mountain" led people to line up at local centers to obtain free EEC butter distributed through churches and charitable organizations for those in need, such as pensioners and the unemployed (Kirvan and Tuckman, 1987). Butter was redistributed at subsidized prices through Christmas butter sales and as exports to other countries, including the USSR (Baldwin and Wyplosz, 2019). In 1983, agricultural expenditure consumed 65% or 15.92 million European Currency Unit (ECU) out of the total European Community spending of 24.58 million ECU (Trostle et al., 1986).

CAP's first major reform in 1992 introduced a direct payment system and gradual reduction of price support. Direct payments were made based on the size of farms and the number of livestock. Farmers were also encouraged to switch to more environmentally-friendly farming practices (European Commission, 2018). In 2003, the EU introduced a mechanism known as "decoupling" through a second reform. This allowed farmers more freedom in answering to market demands as payments for the most part were no longer tied to the output type and amount produced.

Under the newest CAP reform in 2015, member states may still offer "coupled" support to maintain a certain production level in sectors or regions undergoing certain difficulties. Meanwhile, the per-hectare direct payment, which accounts for almost 70% of the total CAP budget, remains biased towards regions with high-income farmers and highest greenhouse gas emissions (Scown et al., 2020). In 2019, small European farmers protested for a gradual reduction in direct payments due to the perceived bias towards large farms (Schulz, 2019).

Despite its weaknesses and criticism, the CAP is unlikely to be eliminated in the near term. In fact, another reform targeting stronger environmental and climate aims is being discussed with a provisional start date of 1 January 2023.

POLICY RECOMMENDATIONS

These proposed recommendations aim at reforming the government's input interventions in order to:

1. avoid unintentionally encouraging the overuse of urea and its adverse consequences on soil quality;
2. provide a competitive market for private input producers in order to ensure sustainable supplies of quality inputs at a quantity that allows producers to reduce their purchase prices; and
3. incentivize farmers to choose an input combination to support maximum productivity and move towards self-sufficiency rather than reliance on government assistance.

“These goals are achievable via subsidy removal and a transition to direct payments, with a view toward program graduation in the long term once the input market is developed and farmers' input use and technological adoption reach their target levels.”

These goals are achievable via subsidy removal and a transition to direct payments, with a view toward program graduation in the long term once the input market is developed and farmers' input use and technological adoption reach their target levels.

Short- and Medium-Term Recommendations

These recommendations should be implemented for up to five years (a medium term in Indonesia's development planning) after the start of transition to direct payments. Intervention in this period should be dedicated to incentivizing optimal input use decisions by providing direct cost support through Farmers Cards and preparing the market to provide a consistent amount of diverse, high-quality inputs at affordable prices.

Remove fertilizer subsidies to eliminate the price disparity, open up competition, and increase input choices for farmers.

Fertilizer subsidies should be removed for reasons echoed throughout the paper: the subsidies 1) are not effective and cost-efficient in encouraging productivity; 2) preserve suboptimal input use decisions by incentivizing farmers to opt for cheap inputs regardless of soil characteristics and nutrient needs; 3) discourage competition in the input market via price disparity and special appointment to Pupuk Indonesia; and 4) are prone to leakages and corruption due to the long application and distribution process.

Since not all farmers have received the Farmer Cards, the first one to two years of the recommended pathway should allow for a gradual transition from the status quo to complete subsidy removal/direct payment. In this transitional period, MOA Regulation No. 28/2020 and other related regulations should be revised to reduce the subsidized COGS gradually.

Transition to direct payments paid via the Farmer Cards.

Once fertilizer subsidies are fully eliminated, direct payments should be the MOA's main tool for input intervention. Direct payments ensure farmers receive cost support while avoiding the downsides of subsidies. Direct payments are also superior to output subsidies, which are market-distorting and so expensive as to be unrealistic for Indonesia. Direct payments should fulfil the following criteria:

1. The direct payment takes the form of a single balance in the Farmer Card. Farmers can spend their balance on any fertilizer, seeds, pesticide, and other products sold at existing agricultural retailers (*Kios Pertanian*) without specific portions that must be spent on any given output. This levels the playing field for state-owned and private input producers by eliminating preferential treatment for Pupuk Indonesia and encourages farmers to base their input decisions on the specific input needs of their farms.
2. The direct payment amount should be based on a standardized farming cost reference, for example the average input costs per hectare by commodity (see Table 1), which may be adjusted for regional differences.
3. A simpler application to determine eligibility should replace the e-RDKK requests. Farmers should annually declare their identity, land area managed, and type of commodity cultivated. This collected data would be simpler to collect and check—for the most part administrative checks should be sufficient, eliminating on-farm verification except for significant changes or inactivity (balance unused)—and fewer actors would simplify the process. This should facilitate regular and predictable needs estimation, budget planning, and disbursement.
4. The balance represents monetary value but cannot be withdrawn as cash.
5. Existing rules for entitlement to fertilizer subsidies (farmers managing up to two hectares of land who are members of a Farmer Group) should be maintained as a basis for the direct payments, at least during the transition period when rising fertilizer prices may create shocks. In the future, the entitlement threshold may need to be re-adjusted based on the available budget and the relationship between land size and profitability.

Discontinue the Seed Assistance Program and focus on developing seed supplies.

There is no need for an additional assistance program to promote adoption of high-yielding seeds. A past study from CIPS showed that the government's free seeds programs and seed subsidies have been unsuccessful in promoting permanent adoption of hybrid rice seeds (Krishnamurti & Biru, 2019). This study also identified the issue with hybrid rice seeds as a supply side one, as marked by low production capacity. Public efforts should therefore be concentrated on the supply side, for example by collaborating with the private sector in research and development and relaxing seed import requirements.

Improve farmer knowledge on input use.

Not all problems of input use are attributable to farmers' cost-based decisions in a distorted input market. Another challenge is information failure: inadequate information about input quality or the effects of different inputs makes them much less likely to be used well. Extension services, offered by private companies, are partly a corporate strategy to educate farmers about how to apply the right input products given the challenges that farmers are facing. PT Meroke, for example, deploys agronomists to train farmers—it is only by promoting the benefits of their more tailored products that they can compete with cheaper subsidized fertilizer beyond a narrow market niche. Therefore, large-scale extension services, including those provided by private input producers, should be more available to promote integrated crop management and good agricultural practices to farmers.

Improve management of rural infrastructure and common resources.

Infrastructure also represents an important challenge. Public investments in large-scale reservoirs, canals, and tertiary irrigation systems need to be maintained. Equally important, Associations of Water-User Farmers (*Perkumpulan Petani Pemakai Air* or P3A) must have stronger institutional and entrepreneurial capacity to better manage the operations and management of tertiary irrigation. This should be done by improving the legal status of P3A to formalize its structure and responsibilities, by assisting P3As in developing operations and maintenance (O&M) procedures and service delivery standards, and by encouraging P3As to partner with local businesses to secure investments in water channel construction or pumps.

Adjustments to the irrigation service fee in order to support the strengthened role of P3As should be considered. Most farmers do not pay irrigation service fees, but as discussed earlier, they are willing to pay higher fees than those they currently shirk if service is improved.

Improve entrepreneurial capacity.

Finally, while funding assistance for organic fertilizer plants might be useful to increase organic fertilizer use and create rural opportunities, sustainable use of the facility depends more on entrepreneurial initiatives from the community than government assistance. Farmers need access to finance, business training, and infrastructure supports such as internet for marketing and access to ports and warehousing.

These recommendations on institutional strengthening and farmer's enterprise are in line with MOA's Strategic Plan (*Rencana Strategis* or Renstra) 2020–2024, where the strengthening of farmer enterprise (*korporasi petani*) is among its priority projects.

Program Graduation

A common drawback of assistance programs is that they tend to become permanent, creating reliance by recipients on these programs to always provide support and a perpetual drain on government coffers. A better approach is to recognize that interventions should have goals and deadlines. Once these goals are reached, or if the program proves incapable of achieving them by a predetermined deadline, there should be no reason to continue providing assistance.

Graduation refers to the transition from input assistance (direct payment) to full market mechanism and/or other programs targeting different aspects of Indonesian agriculture beyond productivity. An example is environmental sustainability, where an incentive payment might be made dependent upon current and historical fulfilment of certain criteria, such as share of organic fertilizer use, lower farm emission from reduced urea use, controlled pesticide use, and crop rotation. Surveys or data gathered from the use of Farmer Cards may be leveraged to supply this information. It is thus important that the Farmer Card's integrated data function be implemented consistently to support this long-term objective.

Program graduation as an exit strategy should be embedded in planning documents for MOA programs such as Renstra. In line with Indonesia's planning terms, program graduation should kick off after five years of direct payment implementation.

Elements of program graduation should include clear indicators of program achievement. They should be evaluated to determine whether the short- and medium-term recommendations have solved the initial market and information failures. The indicators should be designed to support an overall outcome. In this case, the desired outcome is that farmers possess and apply sufficient knowledge and means to use agricultural inputs more productively and begin to farm in a way that is sustainable without government support. This is verifiable through indicators such as share of farmers using fertilizer, farmers adopting new, high-yielding and/or hybrid seed varieties, affordability of input prices on the free market, and improvements in soil fertility.

Farmers or input markets in regions that have achieved these indicators should be considered "graduated", at which point they should no longer receive direct payments. Program graduation at the regional level could be planned for earlier dates than the five-year national deadline.



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INTERVIEW LIST

Interview 1 – Yuana Leksana, Corteva Agriscience (2021, May 6). Personal communication.

Interview 2 – Edwin, a chili farmer in Batam, Riau Islands (2021, May 31).
Personal communication.

Interview 3 – Heri Mustari, an owner of a fruit nursery and extension agent in Kubu Raya District, West Kalimantan (2021, June 1). Personal communication.

Interview 4 – Bambang Sayaka, researcher at the Center for Agriculture Social Economic and Policy Studies (PSEKP), MOA (June 7). Personal communication.

Interview 5 – Ahmad Dzuha, Project Officer for Rice at Rikolto Indonesia (2021, June 10).
Personal communication.

Interview 6 – Sumaryanto, researcher at the Center for Agriculture Social Economic and Policy Studies (PSEKP), MOA (June 11). Personal communication.

Interview 7 – Teddy Kristedi, intervention manager at PRISMA (2021, June 11).
Personal communication.

Interview 8 – Mohasin Kabir, Chief Technical Officer at PRISMA (2021, June 11).
Personal communication.

Interview 9 – Ermain, Chief Agronomist at PT Meroke Tetap Jaya (2021, July 15).
Personal communication.

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