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The Roles of Input Policies in Transforming Agriculture in Indonesia

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INTRODUCTION

Background and Rationale

Indonesian agriculture has experienced a significant structural transformation in the past four decades. The growth performance of the agricultural sector remains a moderate 4.0 percent per year in 2012, a significant increase from a 2.9 percent growth right after the global financial crisis in 2010. The performance of agricultural growth is the second lowest after the mining sector's growth of 1.5 percent. Agricultural performance is obviously lower than that of the manufacturing and service sectors, achieving 5.7 percent and 8.1 percent growth, respectively. The estate crops, fisheries, and food crops sectors have contributed to agricultural growth performance, mostly because the world price of such important commodities remains high, contributing significantly to the added value of agricultural sectors. However, in view of the quality of growth argument, a 4.0 percent growth is simply not adequate to generate more employment and alleviate poverty.

The current administration of President Susilo Bambang Yudhoyono (SBY) has issued several policies affecting the growth and performance of the agricultural sector under a package of "revitalizing agriculture." It has implemented a quadruple tracks strategy—pro-growth, pro-job, pro-poor, and pro-environment—that is an improvement from the triple-track strategy of the previous administration, adding the last expression of pro-environment. Subsidies on agricultural inputs, particularly fertilizer, seed, and some subsidized credit programs, are among the important policies to improve food and crop production and achieve food self-sufficiency in five strategic commodities: rice, corn, soybean, sugar, and beef. Although there has been no significant indication at the field level that these policies have led to radical changes in the market structures of input and industry performance, and hence structural transformation, the policies will continue until 2014, the end of the administration.

Some rationales for the input policies include the facts that the agricultural production system in Indonesia is highly dependent on small-scale farmers, who have limited access to capital, and a high diversity of farming systems in the country, implying serious complexities for increasing economies of scale and efficiency levels. The majority of small farmers are rice farmers, with about 9.5 million farm households controlling agricultural land of 0.5 hectare or less. These rice farmers make up about 53.6 percent of the total 17.8 million farm households. The second largest farm household in Indonesia is corn farmers, contributing 21 percent of the total, although the two crops of rice and corn are not mutually exclusive. Rice in Indonesia is produced in 11 rice production centers: Aceh, North Sumatra, West Sumatra, South Sumatra, Lampung, West Java, Central Java, East Java, Bali, West Nusa Tenggara, and South Sulawesi. Nearly 60 percent of rice production in Indonesia comes from Java and Bali, islands with large urban populations and well-developed market infrastructures.

The use of modern inputs and relevant technology in the agricultural production system is ultimately important for such a large country as Indonesia. This means that relying on agricultural production to increase crop intensity, let alone slow the expansion of new agricultural land, is clearly not the answer for the huge challenge of food security in the future. Indonesia needs more sound input policies and, more importantly, progressive technological change to transform the agriculture for the future. This study will identify and explain the following problems. Subsequent research questions will follow, which will drive the operational objectives of the study.

(a) Key drivers of changes in agricultural input policies are not clearly identified.

Agricultural input policy is obviously an integral part of agricultural development in the modern history of Indonesia. All government administration regimes have put emphasis on strategies to increase food production and achieve self-sufficiency. The use of modern inputs, particularly high-yielding seed and chemical fertilizer, has played an important role in the performance of agricultural development. Studies have suggested that programs of mass guidance (BIMAS) and mass intensification (INMAS) and their derived programs during the first 50 years of Indonesian independence have somehow shaped the level of agricultural input uses. During such a golden period, the phenomena of Green Revolution technology have influenced the massive use of chemical fertilizer and high-yielding inputs. Inevitably, the government has to employ a great amount of fertilizer and seed subsidies, in addition to credit subsidies during the early stages of crop production cycles and infrastructure development in rural production centers. In the 1980s, the government also adopted the success of agricultural input use in food crops into its cash crop development strategies, where small farmers received subsidized seedling and fertilizer to increase their cash crop production and improve the value of exports.

These subsidy programs were terminated during the Asian economic crisis in the 1990s, when the economic policy in Indonesia was directly supervised by the International Monetary Fund (IMF). Direct policy intervention from the IMF removed the fertilizer subsidy, but increased the amount of funds for a social safety net, including the Rice for the Poor (*Raskin*) program. However, when the agricultural sector's performance began to lag, the government reinstated the input subsidy in 2003, but sharpened the target beneficiaries to include only farmers with landholding of 2 hectares or less. An agricultural development program has been on the radar screen of the government administration since the global food crisis in 2008, which coincidently occurred in conjunction with the El Niño drought in 2007–2008. The program also aimed to provide compensation for farmers affected by the long drought. In all, the government has increased its budget allocation for the agricultural sector, instituted a rice subsidy for the poor, and started several programs to improve productivity.

During the previous administrations before *Reformasi*, government policy was implemented through strong command and order from the top to regional and district levels. There may be some deviations from the direction formulated by the central government, but the bureaucracy staffs are fully responsible for the success and failure of the government program. After the fall of Soeharto in 1998, the government system became radically decentralized, so that the central government has limited authority, including shaping the input policy for food security and agricultural development in general. Similarly, the political system has also changed drastically from a shadow democracy of three political parties—but the government party was the majority—into a full procedural democracy of multiparty political system. Hence, the parties' political considerations and interests have increased significantly during the past decade. The policy on input subsidies may be a compromise of political dynamics and consensus among the political parties and some bureaucratic leaders. In short, the current bureaucratic administration may not be compatible with the multiparty and decentralization government system. Agricultural development program, hence agricultural input policies formulated at the central level is not always translated into actions at the provincial and local government level. The subsequent research question to be answered in this study is what are the key drivers of changes in seed and fertilizer policies in the modern history of Indonesian agriculture?

(b) Macroeconomic implications of input policies is not well documented.

An agricultural input policy that uses a heavy subsidy, such as that implemented in Indonesia, has significant macroeconomic implications, not only in terms of the state budget but also in terms of a high dependency on chemical inputs and inefficient outcomes. The fertilizer subsidy has increased nearly tenfold during the two terms of President Susilo Bambang Yudhoyono's (SBY) administration. The amount of fertilizer in 2013 was about Rp 17 trillion (US$1.7 billion), with plans to increase it to over Rp 21 trillion (US$2.1 billion) in 2014, nearly 10 times that of the Rp 2.5 trillion (US$25 billion) subsidy in 2005. The amount of subsidy for seed also increased tremendously, from Rp 60 billion (US$6 million) in 2012 to Rp 1.45 trillion (US$145 million) in 2013. The amount of seed subsidy is planned to increase to Rp 1.6 trillion (US$16 billion) in 2014, also a nearly tenfold increase from the Rp 145 billion (US$14.5 million) subsidy in 2005. The major decrease in seed subsidy in 2012 was mostly because the 2011 program implementation failed and rice production experienced a significant decrease of more than 1 percent from the previous year of 2010. The amount of the subsidy is, of course, far below the amount of the energy subsidy, which reached Rp 300 trillion (US$30 billion), with serious consequences for the state budget, development programs, and social welfare.

Previous studies of fertilizer subsidies indicate that farmers have been trapped in a dynamic disequilibrium in actual fertilizer application because they have been used to a relatively cheap price. The large amount of fertilizer subsidy is allocated at the expense of providing support in public goods and empowerment programs that matter more to farmers and agricultural development. These include irrigation infrastructures, expansion of rice fields, research and development (R&D), extension service systems, agricultural and

rural finance, and microcredits (Arifin 2013). The effects of such subsidies on the input market depend on input supply elasticity, and this in turn will depend on structure, conduct, and performance in domestic production and imports (Dorward 2009). The cost associated with the fertilizer subsidy program has outweighed the benefit from achieving higher rice yields in both fiscal and economic perspectives (Armas et al. 2012). The fertilizer subsidy under the current regime has benefited both small and large farmers so that the policy is regressive and the 40 percent largest farmers capture up to 60 percent of the total subsidy (Osorio et al. 2011).

Moreover, the price disparity between subsidized and nonsubsidized agricultural inputs has led to imperfect market segmentation among farmers, as the final consumers. Similarly, the price difference between domestic subsidized fertilizer and fertilizer in the international market have also led to smuggling and the illegal export of fertilizer to neighboring countries. A high dependency on subsidy among fertilizer producers, which are all state-owned enterprises, has become a negative incentive for manufacturers to innovate, invest in producing and distributing fertilizer more efficiently, and diversify their products for more sustainable agriculture, such as organic and biological fertilizers. Therefore, the study will answer the question, what are the macroeconomic implications of input policies in different regimes of policy administration?

(c) Information on the process of developing input policies for agricultural development is scant.

A policy is not only about an academic or a government decision as a response to a current situation; it also involves a very complex process of interaction, debate, fight, compromise, and consensus among political, business, academic, and civil societies. As explained previously, each government administration has some unique agricultural input policies, although the objectives do not differ very much—that is, to increase production, achieve self-sufficiency, and improve farmers' welfare. The way a government regime formulates, organizes, and implements the policy is very much dependent on the capacity of the actors involved, the degree of communication and interaction among the actors, and the effectiveness and smoothness of the policy process. Nevertheless, studies that document the policy process of agricultural input policies in Indonesia are disappointingly scant. The political economy analysis of such important aspects of agricultural input policies is not much documented.

The significance of agricultural input subsidies to increase agricultural production, and thus meet specific government programs, may be known. For example, the literature documents gas subsidy to fertilizer producers, fertilizer distribution and zoning, and maximum retail price (MRP or HET, *harga eceran tertinggi*) of subsidized fertilizer to farmers. However, how the government decided to implement the dual pricing system for subsidized and nonsubsidized fertilizer, and the complexity of the program implementation in a huge country such as Indonesia, is not very well analyzed. Similarly, how farmers and/or farmers' groups propose the amount of fertilizer subsidy on the basis of the size of operated land (RDKK) is not well documented.

Meanwhile, the standard triangle of public policy process in agricultural inputs for food security and agricultural development involving policy formulation, policy implementation, and policy evaluation may be well known. However, who serves as the policy actors involved in agricultural inputs and how these actors fit in the above public policy process obviously need more careful observation and rigorous policy analysis. At least, these actors should operate at the appropriate level, depending on their hierarchical place in public policy concerns, whether on a strategic-political level, an organization level, or an implementation level. Since the era of decentralized government after the *Reformasi*, technical details on policy implementation of agricultural inputs require more investigation at the level of government, whether at the central, provincial, or local level, and the third parties involved, if any. For example, the amount of subsidized high-yielding seed produced by the state-owned seed manufacturers is very dependent on the bottom-up policymaking process at the local and provincial levels. The following question is quite valid: how does the policy process of fertilizer and seed inputs contribute to agricultural development in Indonesia?

(d) Policy constraints in promoting the seed and fertilizer industries are quite complex.

The difference between the development stage of the seed industry and that of the fertilizer industry is mostly due to the historical level of state intervention in each industry. Two seed companies that belong to the state are PT Sang Hyang Seri (SHS) and PT Pertani, which have been involved in the process of agricultural transformation for the past half century. These companies have close collaborations with public universities and agricultural research institutes under the coordination of the Agency of Agricultural Research and Development (AARD) at the Ministry of Agriculture. The development of new high-yielding seed at the field level requires seed propagation performed by farmers or farmers' leaders across farmers' groups in Indonesia. Officials from these companies and from the Ministry of Agriculture and provincial and local government are responsible for quality controls and the release of high-yielding varieties

from the propagation process. For marketing and distribution of new high-yielding varieties, these two seed companies have also involved other agencies at the Ministry of Agriculture, especially the agricultural extension agents, who helped in the field trials, training, and visits to farmers and farmers' groups.

Since the 1980s, private sectors, especially foreign-affiliated seed companies, have also been involved in developing high-yielding maize seed, particularly hybrid maize, and distributed it to farmers. Farmers across the country have responded very well to such initiatives and started growing hybrid maize. Private seed companies also develop high-yielding seed in horticulture, particularly for fruits and vegetables. Amazingly, the seed industry in the horticultural sector has developed quite well over the past decade. These private companies develop the seeds mostly in their own laboratories, research facilities, and field trials. Sometimes these companies collaborate closely with public universities and research institutes. Only in one case do private companies involve farmers' groups for seed propagation purposes, but they enforce strong monitoring and evaluation procedures because of their proprietary rights.

Since the 2000s, some private foreign companies have also been developing transgenic seeds, especially in maize and cotton, although the process of field trials and policy formulation has not been as smooth as it should be. After a long interruption, the development of high-yielding seed using biotechnology principles has recently been reintroduced, after local universities and research institutes conducted intensive research at the laboratory level. Some researchers have been collaborating with private-sector companies to develop new high-yielding seeds and to develop the seed industry in general. However, further development of the seed industry is constrained by unclear policies on biotechnology usage. Although Indonesia has ratified the Cartagena Protocol on biotechnology development, the implementation policy at the field level is not clearly defined.

Unlike from the seed industry, the fertilizer industry in Indonesia has made significant progress over the past four decades under PT Pupuk Indonesia (formerly PT Pusri Holding). The holding company has five subsidiaries: PT Pupuk Iskandar Muda and PT Pupuk Sriwijaya in Sumatra; PT Pupuk Kujang and PT Pupuk Petrokimia in Java; and PT Pupuk Kaltim in Kalimantan. Given the historical background of these five state-owned enterprises and heavy subsidies for the fertilizer industry, the private sector is not interested in establishing a fertilizer producing plant. These state enterprises are also involved in the development of organic fertilizers by employing farmers and/or farmers' leaders of farmers' groups across the country. The state enterprises sometimes provide microbes for mixing the manures and composts and perform quality controls, and sometimes brand the organic fertilizers. Indonesia has also developed a biological fertilizer in a three-way partnership among public universities, research institutes, and government agencies. However, the biofertilizer industry is in an early stage of development, particularly because some early biofertilizer products were unsuccessful in the market. The immediate question to be answered in this study is, what are the policy constraints to promoting the seed and fertilizer industries in Indonesia?

(e) Strategies to improve the policy environment are not well formulated.

Strategies to improve the policy environment for the roles of agricultural input in agricultural transformation in Indonesia cannot be separated from the process of policy formulation, policy implementation, and policy evaluation. Ideally, the policy environment should be improved when policy outcomes in the field and ideal conditions simulated in academic exercises deviate quite significantly. The stakeholders—that is, the gainers and the losers of agricultural input policy—could be identified quite well by careful and rigorous policy analysis. Similarly, the quantification of the benefits and costs of agricultural policy inputs, particularly in terms of agricultural output by different stakeholders, could also be determined through field observations and economic analysis. These results need to be compared to the ideal conditions formulated at the ideological and theoretical level and imagined interactions among political, business, and civil society. A policy change needs to be recommended, focused either on the policy contents based on the analysis results or on the policy context and environment based on continuous communication and advocacy of the stakeholders, particularly to high-level policymakers at the formulation level and to policy implementation actors at the field level.

One should note that improving the policy environment for promoting sound input use should be based on the facts that agricultural input subsidies are not a short-term "quick fix." Given the long history of the roles of agricultural inputs to food security and agricultural development in general, agricultural input subsidies in Indonesia should not be totally removed. The agricultural input policy needs to be sharpened for both target beneficiaries and disbursement mechanisms, which obviously require a policy environment that promotes sound input use in a democratic and decentralized government administration. Therefore, the study will specifically answer the question, what are the strategies to improve the policy environment to promote sound input use?

Research Objective

The objective of this study is to examine more comprehensively the role of input policies, mostly for seed and fertilizer, in transforming Indonesian agriculture. More specifically, this study will

1. identify key drivers of change in seed and fertilizer policies in the modern history of Indonesian agriculture, especially since the 1970s,
2. analyze macroeconomic implications of input policies in different regimes of policy administration,
3. examine policy processes on agricultural inputs (fertilizer and seed) to contribute to agricultural development in Indonesia,
4. identify key policy constraints in promoting the seed and fertilizer industry in Indonesia, and
5. formulate strategies to improve the policy environment to promote sound input use.

Methodology: Approach and Framework

The study combines desk analysis, literature studies, and in-depth interviews with relevant resource persons from the government, private sectors, academics, farmers' associations, concerned groups and community organizations, and relevant stakeholders in the fertilizer, seed, and other input industries in the country. This detailed approach and framework are outlined as follows.

Desk Studies: This reviews previous studies on seed and fertilizer policies (with the team) that affect agricultural performance. Basically, this step examines drivers of changes in seed and fertilizer policies in Indonesia (since the 1970s). This desk study will answer the first and second questions outlined above.

Policy Analysis: The analysis examines the policy process, context, and inputs imposed by different government administrations. This policy analysis will answer the third, fourth, and fifth questions.

In-Depth Interviews: These informal but thorough interviews with key resource persons from government, academics, private sectors, and farmers will confirm, calibrate, and verify some findings of the study.

Organization of the Report

After this introductory chapter, Chapter 2 provides an overview of Indonesian agriculture by thoroughly analyzing its role in the country's economy from an economic policy and historical perspective. The section on the structural transformation in modern Indonesian history examines the four stages based on economic theory: (1) the early "Mosher" stage of "getting agriculture moving," (2) the "Johnston-Mellor" stage of the contribution of the agricultural sector to economic growth through a variety of linkages, (3) the "Schultz" stage of rapidly growing the nonfarm economy above the rising rate of agricultural income, and (4) the "Johnson" stage that has not been achieved fully by the Indonesian economy, primarily because of labor and financial markets. Chapter 2 also provides a comprehensive overview of seed and fertilizer on the pathways of agricultural input policy to achieve agricultural development objectives.

Chapter 3 clearly identifies key drivers of changes in agricultural policy in various government regimes. The section on the origins of agricultural input policy examines thoroughly each key driver of the changes, namely (1) the agricultural development strategy, (2) major long droughts, (3) the economic crisis, and (4) the multiparty political system. A historical matrix of these key drivers is presented in a table to cover different components of all four major government administrations, followed by an explanation on different dimensions of the drivers. The argument continues with an analysis of the benefits and drawbacks of agricultural input subsidies, both in theoretical and in empirical terms. The chapter also analyzes the macroeconomic implications of agricultural input subsidies, especially from the perspective of the state budget and allocation efficiency issues in public spending. Given the strategic objectives, agricultural input subsidies should not be totally removed in Indonesia, but rather need to be sharpened and implemented more appropriately in the field.

Chapter 4 examines the policy process of agricultural input subsidies and its contribution to agricultural development and the Indonesian economy in general. The section starts by examining the context and contents of input policies, emphasizing, but not limited to, the performance of the current government administration of President Susilo Bambang Yudhoyono (SBY). The section on policy actors in input use for food security covers the strategic and political level, the organization level, and the implementation level. Key policy constraints in promoting the seed and fertilizer industries in Indonesia are also analyzed comprehensively, primarily regarding the biotechnology development controversy and the persistent scarcity of fertilizer despite high amounts of subsidies. Finally, the chapter examines the roles of policy formulation, implementation, and evaluation in improving inputs for agricultural development. Improving these processes is an integral step in promoting sound input use.

Chapter 5 provides a conclusion and recommendations for improving agricultural inputs and transforming the agricultural sector in Indonesia.

OVERVIEW OF INDONESIAN AGRICULTURE

The Role of Agriculture in the Indonesian Economy

Agriculture has played a very important role in the national economy, especially since the modern era of the 1970s. All subsectors—food crops, cash crops, livestock, and fisheries—show significant increases, more rapidly in the 1980s, then a bit slower in the 1990s, before returning to moderate in the early 21st century. The sources of agricultural growth in Indonesia include land area expansion, technological change (Green Revolution), infrastructure development (irrigations, roads, bridges, and so on), and public goods (research and development and extensions).

Indonesian agriculture has performed quite well in the past decade, surviving the Asian economic crisis at the end of the 1990s. In the 1980s, agriculture grew more than 6 percent per year, brought about by most subsectors of food crops, cash crops, livestock, and fisheries. Indonesian agriculture once again survived the world food crisis of 2008, and food crops, especially the rice sector, have performed quite well, achieving growth in production of more then 4 percent during the world food crisis.

Since the food crisis, Indonesian agriculture has grown at around 3 percent per year. In 2008, all sectors performed very well, except for forestry, which grew at 4.8 percent per year, mostly due to high food prices in the global market. Export earnings from crude palm oil, coconut, coffee, cocoa, rubber, shrimp, and fishery products contribute to the growth of the Indonesian economy. The sector declined to 4.0 percent per year in 2009, after global prices returned to "normal" (or, more precisely, declined). The growth performance of the agricultural sector remained moderate at 4.0 percent in 2012, mostly due to cash crop sectors and plantations.

In general, food crops contribute significantly to overall agricultural performance. The present share of rice in the economy is not as large as it was in the 1970s. Nevertheless, rice has been and remains a political commodity, where a shock in price and production performance usually creates political tensions and public debates. All political leaders have used food security approaches in the implementation of economic development strategies.

Table 2.1.1 shows the production of strategic foods—rice, maize, soybean, and sugar—from 2008 until 2012. For rice, the most important food crop in Indonesia, production in 2012 was 69.4 million tons of dry paddy or non-husked rice, equivalent to about 39.3 million tons of rice, well above sufficient for the total consumption of 27.5 million tons (using the consumption data of 113.5 kg per capita) or 33.7 (using the consumption data of 139.2 kg per capita). Generally, people are now more critical of the official published data, as the government, through the state owned-enterprise BULOG, imported in 2012 about 1.3 million tons more rice than Thailand and Vietnam, although it was claimed only for buffer stock. Micro problems in the rice economy are mostly due to production inefficiency at the farm sector, very small landholding size, and poor financial access.

Table 2.1.1—Production of strategic foods in Indonesia, 2008–2012

Strategic Foods	2008	2009	2010	2011	2012
Rice					
Harvested area (ha)	12,327,425	12,883,576	13,244,184	13,203,643	13,445,524
Productivity (ton/ha)	4.89	5.00	5.01	4.98	5.15
Production (ton dry paddy)	60,325,925	64,389,890	66,411,469	65,756,904	69,056,126
Maize					
Harvested area (ha)	4,001,724	4,160,659	4,131,676	3,864,692	3,957,595
Productivity (ton/ha)	4.08	4.23	4.43	4.56	4.90
Production (ton dry grain)	16,317,252	17,629,748	18,327,636	17,643.250	19.387.022
Soybean					
Harvested area (ha)	590,956	722,791	660,823	622,254	567,624
Productivity (ton/ha)	1.31	1.25	1.24	1.37	1.48
Production (ton dry bean)	775,710	974,512	907,031	851,286	843,153
Sugar					
Harvested area (ha)	436,505	441,040	435,000	430,000	440,000
Productivity (ton/ha)	6.11	5.70	5.11	5.27	5.22
Production (ton sugar)	2,668,428	2,517,374	2,300,000	2,270,000	2,300,000

Source: Central Agency of Statistics (BPS), various years.

The second most important food crop in Indonesia is maize, where the production in 2012 was 19.3 million tons, primarily due to an increase in harvested areas in maize production centers in Java, Sumatra, and Sulawesi. Increasing the use of hybrid seed and other results of (traditional) biotechnology brought about an increase of nearly 1 million hectares of harvested area of maize. Indonesia is now preparing to increase the use of (modern) biotechnology, where genetically modified organisms have been in the forefront of public debates and high-level discussions. Increasing maize production also has a positive impact on the poultry and livestock sectors, where the feed industry has developed significantly in the past decades or so. Small-scale meat producers do not have to rely on imported feed, which experienced significant price increases, especially during the global crisis. Livestock Revolution has achieved some progress since the 1980s, but the dualistic structure remains problematic in the poultry industry, and industry restructuring policies face several significant challenges. Meat production is growing, but far less than the consumption level, which has shown an increasing trend in the past decades. Indonesia is now struggling to achieve self-sufficiency in beef in 2014, although there was some political controversy on import policies and nongovernance cases in 2012.

Soybean production has been decreasing in the past decades, reaching only 843 thousand tons, and it will be nearly impossible to achieve self-sufficiency in 2015 for the annual consumption of more than 2.5 million tons. Indonesia has been importing soybean from the US, Argentina, and Brazil. During the 1980s and 1990s, soybean imports were controlled by the logistics agency (then BULOG), but now are more open to the private sector. The high import dependency on soybean has caused suffering in Indonesia due to the global fluctuation in soybean prices, which is associated with fossil fuel prices, and hence biofuel prices in the world market. A soybean price surge in 2008 created instability in the domestic soybean economy, especially the sustainability of tofu and tempeh production as the staple foods of most Indonesians. The US drought in 2012 once again caused imported soybean prices to soar. The government has to carefully formulate a trade policy on soybean imports, as this commodity is one of Indonesia's special products (SPs), the country's commitment in the World Trade Organization negotiations.

Sugar production is about 2.3 million tons, while total consumption is about 4.9 million tons (2.7 million tons for households and 2.2 million tons for industry, consisting of 1.1 million tons for large-scale industry and 1.1 million tons for small-medium enterprises, or SMEs). After the sugarcane mass intensification policy (*Tebu Rakyat Intensifikasi*, TRI), best farming practices at the farm level are far below standards, due to poor availability of production factors, fertilizers, and pesticides; access to capital; and market-level and large-scale economic infrastructures. Competitiveness of sugarcane domestic production is decreasing so that extra efforts are needed to seek alternatives to upland sugarcane, especially outside Java. Indonesia will need to seriously target structural problems in harvesting, processing, and governance systems if it is to achieve self-sufficiency in 2014. The refinery industry creates new complexities in the sugar industry as well, with five new sugar refinery plants (four plants with 70 percent utilization of capacity), three completed in 2009. The industry is not required to pay an import tax, even for palm sugar. Sometimes they obtain status as a producer's importer (IP) to deliver sugar for local food and beverage industries, primarily foreign-affiliated companies. Foreign-affiliated food and beverage companies have specific requirements for imported sugar, which are usually set by headquarters. The refined sugar theoretically has to be transported directly to the food and beverage industry. However, poor governance, monitoring, and enforcement in trade and distribution policies have contributed to the instability of sugarcane prices at the farm-gate level.

Indonesian agricultural export commodities are in different stages of competitiveness and sustainability. The competitiveness of crude palm oil (CPO) is the highest among all agricultural exports, a logical consequence of Indonesia's fast-growing production and export and now the largest in the world. CPO production in 2011 was about 24 million tons, growing at 5.1 percent per year, which is far ahead of that of Malaysia, with less than 20 million tons. However, the productivity gap between smallholders and large-scale plantations created land conflicts in the field and accusations of carbon emissions; declining natural forests have also contributed to the sustainability challenges of the CPO industry in Indonesia. Some major palm oil businesses in Indonesia are members of Roundtable Sustainable Palm Oil (RSPO), a major certifying body in palm oil trade. Interestingly, the Indonesian Palm Oil Association (IPOA, or locally known as GAPKI) has withdrawn its membership in RSPO, and instead become a co-promoter with the Indonesian government for the new and mandatory certification system of Indonesia Sustainable Palm Oil (ISPO).

A trend of CPO price increases in the world market has increased the country's export level to 18 million tons, which will probably change the structure of international trade policy in the near future. However, the CPO sector is now facing problems in low productivity, dual-structure systems between smallholder and large-scale producers, availability of high-productivity seedling, and an unsuccessful policy in the domestic market obligation (DMO) on CPO provisioning. The share of smallholder palm oil farmers has decreased to only 41 percent, while the share of large-scale plantations has increased to 48 percent; the remaining 11 percent are state-owned enterprises, which are tending to decrease. In addition, the allocation of "foods versus fuels" has now become more real than it was 10 years ago. The industry has to strengthen research and development (R&D) to adjust its strategy to meet the growing demand

in the world market. However, an unclear pricing policy of biofuels has somehow hindered the market development of the palm oil industry.

Other agricultural export commodities are not as advanced as palm oil in terms of competitiveness and sustainability principles. Coffee ranks second in terms of export earnings from agriculture, but growing coffee consumption and changing lifestyles among urban communities will shape different stages of competitiveness and sustainability. Major buyers and actors in world coffee supply chains have been aggressively promoting some changes in corporate environmental governance in the coffee industry. Rising concern for sustainability standards has emerged very rapidly in the past two decades, probably because of the dynamics of private sectors and multinational corporations. Certification and labeling systems are also expanding rapidly in the global food sector, as the environmental and social standards in the coffee economy have serious and long-term implications for the sustainability of natural ecosystems in the tropics and the livelihood of coffee producers who are mostly smallholder farmers. Supply chain verification schemes currently operating in the Indonesian coffee trade include Organic, Fairtrade, Rainforest Alliance, Utz Kapeh, and Starbucks CAFÉ Practices, all of which attempt to address environmental (and social) concerns at the site of production through market signals sent by buyers along the supply chain. The latest certifying partnership introduced to the Indonesian coffee sector is the 4C (Common Code for the Coffee Community), which intends to foster sustainability in the "mainstream" green coffee chain and to increase the quantities of coffee meeting basic sustainability criteria of economic, environmental, and social concern. Nevertheless, these global partnerships in the coffee sector are sometimes viewed as competition among coffee partnership buyers in the north to ensure a sustained coffee supply from the producing countries in the south.

The Indonesian cocoa sector has been in a revitalizing process to restore its major role in export earnings for small-scale cocoa farmers to what is was in the late 1990s. The National Movement (*Gernas*) to increase cocoa production, initiated in Sulawesi in 2009, by developing tissue culture for cocoa seedling, increasing farmers' capacity building, improving agricultural practices in the field, and increasing the cocoa bean quality, may provide better avenues to improve the competitiveness of the cocoa industry in the future. Sooner or later, the global certification partnerships will extend their operations in Indonesia because the market demand for cocoa will require higher sustainability standards and other requirements of global environmental governance. However, when the current government administration imposes an export tax on cocoa to develop downstream processing industries domestically, the net outcome to improve the competitiveness may not be as good as the initial intention, mostly because of limited efforts to improve the marketing structures and domestic supply chains of the cocoa market.

The competitiveness of the rubber economy has not developed as required to be a major source of export earnings and farmer livelihood in Indonesia. Rubber exports are dominated by primary products of latex and slab, tapped directly from the rubber tree. These primary products are of low quality, as they are sometimes mixed with sand and wood debris, making economic returns quite small. Domestically, the harvested area of rubber has been under pressure, partially due to land competition with fast-growing and more profitable crops such as palm oil. Since 2007, the government has been trying to solve these quantity and quality problems in rubber production by providing subsidized credit for rubber replanting and enforcing a quality control on rubber products that went into effect in early 2000. However, after more than a decade of implementation, product quality efforts are mainly in the hands of farmers who have grown clonal rubber seedlings, not by the majority of rubber farmers who have been dependent on traditional seedlings. Efforts to increase the added-value have not been quite successful because the investment climate and the business environment in general have hindered the development of downstream rubber industries. The business climate is also associated with government policy strategies to promote investment in such prospective sectors and to contribute to industrial development in general. The rubber-based industrial development is obviously related to many segments of economic policy, including technological advancement, information systems, financial institutions, legal issues, and enforcement structures.

An example of this complexity was the decline in rubber production in 2009 due to an "adjustment process" in the world market after a record high price of oil and gas during the global economic crisis of 2008. The demand for synthetic rubber was back to normal in 2009, so that the price of rubber dropped significantly to a record low of US$1.61/kg. This low price of rubber, coupled with pressure to convert rubber trees into oil palm trees, contributed significantly to the decline in rubber production in 2009. After the international price rebound to over US$3/kg in 2010 and above US$4/kg in 2011, natural rubber production increased steadily. Similarly, a sudden decline in coffee production in 2009 was also associated with the global crisis and price signals received by coffee farmers in producing countries. However, an increasing world price of these commodities since 2010 has been met with increased production.

The strong world demand for coffee and an increasing price that reached US$2.25/kg for Robusta and US$4.95/kg for Arabica coffee should provide significant incentives for farmers to increase coffee production and productivity. Similarly, an increasing price trend for natural rubber of US$4/kg and a rebound in cocoa price of US$2.36/kg, after a significant decline in 2011, would increase the

production of agricultural export commodities this year. The price of rubber reached US$4.32/kg in early 2012, a significant decline compared to the average of US$4.82/kg in 2011. However, Indonesian agricultural export commodities continue to face various challenges, most of them structural in nature, such as low-yielding smallholder crop systems, sustainability pressures, low quality of production, underinvestment, inadequate infrastructure, underdeveloped agricultural practices, and restrictive government policies.

Structural Transformation in Modern Indonesian History

Agriculture has played a very important role in the national economy, even though its share of the gross domestic product (GDP) has declined as the economy has grown. Economists normally attribute the decline to either a push factor or a pull factor. A push factor has a negative connotation and poverty implications, where agriculture cannot accommodate the growing numbers in the labor force, so that resources move out from the agricultural sector to more rapidly growing sectors in the economy. A pull factor implies that nonagricultural sectors have more attractive employment opportunities, primarily due to differences in factor endowments and capital accumulation. Structural transformation in the Indonesian economy has not occurred smoothly, especially in the past decade. Table 2.2.1 shows that Indonesian agriculture has experienced a declining share in the GDP, from 30 percent in 1975 to about 23 percent in 1985, and 14.8 percent in 2012. The declining share of agriculture in the Indonesian economy is also consistent with the increasing share of industry and service sectors in the economy.

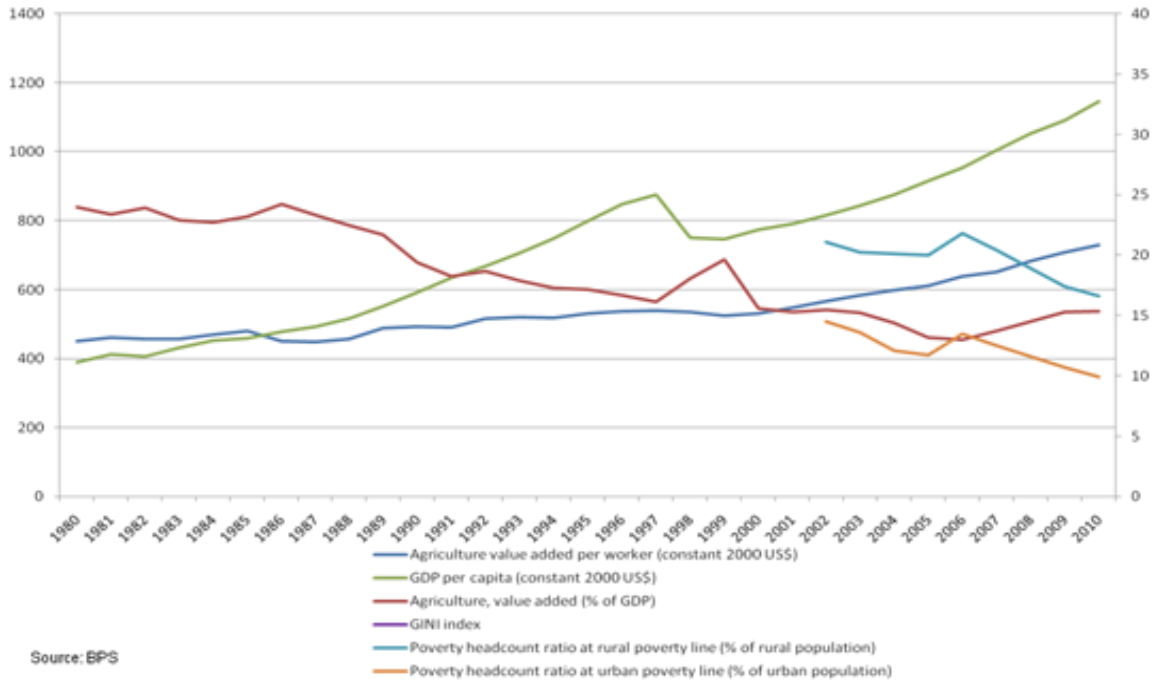
Table 2.2.1—Agriculture and structural transformation in the economy, 1975–2012

	1975	1985	1995	2000	2005	2012
1. Share of GDP (%)						
▪ Agriculture	30.2	22.9	17.1	17.0	13.1	14.8
▪ Industry (manufacturing, etc.)	33.5	35.3	41.8	47.0	45.8	40.2
▪ Service	36.3	42.8	41.1	36.0	39.8	45.0
2. Share of employment (%)						
▪ Agriculture	62.0	56.0	46.0	44.0	42.5	39.0
▪ Industry	6.0	9.0	12.8	13.0	13.0	13.5
▪ Service	32.0	35.0	43.2	43.0	44.5	47.5
3. Investment in agriculture (% total)						
▪ Fertilizer subsidy	n.a.	4.4	1.6	0.7	1.2	4.0
▪ Irrigation infrastructures	n.a.	18.1	10.2	10.4	11.1	12.2

Source: The share is calculated from BPS data, various issues. Investment data are from the Ministry of Finance on the State Budget, various issues.

The manufacturing sector (including mining) contributed to about 38 percent total of the GDP in 1975, rising to 44 percent in 1985 and over 60 percent in 2012. The declining share of agricultural GDP relative to the national economy was much faster compared to the declining share of employment in the agricultural sector. This phenomenon is an indication that the structural transformation has halted, as the source of economic growth during the past five years was in the service sectors. Because these sectors are less labor-intensive than the agriculture and manufacturing sectors, excess labor forces in the agricultural sector cannot go anywhere but stay in agriculture or become disguised unemployment. Limited efforts of value addition in agricultural products and slow diversification of the agricultural export base are among contributing factors of such imbalanced structural transformations in the Indonesian economy. Figure 2.2.1 shows the transformation of Indonesia agriculture in the past three decades.

Figure 2.2.1—Transformation of Indonesian agriculture since the 1980s



Barrett (2011) identifies the evolving four basic stages of agricultural development, (1) the early "Mosher" stage, when "getting agriculture moving" is the main policy objective; (2) the "Johnston-Mellor" stage, when agriculture contributes to economic growth through a variety of linkages; (3) the "Schultz" stage, when rising agricultural incomes fall behind those in a rapidly growing nonfarm economy, inducing political tensions; and (4) the "Johnson" stage, when labor and financial markets fully integrate the agricultural economy into the rest of the economy. Efforts to "skip" the early stages and jump directly to a modern industrial economy have generally courted disaster. In the early stages, there is typically a substantial gap between the share of the labor force employed in agriculture and the share of GDP generated by that workforce. This gap narrows over time as incomes rise; the convergence reflects better integrated labor and financial markets. But this structural gap often widens during periods of rapid growth, as is evident in the history of OECD economies (Timmer 2009). When overall GDP grows rapidly, the share of agriculture in GDP falls much faster than the share of agricultural labor in the overall labor force. The turning point in the gap generated by these differential processes, after which labor productivity in the two sectors begins to converge, has also been moving "to the right" over time, requiring progressively higher per capita incomes before the convergence process begins.

The transformation of Indonesian agriculture starts with the well-known speech by President Soekarno during the first inauguration of Bogor Agricultural University (IPB) in 1952, when he said that "food is a matter of life and death of the country." President Soekarno paid much attention to improving the capacity of human resources in agriculture, especially in higher education, increasing research and extension to empower small farmers. The innovative program of mass guidance (BIMAS) and mass intensification (INMAS) in the 1960s is considered the first and most successful government program focusing on agricultural development. Coincidently, the program was implemented at the time of Green Revolution technology, which then easily spread throughout agricultural production centers in Indonesia. The program not only introduced seed and fertilizer, but also more importantly provided massive guidance from the government and higher education communities to farmers in the field. In other words, mass guidance was really an approximation and implementation of the agricultural extension system in a systematic and comprehensive manner.

The mass guidance program was slightly modified to special intensification (INSUS), using the command and control system, the military style of management used by President Soeharto. Fertilizer subsidy using the massive state budget was first officially introduced in 1971, after the first implementation of the Five-Year Development Plan I in the period of 1969–1974, primarily to keep up with the momentum of Green Revolution technology. As an oil-rich country, Indonesia received a considerable amount of state revenue from the windfall profit of oil price increases in the 1970s, while in other parts of the world the first energy crisis was just being encountered. At the same time, the government also implemented a price-band stabilization policy through BULOG (then the powerful Government Logistic Agency), by imposing a floor price during the harvest seasons and a ceiling price during the planting seasons. The state

revenue from the oil- and gas-based economy was more than adequate to implement the subsidized programs of both input and output policy, for the sake of agricultural development. The state budget for agricultural development was also allocated for a combination of domestic procurement of rice, market injections—also known as market operations—from short-run buffer stocks and international trade, and BULOG's access to financial credit to purchase domestic grains during harvest seasons and store it under a specific stock management system. The state budget for this subsidy program also needed to cover operational losses due to the squeeze on the price margin and to cover losses on international trading (see Timmer 1989).

Such a strategy of combining land use intensification, area expansion, and crop diversification led to a remarkable growth in the agricultural sector, reaching 6 percent per year, and economic growth in general of more than 7 percent per year up to the mid-1980s. For the first time ever, economists and political scientists alike have acknowledged that the agricultural sector has played a very important role in Indonesian economic development. At least, Indonesian agriculture passed the "Mosher's getting agriculture moving" stage when government policies helped increase crop production and labor productivity. The share of the agricultural sector in Indonesia's GDP has declined from 30.2 percent in 1975 to 22.9 percent in 1985, while the shares of the industrial and service sectors increased from 33.5 percent and 36.3 percent to 35.3 percent and 42.8 percent, respectively, in the same period of 1975–1985. The agricultural sector at the time had successfully introduced new technology of high-yielding varieties and chemical fertilizer application, especially in Java and Bali. An efficiency-driven strategy was adopted in the rice-producing activities as the new rice varieties are generally smaller than local varieties and their harvest period is generally shorter (about 100 days). The harvest methods of these new varieties changed, too; female workers using a small knife (*ani-ani*) were replaced with fewer male workers using a larger sickle.

The labor force involved in the agricultural sector has also declined from 62 percent in 1975 to 56 percent in 1985, while those involved in the industrial and service sectors has increased from 6 percent and 32 percent to 9 percent and 35 percent, respectively, in the same period of 1975–1985. More importantly, the agricultural sector has gone through the "Johnston-Mellor" stage, especially through a variety of linkages. For example, the use biochemical inputs (high-yielding varieties and fertilizer), primarily in densely populated areas such as in Java and Bali, and mechanical inputs in a relatively sparse agricultural area in the Outer Islands contributed significantly to achieving self-sufficiency in rice production. In addition, Indonesia had adequate state revenue to implement cash crop development, especially in Sumatra, Kalimantan, and Sulawesi, and to resettle farm families from Java to the Outer Islands under both general transmigration and specific transmigration of cash crop development. The agricultural development strategy in the 1980s also implemented a nucleus-estate smallholders (NES) program, by providing nucleus companies with subsidized capital and long-term leases to public lands for estate crop production. These companies have to provide technical assistance and marketing services to smallholder farmers surrounding the nucleus plantations. Meanwhile, the manufacturing and service sectors also developed quite significantly due to the structural transformation that occurred in the agricultural sector and in the economy as a whole. Generally, these two sectors require more labor force, especially those with a higher education level and more advanced skills and professions. Labor movement from the agricultural sector and rural areas to the more modern industrial and service sectors occurred smoothly because it coincided with the expansion of a nonfarm economy across the country. Investment in foot-loose industry sectors, such as textiles, garments, and manufacturing has contributed significantly to a high growth rate in the agricultural sector and in the Indonesian economy as a whole.

Moreover, Barrett (2011) suggests that the modern political economy has its roots deep in agriculture. Explaining the evolution of agricultural policy has long been difficult for models that use democratic institutions, median voters, or other forms of representative governance. Two aspects of agricultural policy are especially puzzling. First is the "development paradox," whereby the sector is discriminated against when a large share of the population works in agriculture, but is protected when the number of farmers becomes much smaller. Second is the "trade paradox," whereby both agricultural imports and exports are usually taxed. Such strategies neglect economic laws of comparative advantage based on factor endowments and typically lead to higher prices, greater inefficiency, and environmental damage than does reasonably free international trade in agricultural goods.

The "Schultz" stage of structural transformation occurred in the second half of the 1980s, when rising agricultural incomes fell behind those in the rapidly growing nonfarm economy. The price of oil and gas, which the Indonesian economy also largely depends on, has declined significantly, hence the state revenue generated from the sector. The government has tried to restructure the economy to not depend heavily on oil and gas extraction and to promote renewable resources. In 1986, government policy on deregulation and devaluation marked the differences in priorities and strategies for economic development. The share of the agricultural sector in the GDP had not changed significantly, staying about 17 percent from the period of 1985–1995, while the industrial sector made progress from 42 percent to 47 percent during the same period. However, the performance of the agricultural sector, especially the food sector in the 1990s, was not as impressive as in the early 1980s, with a growth level of 3.4 percent per year. Contributing factors included a heavy burden of agricultural subsidy on the state budget, problems with governance in both agricultural and industrial sectors, and the

first El Niño drought in 1992–1993. More importantly, there was a slow pace in research and technological progress in the agricultural sector, due to an accumulation of some political tensions in economic development strategies (Arifin 2013).

Basically, Indonesian agriculture has experienced no significant increase in rice yield since the early 1990s and there are structural and institutional problems in the estate crops as well as pest and disease outbreaks in major production centers, which might be closely associated with the long droughts in 1987–1988 and 1992–1993. More importantly, important infrastructures such as irrigation, roads, bridges, and ports have deteriorated in several places in the country, and this has contributed to the decline in agricultural growth. When research systems and technological progress did not improve the rice yield required to maintain the necessary growth rates, and when public expenditures on these important elements of agricultural development declined significantly in the 1990s, the poor performance of the agricultural sector was quite a logical consequence. The slow growth or leveling off in agricultural production continued until the early period of the economic crisis in 1998. During the crisis period, however, the agricultural sector seemed to show some progress due to large devaluation in Indonesia's currency, where some estate and cash crops, fisheries, and other high-value crops enjoyed high output prices. However, because the labor movement between agriculture and industry and between rural and urban economies did not flow smoothly due to limited absorption capacity, especially in rural areas, agriculture likewise experienced serious difficulties in maintaining growth performance. Unfortunately, the economic crisis coincided with the fall of President Soeharto's administration in 1998, and some radical changes occurred in the development strategy.

The gaps inevitably presented political problems as farm incomes visibly fell behind incomes earned in the rest of the economy. The long-run answer is faster integration of farm labor into the nonfarm economy, including the rural nonfarm economy. But such integration takes a long time. It was not fully achieved in the United States until the 1980s, and the productivity gap appears increasingly difficult to bridge through economic growth alone (Timmer 2009). Lagging agricultural earnings growth fosters deep political tensions over the course of the structural transformation, and those tensions grow with the lag. The standard government response to these tensions has been to protect the agricultural sector from international competition and ultimately to provide direct income subsidies to farmers.

In order to ease the burden for farmers during the Asian economic crisis, the government increased the minimum purchase price for rice, reduced the annual interest rate on subsidized credit loans from 14 percent to 10.5 percent, and raised the maximum borrowing level for farmers. In 2003, the government reinstated fertilizer subsidies for domestically produced urea, SP-36, ZA, and NPK fertilizers solely for farmers producing on less than 2 hectares. The first directly elected president, Susilo Bambang Yudhoyono (SBY), started a development strategy by revitalizing agriculture. A detailed analysis of agricultural input subsidies was presented in the preceding chapters.

In the first decade of the new millennium, the share of the agricultural sector in the GDP was 14.8 percent in 2012, a significant decrease from 17 percent in 2000. The share of the industrial sector declined significantly from 47 percent in 2000 to 40.2 percent in 2012, which was a significant sign of deindustrialization in the Indonesian economy. Meanwhile, the share of the service sector increased from 36 percent in 2000 to 45 percent in 2012, due mostly to the growth of supporting service sectors in both private entities and government organizations. However, the Indonesian economy has not yet achieved the "Johnson" stage, where the labor and financial markets fully integrate the agricultural economy into the rest of the economy. The agricultural sector remains in a dual-economy format, consisting of on one side a large number of smallholder farmers practicing traditional farming and on the other side a small number of large-scale agribusiness companies using more modern technology, good agricultural practices (GAP), and good management practices (GMP). As mentioned previously, the growth performance of the agricultural sector was just about 3 percent per year in the past three years, about similar to the period before the global food crisis in 2008.

Even though the per capita GDP has increased significantly in the past decade, the increase in agricultural GDP per worker is quite slow, mostly because employment creation in nonagricultural sectors is not very high. The structural transformation somehow contributed to the declining poverty rate, which was 11.9 percent in 2011. The percentage of poor people living in rural areas in 2012 was 14.7 percent, and generally higher than those living in urban areas, which was about 8.6 percent. Nevertheless, the Gini coefficient of the Indonesian economy generally increased in the past decade or so, from 32 in 1998 to 38 in 2007 and 41 in 2012. Poor infrastructure affects economic access to resources over resources and production factors, which might require radical reforms in the policy setup. For example, the Gini coefficient at 0.41 means that 40 percent of the population receives only 16.86 percent of the GDP, while the top 20 percent of the population receives as high as 48.41 percent of the GDP. This is quite serious. Failing to overcome this inequality issue means that social inclusion policies and programs might fail to be implemented. More importantly, ineffective government policies have contributed to income inequality in the country. These include subsidies for fuel, education, and fertilizer, the central theme of this study.

Pathways of Agricultural Input Policy: The Significance of Seed and Fertilizer

Agricultural input policy has been one of the major instruments of food and agricultural policy in general since the 1970s, in addition to infrastructure, research and development (R&D), and extension services. Policies to promote modern agricultural inputs have become the main strategies during the Green Revolution, where Indonesia has translated the movement into Five Farm Principles (*Panca Usahatani*): high-yielding seed, fertilizer, irrigation, crop density, and pest management. Later, two more principles, postharvest and extension systems, were added to become Seven Farm Principles (*Sapta Usahatani*). The current government administration has not significantly changed the policy on agricultural inputs, where farmers, mostly food crop farmers, are given price subsidies for fertilizer and high-yielding seed. These policy instruments are among several other instruments, including price procurement, financial supports, direct community assistance, rural agribusiness development, are rural economic institutions, for achieving self-sufficiency in the strategic food commodities of rice, maize, soybean, sugar, and beef.

The significant increase in rice production in the past decade is partly attributable to the wider use of certified rice seed by farmers. More than 73 percent of rice farmers have used high-yielding seed, and more than 54 percent of maize farmers have even used hybrid seed. The percentage of soybean farmers and sugarcane farmers using high-yielding seed is also quite large, reaching about 39 percent and 69 percent, respectively. Farmers' use of certified rice seed increased significantly from 117 thousand tons in 2005 to about 200,000 tons in 2012 for more than 13 million hectares of harvested area.

The growing demand for high-quality seed has encouraged investment in the rice seed breeding industry in the private sector. Two major rice seed producers in Indonesia are PT Sang Hyang Seri (SHS) and PT Pertani, state-owned enterprises that have been in business since the 1970s. The propagation of rice seed is also conducted by farmers and/or farmers' groups in mostly rice-producing centers all over the country. Investors have established companies to produce high-quality seed and existing producers have expanded their production capacity. SHS built new facilities with a production capacity of 10,000 tons of seed per year. Foreign investors, such as PT BISI International, affiliated with the the Charoen Pokphand Group, PT DuPont Indonesia (Pioneer), PT Syngenta Indonesia, and PT Bayer Indonesia, have also shown interest. These private seed companies have been involved in producing and distributing hybrid maize across the country. The government policy on seed development has been quite conducive, as the requirement from private enterprises to invest in the seed-breeding industry is quite simple. Seed importing companies, including foreign-affiliated enterprises, can start producing seed domestically after operating for two years. Such a simple policy requirement has been in place in conjunction with the government policy to develop hybrid seed in maize and later hybrid seed in rice.

Rice seed is produced from the generative breeding of rice plants, under the recommendation of the National Seed Agency (*Badan Benih Nasional*), stipulated by the presidential decree, and technically commissioned by the Ministry of Agriculture. There are four varieties of high-yielding rice seed: breeder seeds (BS), foundation seeds (FS), stock seeds (SS), and extension seeds (ES). The seeds used by farmers are generally the extension seeds, which are the offspring of breeder seeds or foundation seeds. The hierarchy is as follows: breeder seeds are the source of foundation seeds or the foundation seeds are the first offspring of breeder seeds. Stock seeds are the offspring of breeder seeds or foundation seeds. Each seed is marked with a specific colored label. BS is yellow, FS is white, SS is purple, and ES is blue. A pink label is usually attached to the first offspring of ES, although in reality it is not easy to monitor.

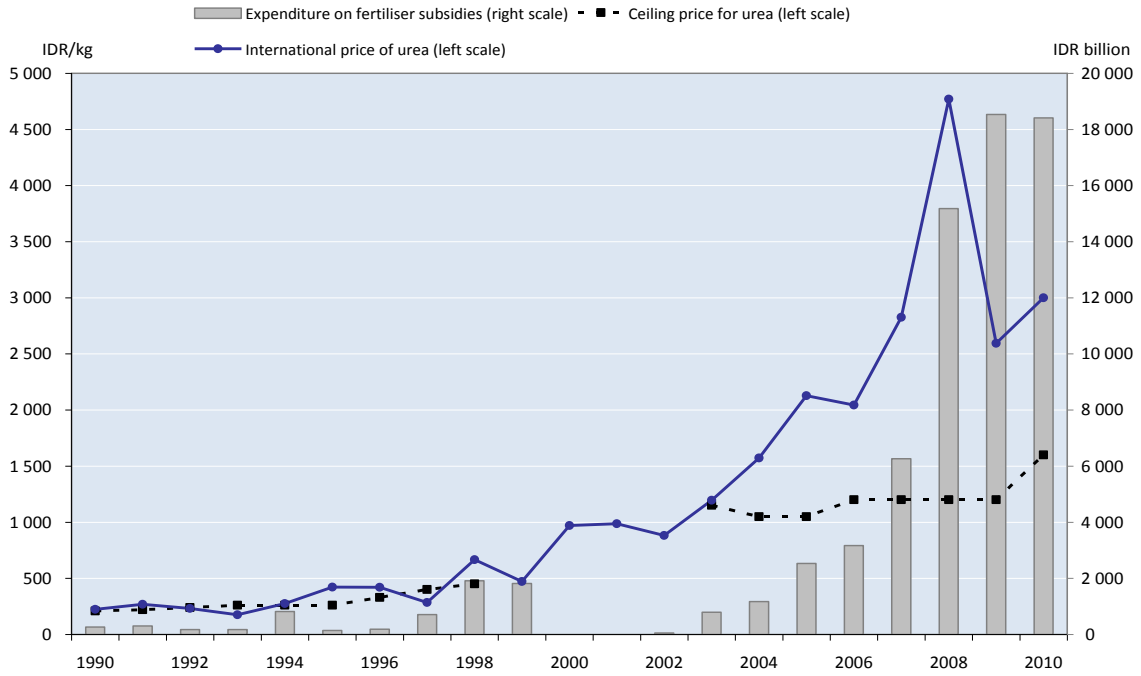
Horticultural crops, namely vegetables and floriculture, are a second area where the private seed industry conducts breeding and supplies seed to farmers (Fuglie 1998). These companies are particularly active in providing improved seed that is exported or processed into high-valued products. Marketing linkages are often through large agribusiness companies with processing facilities or international trade networks that contract with local farmers for the production of specific commodities. For example, one seed company provides viral-free microtuber potato seed to a private company that produces potato chips. The processing company multiplies the seed and distributes it along with other inputs and technical advice to contract farmers. The farmers produce potatoes and sell them back to the company at a price specified in the contract.

In this way, the private company is assured of a steady supply of quality-specific raw material for its processing plant. It is not known the extent to which the Indonesian seed industry supplies improved seed to producers who provide fresh fruits and vegetables to local markets. At least 10 companies in Indonesia propagate seeds and seedlings for vegetables, floriculture, and some fruits. Of these, at least two companies have breeding programs. The largest vegetable seed producer with a breeding investment in Indonesia (East-West Seeds) is a joint venture with a Dutch firm. This company als maintains horticultural breeding programs in the Netherlands, Thailand, the Philippines, and other countries. Domestically produced horticultural seed competes with directly imported seed and farmers' saved seed (Fuglie 1998).

Input policies in Indonesia require a significant amount of the state budget, especially for the subsidized programs for fertilizer, seed, food for the poor, and banking credits. The state budget is formulated in formal parliamentary sessions; thus, these policies go through the political process and are subject to a wide variety of interests and constituencies. The amount of seed subsidy in 2013 was Rp 1.45 trillion (US$14.5 billion), a significant increase from Rp 60 billion (US$6 million) in 2012. In 2012 the amount of fertilizer subsidy was about Rp 14 trillion (US$1.4 billion), and increased to Rp 16.2 trillion (US$1.62 billion) in 2013, or about similar to the fertilizer subsidy in 2011. The amount of food subsidy for the poor in 2013 was Rp 17.2 trillion (US$1.72 billion), a decrease from that in 2012 of Rp 19.2 trillion (US$1.92 billion), mostly because the poverty level decreased slightly. Some government agencies are planning to implement an exit strategy of the Rice for the Poor program, which has been in place for the past 14 years, or since the Asian financial crisis in 1998. In addition, the amount for credit programs was budgeted at Rp 1.25 trillion (US$12.5 billion) in 2013, a slight increase from Rp 1.1 trillion (US$1.1 billion) in 2012.

Figure 2.3.1 shows the historical perspective of budget expenditures on fertilizer subsidies in the past two decades, the ceiling price of urea in the domestic market in Indonesia, and subsequent prices in the international market.

Figure 2.3.1—Expenditures on fertilizer subsidies and price of urea, 1990–2010



Source: OECD (2012), Ministry of Agriculture (2011).

The amount of expenditure on fertilizer subsidies increased more than 100 percent, from Rp 3.2 trillion (US$32 billion) in 2006 to Rp 6.3 trillion (US$63 billion) in 2007. During the world food crisis, parliament members agreed to triple to expenditure on fertilizer subsidies in 2008 to Rp 15.2 trillion (US$1.52 billion) compared to that in 2007 to maintain food production and self-sufficiency. Since then, the fertilizer subsidy remains very high, although the actual problems of fertilizer use and availability were not fully solved. One should note that the fertilizer subsidy in Indonesia is not a direct price subsidy to farmers, as the main consumers of fertilizer, but an indirect subsidy given to the state-owned enterprises (SOEs) of fertilizer producers under the fertilizer holding company PT Pupuk Indonesia (then PT Pusri Holding). The subsidy is given to these companies to compensate for the world market's soaring price of gas, the main input for urea production. Similarly, the seed subsidy is not given directly to farmers to ensure the use of certified high-yielding seed, but instead is given to two main seed producers of SOEs, PT Sang Hyang Seri (PT SHS) and PT Pertani. In addition, these companies are also developing some trials to test the compatibility of specific high-yielding varieties at specific locations for specific crops.

The Central Agency of Statistics (BPS) conducted a complete farm survey in 2009 on the use of inputs for food crop households, particularly rice, corn, and soybean. Table 2.3.1 shows the results. The use of fertilizer among rice farmers in Indonesia is very high at about 92 percent of 15 million rice farmers. Nearly 68 percent of these farmers use chemical fertilizer only, less than 1 percent use organic fertilizer only, and 23.5 percent use both fertilizers. The percentage of fertilizer use in corn farmers is quite different

from those in rice farmers, where about 85 percent of corn farmers use fertilizer; 36.8 percent use chemical fertilizer, 2 percent use organic fertilizer, and 46 percent use both chemical and organic fertilizers. The proportion of soybean farmers who use fertilizer is 81.5 percent; 42.3 percent use chemical fertilizer, 7.3 percent use organic fertilizer, and 31.8 percent use both chemical and organic fertilizers. The figures of fertilizer use in sugarcane farmers do not differ very much from those of rice farmers, where 67.4 percent of sugarcane farmers use chemical fertilizer, 2.2 percent use organic fertilizer, and 29 percent use both chemical and organic fertilizers.

Table 2.3.1—The use of fertilizer by cropping farms, 2009

Cropping Farms	No Fertilizer	Chemical Fertilizer	Organic Fertilizer	Chemical + Organic	Total
Rice					
Farm households	1,225,700	10,155,465	94,112	3,516,860	14,992,137
Percentage	8.18	67.74	0.63	23.46	100.00
Maize					
Farm households	1,010,330	2,472,889	134,648	3,096,828	6,714,695
Percentage	15.05	36.83	2.01	46.12	100.00
Soybean					
Farm households	215,717	492,888	85,173	370,699	1,164,477
Percentage	18.52	42.33	7.31	31.83	100.00
Sugarcane					
Farm households	2,819	131,633	4,324	56,683	195,459
Percentage	1.44	67.35	2.21	29.00	100.00

Source: BPS, Farm Survey, July 2009.

Table 2.3.2 shows seed use in the same categories of food crop households. In 2009, Seventy-three percent of rice farmers used high-yielding seed, but only 40 percent of soybean farmers did. As presented previously, the yield of soybean is now only 1.5 tons per hectare and total production is less than 850 thousand tons, far below the required level of self-sufficiency of 2.5 million tons. The use of hybrid seed and composite seed by maize farmers is quite high, reaching 59 percent, while the remaining 41 percent of maize farmers are quite comfortable using local seed. Maize productivity in Indonesia is quite high, averaging 4.9 tons per hectare, which is very high for Southeast Asian country standards.

Table 2.3.2—The use of seed by cropping farms, 2009

Cropping Farms	Farm Households	Percentage of Farms (%)	Percentage of Total (%)
Rice	**14,992,137**		**84.08**
Hybrid	430,996	2.87	2.42
High yielding	10,947,289	73.02	61.40
Local seed	3,613,852	24.10	20.27
Maize	**6,714,695**		**37.66**
Hybrid	3,651,210	54.38	20.48
Composite	341,377	5.08	1.91
Local seed	2,722,108	40.54	15.27
Soybean	**1,164,477**		**6.53**
High yielding	452,029	38.82	2.54
Local seed	712,448	61.18	4.00
Sugarcane	**195,459**		**1.10**
High yielding	134,726	68.93	0.76
Local seed	60,733	31.07	0.34
Total Farm Household	**17,830,832**		

Source: BPS, Farm Survey, July 2009.

The pathways of agricultural policy through the appropriate use of agricultural inputs, primarily fertilizer and seed, might represent technological change in agricultural development. It will require supporting policies on R&D, innovation, good agricultural practices, and modernization of food production systems in general. The subsidy system on input use may be necessary to improve the yield

and total production of strategic foods and other agricultural commodities, and thus farmers' income. The government should improve R&D policy and empower research centers and universities throughout the country and at the local level. For example, if policy promoted biotechnology development in the agricultural sector, then the private sector would be encouraged to play a role, especially to participate in R&D, develop new innovations, and weigh in on business decisions and policymaking processes. Subsidies on agricultural inputs, such as fertilizer and seed, is one step, but improving the extension system and mobilizing extension agents in rural areas are other important means to agricultural development in Indonesia.

Regarding capital inputs, most Indonesian farmers have to rely on their own capital, posing serious challenges for agricultural financing in the country. The amount of credit being disbursed to the agricultural sector in 2012 was Rp 150 trillion (US$15 billion), or only 5.5 percent of the Rp 2.8 thousand trillion (US$280 trillion) in banking credit disbursed in the country. Besides using their own financial capital (94.4 percent), rice farmers sometimes obtain financial capital from money lenders and collector traders (4.3 percent), whereas cooperatives and banks combined only contribute less than 1 percent of the capital input. Similar figures are found for corn farmers and soybean farmers who depend on their own capital (94.5 and 96.3 percent, respectively), whereas the capital from money lenders is 4.1 and 2.5 percent, respectively, and the capital from cooperatives and banks combined is less than 1 percent. Even though the amount of capital input is not as much as that in the other three main crops of rice, corn, and soybean, a slightly different figure is found in sugarcane farmers who obtained a subsidized credit channeled through cooperatives (5.5 percent) and banks (2.9 percent), in addition to their own sources of capital (85.2 percent). In short, the policies on agricultural financing have to be properly formulated as the agricultural sector faces greater challenges for food security in the future.

KEY DRIVERS OF CHANGE IN AGRICULTURAL INPUT POLICY

Origins of Agricultural Input Policy

Agricultural input policy in Indonesia is a function of the agricultural development strategy and the confidence of the government to implement a particular strategy. During the first government administration of President Soekarno after Indonesian Independence in 1945, the agricultural development strategy cannot be separated from the political struggle to finance the economic development process of the newly born country. The administration of President Soeharto was able to exercise different policy regimes by adopting Green Revolution technology and shifting economic development to encourage renewable resources in the country. During the Asian economic crisis, Indonesia formulated its agricultural development in response to the crisis and the severe El Niño drought by adopting social safety net programs. Finally, President Susilo Bambang Yudhoyono (SBY) has emphasized revitalizing agriculture under the broader quadruple-track development strategy of pro-growth, pro-job, pro-poor, and pro-environment. The following key drivers of agricultural input policy, summarized in Table 3.1.1, are derived from existing literature, interviews with competent resource persons, and synthesis from data analysis and information made available for the study.

Table 3.1.1—Historical matrix of key drivers of Indonesia's agricultural input policy

Transformation—Major Agricultural Policy	Soekarno (1945–1966)	Soeharto I (1966–1985)	Soeharto II plus (1986–2003)	Yudhoyono (2004–present)
Share of Agric PDB	>30%	20–30%	15–20%	<15%
Share of Agric labor	>50%	45–50%	40–45%	<39%
Agricultural Growth	Low (<3%)	High (6%)	Low (3–4%)	Low (3%)
Agric Major Policy	Mass guidance	Green Revolution	Green Revolution	Revitalizing agriculture
Agric Input Policy	Introducing modern inputs	Agric inputs for self-sufficiency	Response to drought and crisis	Political pressure, response to crisis
Fertilizer Subsidy	Not specific, but guidance on use	Started in 1971, price subsidy	Removed in 2000, reinstated in 2003	Compound-NPK, more subsidy
Seed Subsidy	Modern seed was known	Package of agric inputs plus credit	Farmers' breeding package and credit	Private sector grows rapidly
Policy Process	Top-down: food and peasants first	Top-down: order and command	Dialogue with some stakeholders	Democratization: dynamic drivers

Source: Synthesized by the author.

(a) Agricultural Development Strategy

The agricultural development strategy during the administration of President Soekarno in the 1960s employed an innovative program of mass guidance (BIMAS) and mass intensification (INMAS) in order to introduce modern inputs to farmers, who are mostly small scale in nature. The government provided subsidized high-yielding seed and chemical fertilizer in a packaged program mostly for rice farmers and provided massive guidance directly to the farmers by employing final-year students at Bogor Agricultural University (IPB). The agricultural development strategy during the early stages was mostly the spirit to achieve self-reliance. The Green Revolution movement was the basic foundation of the agricultural development strategy during the administration of President Soeharto in the 1970s. The major strategy was the adoption of special intensification (INSUS), a slightly modified INMAS, by using the command and control system all over the country. The government was really concerned with the use of high-yielding crop varieties and subsequent use of chemical fertilizer, in order to increase crop production and the productivity, by setting the maximum retail price (MRP or HET, *harga eceran tertinggi*) for four major fertilizers: urea, ammonia (ZA), phosphors (TSP), and potassium (KCl). To determine the amount of subsidy, the government adopted the Farm Formula (*Rumus Tani*), or the ratio of paddy to urea of 1 to 1—that is, the price urea should be comparable to the dry non-husked paddy.

In addition to the fertilizer subsidy, the government also provided subsidized interest on agricultural financing, and even cost of living for farmers during the early production cycles, in the form of package programs, mostly for food crops and strategic cash crops. The agricultural development strategy was implemented through massive infrastructure development, mostly roads, bridges, water canals, and irrigation and drainage systems. The agricultural development strategy was interrupted during the Asian economic crisis at the end of the 1990s, when the International Monetary Fund (IMF) removed most subsidy programs in the country. During the administration of President Megawati Soekarnoputri, the fertilizer subsidy was reinstated in 2002 to complement the agricultural development strategy of putting the farmers first and promoting small farmers. Finally, President Yudhoyono announced an agricultural development strategy of revitalizing agriculture, especially during the era of the multiparty system. The agricultural input policy seems to be weak, with poor policy direction, as shown by inefficiency outcomes in both input use and output achievement. Since 2009, the fertilizer input subsidy has increased more than triple that of the previous years, marking more subsidy dependency but poor governance principles at the policymaking, policy organization, and policy implementation levels.

(b) Major Long Droughts

The major long droughts that influenced agricultural input policy were the El Niño drought seasons in 1987–1988 and 1992–1993. Initially, the government was planning to reduce the amount of subsidy by tightening eligibility and shifting economic development policy to promote deregulation in some strategic sectors. Over the seven years from 1984 to 1990, fertilizer subsidies cost the government an annual average of Rp 650 billion (US$440 million). However, because agricultural production in general started to decline and growth performance was moderate to low, the government increased the agricultural budget, particularly to offset the negative impacts of long droughts and seasonal uncertainty. After the 1990s, the cost of the fertilizer subsidy was about 17 percent of the annual budgetary expenditure supporting agriculture.

Nevertheless, the growth performance of the agricultural sector was only 3.4 percent per year during the period of 1990–1997, and the growth of labor productivity in the sector was less than 2 percent per year. During the economic crisis of 1997–2000, the agricultural sector also suffered from a high rate of inflation, brought about by the Asian economic crisis. Coincidently, another major long drought of El Niño once again occurred in many parts of the country, causing a serious decline in food production. Indonesia had to depend on huge rice imports of 5.8 million tons and 1.5 million tons in 1998 and 1999, respectively, although food-policy mismanagement could have served as a major cause. The Asian economic crisis occurred coincidently with the political crisis in Indonesia, leading to the fall of President Soeharto in 1998. Interim president BJ Habibie's government allocated more than Rp 5 trillion (US$50 billion) for agricultural subsidies on farm credits (*Kredit Usaha Tani*, KUT), amounting to Rp 2 to 5 million per household, in order to overcome the impact of the economic crisis. Farmers could utilize the funds to purchase seed, fertilizer, and other capital as long as they met the objectives of increasing productivity and farm incomes.

(c) Economic Crisis

The economic crises in 1998 and 2008 were important drivers of agricultural policy changes in Indonesia. At the initial period of the Asian economic crisis in 1997, agriculture was expected to serve as a cushion because some agricultural export commodities, such as coffee, rubber, pepper, shrimp, and other fishery products, enjoyed windfall profits due to currency devaluation. Nevertheless, agricultural development cannot rely on the factor of high prices alone, but requires more integrated strategies with the industry and service

sectors. Consequently, during the first year of the crisis, agricultural production and productivity were stagnant or even slightly negative at less than 0.5 percent. Labor productivity declined at a rate of -1.5 percent per year, showing stagnation of the economy in general. To restore the confidence in the state budget and to recover the balance of payment due to the financial crisis, Indonesia had to turn to the International Monetary Fund (IMF), which unfortunately intervened in the microeconomic policy of the country, instead of the structural adjustment program.

One of IMF's major policies in Indonesia was removing fertilizer subsidies starting in 2000, and the prices of fertilizer and seed were left to market mechanisms. The ceiling price policy of rice was also removed and changed to a special market operation, which then transformed into the Rice-for-the-Poor (*Raskin*) program. The program was to provide social protection for and economic compensation to the poor to improve their purchasing power when the inflation rate reached 70 percent in 1998. The policy intervention of IMF also liberalized the Law 22/2001 on Oil and Gas, so that the government could no longer provide subsidies through reduced gas prices, as it had in the past. Under the current system, the natural gas price and the maximum retail price (MRP), or HET for urea, determine the per-unit value of the subsidy. The quantity is limited to the amount of gas needed to produce the volume of fertilizer required by smallholder farmers. The volume of fertilizer is in turn determined through a bottom-up process. In each village a definitive plan-needs group of farmers (*Rencana Definitif Kebutuhan Kelompok*, RDKK) establishes their fertilizer requirements. This is aggregated up at the district and provincial levels to obtain a national volume of fertilizer demand. For non-urea fertilizers, the subsidy was offset the fertilizer selling price (OECD 2012).

However, the performance of the agricultural sector remained quite poor, growing at 1.57 percent per year in the period of 1997–2000. The growth of agricultural productivity was negative -1.45 percent per year and that of labor productivity was also negative -0.45 percent per year. The growth of rice production was also quite slow, only 2.04 percent per year, as a result of a significant decline in the use of modern agricultural inputs, particularly chemical fertilizer and high-yielding seed. The government administration of President Megawati increased the minimum purchase price for rice and reduced the annual interest rate on subsidized agricultural credit loans. More importantly, the government reinstated fertilizer subsidies in 2003 for domestically produced fertilizers. The subsidy is again paid directly to the five state-owned fertilizer enterprises: PT Pupuk Sriwijaya, PT Pupuk Iskandar Muda, PT Pupuk Kaltim, PT Pupuk Kujang, and PT Petrokimia Gresik. The holding fertilizer company PT Pusri Holding is assigned to coordinate the production and distribution of subsidized fertilizer, where the Ministry of Trade issues a decree for the market zone for each fertilizer company. The subsidy is given in the form of a natural gas subsidy, as the fertilizer industry largely depends on natural gas for fertilizer production, accounting for 50 to 60 percent of the total production cost of urea. Every December, the Ministry of Agriculture determines the HET (maximum retail price, or MRP) of subsidized fertilizers using the ministerial decree so that all retailers and distributors have to sell the price of urea as set by the decree.

(d) Multiparty Political System

After the fall of President Soeharto, Indonesia adopted a multiparty system, where the agricultural input policy is formulated with regard to the political parties' interests. Technocratic considerations sometimes have to serve the interests of both the executive branch and the legislative branch in parliament. Although President Yudhoyono declared a revitalization of agriculture in 2005, skepticism has emerged in the initiation of the strategy (see Arifin 2005). The most significant challenge to implementing the revitalization strategy is regional autonomy, where the local government is the implementing unit in the field and has the autonomous power to formulate and implement their own programs, based on local needs and interests. Therefore, the program on agricultural development, hence the agricultural input policy, formulated at the central level is not always translated into actions that can achieve the strategic objectives. Under a multiparty system, the agricultural input subsidy has increased steadily during the first term and second term of President Yudhoyono administration, as shown in Table 3.1.2. Fertilizer subsidies have increased significantly, from Rp 2.5 trillion (US$25 billion) in 2005 to Rp 18.3 trillion (US$1.83 billion) in 2009, the first term of his presidency. Seed subsidies also increased, from Rp 148 billion (US$14.8 million) to Rp 1.6 trillion (US$16.3 billion) during the same period of 2004–2009. Although fertilizer subsidies decreased a little bit to Rp 13.9 trillion (US$1.4 billion) in 2012, the amount of subsidy remained very high and was budgeted for about Rp 17 trillion (US$1.7 billion) in 2013 (not shown in the table). Seed subsidy reached its maximum amount of Rp 2.2 trillion (US$22 billion) in 2010, but was reduced to Rp 100 billion (US$10 million) in 2011 due to some governance problems at the field level. The amount of subsidized credit also increased more than 2000 percent during the election in 2009 and was also at a very high rate in the upcoming election year in 2014.

Table 3.1.2—Total spending and growth of agricultural input subsidy, 2005–2012

Amount (Rp billion)	2005	2006	2007	2008	2009	2010	2011	2012
Fertilizer	2,527	3,166	6,261	15,182	18,329	18,412	16,377	13,960
Seed	148	131	479	985	1,597	2,264	100	60
Credit	39	34	48	77	1,680	820	1,520	1,110
Food for poor	6,357	5,320	8,584	12,096	12,987	15,150	16,340	19,120
Growth (%)								
Fertilizer	-	25.3	97.8	142.5	20.7	0.5	-11.1	-14.8
Seed	-	-11.2	265.4	105.7	62.1	41.7	-95.6	-40.0
Credit	-	-11.4	38.9	62.1	2,081.2	-51.2	85.4	27.0
Food for poor	-	-16.3	61.4	40.9	7.4	16.7	7.9	17.0

Source: State budget, 2005–2012.

The multiparty political system also approved a budget increase for the Food for the Poor program to Rp 12 trillion (US$1.2 billion) in 2008 in order to reduce the socioeconomic impacts of the world food crisis. Similarly, the amount of fertilizer subsidy increased 142 percent in 2008 to support the government program to maintain self-sufficiency in rice, maize, soybean, and sugar. Between 2008 and 2009, the paddy/urea price ratio increased from 1.5 to 2.5, reflecting the combination of rice market protection and fertilizer subsidies that were operative then. The budgetary cost of the scheme increased significantly between 2003 and 2009, due partly to the increased price of energy and partly to an increase in the quantities of subsidized fertilizer being distributed, especially NPK. In 2009 the budgetary cost of the fertilizer subsidies was 37 percent of the total budgetary support for agriculture, and 1.9 percent of the total government expenditures. Since then, the budget allocation for fertilizer subsidies in 2012 was nearly 4 percent of total government expenditures in the state budget.

Notwithstanding, about 75 percent of fertilizer is distributed at subsidized prices and subject to strict regulations, and 25 percent is sold at market prices in village kiosks. The current emphasis on input subsidies is a result of political dynamics at the beginning of the decade wherein parliament wanted to put in place public expenditure activities to benefit farmers (voters) as directly as possible and avoid all the leakage of traditional programs (World Bank 2012). If the amount of state subsidy is reduced, the maximum retail price (MRP) for subsidized fertilizers will increase, which has to come through political debates in parliament. A slight decrease in the amount of subsidy in 2011 to Rp 16.4 trillion (US$1.6 billion) would imply a significant increase of 10 to 15 percent of MRP (HET) of subsidized fertilizer. The government's reason for such increases was not very clear, whether it was simply to reduce the subsidy for the sake of the state budget or to reduce the probability of fertilizer overuse, especially in rice fields due to cheap fertilizer prices. Similarly, a further small decrease in subsidies to Rp 13.9 trillion (US$1.4 billion) in 2012 had no clear reason, nor was it based on solid academic studies of subsidy evaluation. Finally, politicians have increased the amount of fertilizer subsidy to reach about Rp 17 trillion (US$1.7 billion) in 2014, again with no clear arguments, except to achieve the strategic objective of a rice surplus of 10 million tons in 2014.

Benefits and Drawbacks of Agricultural Input Subsidy

In the literature, effective large-scale input subsidies, such as in Indonesia, should lead to substantial increases in the volume of inputs purchased by farmers, and this can have a number of different impacts on input supply systems and markets. Doorward (2009) suggests that there are at least three beneficial and two damaging impacts of agricultural input subsidies.

The first beneficial impact is the short-term effect on the input market, depending on the nature of the subsidy and the structure of the input supply system. When the subsidy is provided to farmers, it has the effect of shifting input demand upward. This was mostly the Indonesian experience in the 1970s and 1980s, when the agricultural input subsidies were given in a package of extension systems and farmer empowerment, especially because agricultural development has full support from the government to achieve the strategic objective of self-sufficiency in rice. Alternatively, input subsidies may be provided to input suppliers, as was the case in Indonesia during the 1990s, before it was removed due to the Asian economic crisis, and since 2003, after fertilizer subsidies were reinstated. A similar case is also found in India, wherein the fertilizer subsidy is given to domestic fertilizer producers to develop and protect its fertilizer industry (see Fan et al. 2007). The effects of such subsidies on the input market depend upon input supply elasticity, and this in turn will depend upon structure, conduct, and performance in domestic production and imports. More elastic input supply leads to more of a subsidy accruing to producers, with gains for producers (and/or consumers, as discussed earlier). More inelastic supply, whatever its cause, leads to increased subsidy capture by input suppliers and reduced benefits to producers and/or consumers. Clearly, agricultural development benefits from input subsidies are increased by more elastic input supply and decreased by inelastic input supply.

The second beneficial impact is when economies of scale are achieved across the industry and within particular suppliers (as a result of increased volume), creating competition to increase efficiency and reduce market margins as increased volumes attract new entrants into the input supply business. These benefits should accrue to both subsidized and unsubsidized supplies of the same inputs, and expand supply, pushing supply curves down and to the right, with increasing supply elasticity. Of course, the process of realizing economies of scale and competition depend on the nature of the inputs and their supply systems, and upon the ways in which subsidized inputs are acquired and disbursed, such as through general price supports; voucher systems; or distribution involving government institutions, input supplier cartels, or competitive input markets. In the old days, the Ministry of Agriculture in Indonesia established a powerful office of *Satuan Pengendali BIMAS* (Monitoring Office of BIMAS) that had complete arms at the provincial and district levels to implement input disbursements and monitor the target beneficiaries. However, since the *Reformasi*, Indonesia does not have such a powerful organized system of agricultural input policies, and now there is no single agency that can look over the impacts of input subsidies on crop production and self-sufficiency targets in general.

The third beneficial impact results from the ways that increased input supplies and transactions can promote the development of new relationships among input sellers and buyers in poor rural areas. After regional autonomy was implemented in the early 2000s, many private sectors on agricultural inputs penetrated directly to rural areas all over the country. Sometimes the marketing agents of these unsubsidized inputs worked together and hand-in-hand with extension agents at the local level. After the Monitoring Office of BIMAS, which represented the centralized system was removed, the power of the central government to implement input subsidies significantly declined. This may lead to more dynamic relationships—but also interlocking arrangements—between input sellers, from either state-owned enterprises or private companies, the seasonal informal finance providers, and the collector traders serving mostly as pre-financed produce buyers. Again, this process are critically dependent on the nature of the inputs and their supply systems, on the ways in which subsidized inputs are disbursed, and more importantly, on the governance system in the input markets and the rural economy in general. This process can also contribute to wider economic and market activity, which has potential spillover into other markets; for example, the expansion of a network selling subsidized inputs may also buy and sell other commodities.

However, the impact of input subsidies on input supply systems is not always beneficial. Doorward (2009) further suggests that damaging effects can arise in two main ways. First, input subsidies may create considerable uncertainty and risks for input suppliers and directly undermine the incentives for private investment in input supply systems. This occurs most obviously when governments intervene directly in input markets by directly supplying subsidized inputs and/or regulating input markets. Directly supplying subsidized inputs may take away business from private suppliers if there is a significant displacement of unsubsidized sales, leading to unsold stock and lower sales volumes to carry fixed costs. Regulating input markets may restrict prices or volumes, or require sales of unprofitable lines or in unprofitable locations, hence restricting revenues and increasing costs and risks. Second, subsidies may damage the development of input supply systems by distorting incentives so that input suppliers are distracted from expanding profitable sales and instead divert resources to compete for government contracts to provide subsidized inputs. Unless subsidies are carefully designed to address and indeed exploit this, such investments are unlikely to lead to the development of longer-term sustainable supply systems.

Although agricultural input subsidies have contributed to the success of agricultural development in Indonesia since the 1970s, studies have shown that fertilizer subsidies and their distribution complexities have not led to efficient outcomes (Osorio et al. 2011, Armas et al. 2012, Arifin 2013). Osorio et al. (2011) analyzed the data from the two rural household surveys in 2003 and 2007 and found that there was no targeting of benefits for the fertilizer subsidy program. Thus, most rice producers benefited from subsidized fertilizer regardless of their level of wealth or whether they had small or large paddies. The effect of this policy was regressive, and the 40 percent largest farmers captured up to 60 percent of the total subsidy. Fertilizer shortages also meant that very few farmers (less than 10 percent in 2007) paid the maximum price as stipulated by the Ministry of Agriculture. The subsidies contributed to an increased use of urea, which in some cases resulted in overuse, which had a negative impact on yields. Thus, overall the relationship between fertilizer use and rice yields is best described as an inverted U-relationship, supporting the existence of an optimum level of fertilizer use, beyond which additional consumption has an adverse effect on output. Despite this, most farmers reported that they used higher than the recommended levels of fertilizer.

Armas et al. (2012) also suggested that the costs associated with the fertilizer subsidy program, both fiscal and economic, outweigh the benefits from achieving higher rice yields. The government policy could focus on improving the provision of public services for agriculture by investing in other agriculture public goods that yield higher returns, while keeping two specific objectives in mind: increasing the productivity of the agriculture sector and increasing the welfare of farmers. Arifin (2013) also suggests a trade-off between providing subsidies for private inputs and the provision of public goods and services. The large amount of fertilizer subsidies is

allocated at the expense of providing support in public goods and empowerment programs that matter more to farmers and the agriculture sector in general, such as irrigation infrastructures, expansion of rice fields, research and development (R&D), extension service systems, agricultural and rural finance, and microcredits.

In the development context, there are at least two important potential dynamic benefits of subsidies that have been given much less emphasis in conventional thinking. First, subsidies that are effective in raising land and labor productivity (with overall increases in on-farm labor demand) and in driving down food staples prices will raise the real incomes of large numbers of poor consumers as well as poor producers. This should expand demand for locally produced nonstaple foods and nonfarm goods and services, driving up local labor demand and wages. Second, subsidies can have important potential dynamic benefits through their stimulation of increased inputs and outputs and wider economic activity. This happens if the greater volume economic activity stimulated by the subsidy reduces coordination and transaction costs and risks and promotes institutional systems, communications, transport services, and infrastructure development. Both these potential dynamic benefits require longer-term and stable implementation to induce behavioral and structural change (see Doorward 2009).

Macroeconomic Implications of Agricultural Input Policies

Macroeconomic implications of agricultural inputs start with the philosophy behind subsidy policies, that the state has an obligation to help ease the burden of farmers, especially smallholders, in increasing production and productivity. Unfortunately, efforts to replicate the success stories of BIMAS, INMAS, and INSUS in the old days of the Green Revolution have not been very fruitful, and thus the effective use of subsidized fertilizers in the field may be quite low. Studies have shown that Indonesian farmers have been trapped in a dynamic disequilibrium, where the use of fertilizers tends to move in a dynamic rather than an equilibrium level (Arifin 2013). The disequilibrium moves along a spectrum of actual fertilizer application on one end and the potential position of fertilizer application (or higher position) at the other end, mostly due to relatively lower prices. The level of farmers' dependence on chemical fertilizers is very high, and their application tends to be overused in some places. Consequently, fertilizer application does not contribute to increased production and productivity of food crops and other sectors in agriculture.

When the price of chemical fertilizer is quite low, the economic incentive to produce organic and biological fertilizers is also small, and it tends to be negative. Although public awareness of organic and biological fertilizers (biofertilizers) is quite high, it is still rather difficult to expect that these fertilizers can be relied upon to replace chemical or inorganic fertilizers. Another very important note on the agricultural input subsidy system is the current shift in the state budget allocation from fertilizer subsidies to the fertilizer industry (and the gas industry in order to allocate gas production for domestic needs). This may be counterproductive to the philosophy of a fertilizer subsidy, which is to increase agricultural production.

Fertilizer production is very dependent on the availability of gas at an affordable price to the fertilizer industry. The total urea production is 6.9 million tons, which is slightly below the installed capacity of 7.5 million tons, where PT Pupuk Kaltim contributes about 3 million tons of the production. The fertilizer production of PT Pusri holding is about 2 million tons, while the production of the other three fertilizer producers is less than 3 million tons in total. The sixth fertilizer factory, PT ASEAN Aceh Fertilizer (AAF), ceased production in 2004, after having several problems in technical financial management and being severely hit by the tsunami in December 2004. Public policy issues emerge when there are fertilizer shortages, especially at the end of the harvest season in April/May and at the beginning of the new planting season for the next round of crop rotation. The fertilizer distribution system has changed over time, from open market access, to a semi-closed system, to an open system again, and finally, since 2009, to a closed system using the bottom-up mechanism of the farmers' group definitive plan (*Rencana Definitif Kebutuhan Kelompok*, RDKK). The government further complicated the issue of fertilizer shortages in 2010 after it opened up the importation of fertilizers, including urea, without import duties. This further increased concerns about the future of the fertilizer industry, and hence the performance of food policies, especially after the global food crisis in 2008–2009.

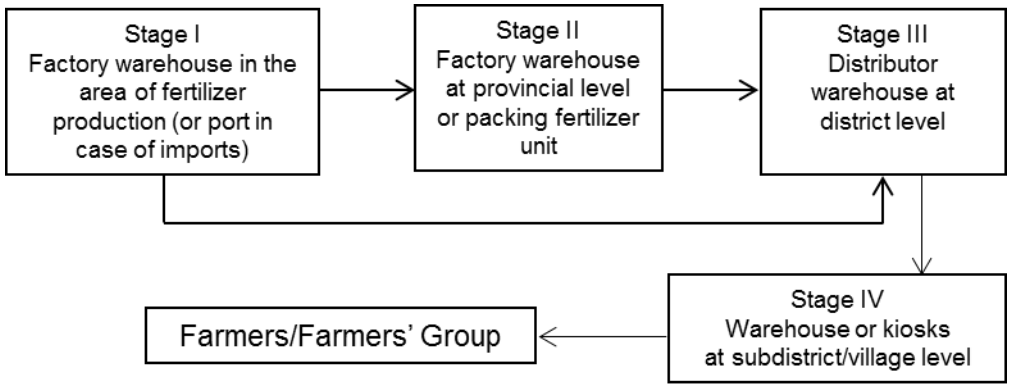
As mentioned briefly above, subsidized fertilizers are destined for staple food producers, while nonsubsidized fertilizers are available mostly for perennial crop producers and staple food producers who wish to apply more fertilizer than is available through the subsidized system. Only those amounts requested by farmers to the farmers' groups based on the size of operated land (RDKK) can expect to be supplied to specified kiosks at the village level, and only farmers who submitted such requests are eligible. To avoid leakages of subsidized fertilizers to noneligible producers, a separate distribution system was put in place. In addition, the government issued a decree on zoning and marketing regions for specific fertilizers produced by all five state-owned enterprises in Indonesia.

Government policy, stipulated in a ministerial decree, determines the production performance of fertilizer. The Ministry of Agriculture issues a decree on the estimated demand for fertilizer each year calculated using a bottom-up method of total area of food

crops from all over the country. The decree is formulated based on a coordination meeting convened by the Ministry of Agriculture and attended by officials from the Food Crop Services at the local and provincial levels. The decree is intended to accommodate the principles of balanced application of fertilizer, in accordance with the characteristics of an area and nominated by the local and provincial government. One should note that the proposed data of planted area of food crops might not be accurate because these local government officials do not have the adequate capacity to update the cropping area in their regions and the methodology for estimation has not been validated in the scientific and academic communities.

Rachman and Sudaryanto (2010) suggested that the lack of competition, insufficient gas supply, and obsolete technologies—where 75 percent of factories are more than 20 years old—are major factors leading to low capacity use, around 20 to 30 percent below potential, and high production costs. The current system is inefficient and leads to a large number of irregularities. Field surveys indicate that subsidized fertilizers are not available in required quantities, deliveries are delayed, only 40 percent of subsidized fertilizer reaches smallholders operating on less than 0.5 hectare, and 90 percent of farmers purchase fertilizers at prices higher than the MRP. The generalized distribution channels of subsidized fertilizer are presented in Figure 3.3.1. Actually, the distribution system of subsidized fertilizer is very complex, is heavily regulated, and involves several government layers. Fertilizer distribution is regulated by a decree, which includes import quotas for certain companies, export restrictions, and requirements for the documentation that distributors and retailers have to present, all of which add to the heavy regulatory environment surrounding the production and marketing of fertilizer (Osorio et al. 2011). Producers are only allowed to export fertilizer after the domestic demand has been fully met, but in reality it has not been easy to monitor the fulfillment of domestic demand, as fertilizer shortages during the planting seasons are reported in production centers of rice and other food crops.

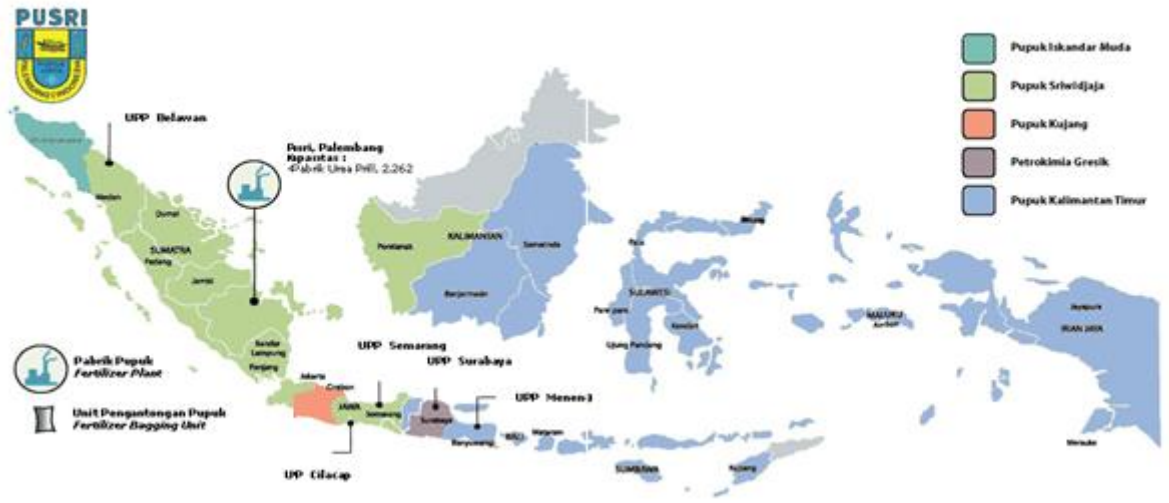
Figure 3.3.1—Subsidized fertilizer distribution channels in Indonesia



Source: Adapted from Rachman and Sudaryanto 2010.

Fertilizer distribution in Indonesia follows zoning specifications, stipulated by the Ministry of Trade Decree 7/2009, as presented in Figure 3.3.2. In general, PT Pupuk Iskandar Muda in Aceh is responsible for distributing subsidized fertilizer to the whole region of Aceh Province and some of North Sumatra Province. PT Pupuk Sriwijaya is responsible for all other provinces in Sumatra, plus West Kalimantan and Banten Province in Java. PT Pupuk Kujang is responsible for West Java Province and some regions in Central Java. PT Pupuk Petrokimia is responsible for some parts of East Java Province. Finally, PT Pupuk Kaltim, the highest in production capacity, is responsible for the other parts of East Java Province and for all other regions in Indonesia. As a way of avoiding urea shortages, the law requires producers to supply their mandated areas first. Under the new management of holding company PT Pupuk Indonesia, this fertilizer zoning has been gradually improved so that competition among fertilizer producers is encouraged based on the principles of modern marketing, such as customer loyalty, branding image, and effectiveness of the product. Time will tell whether this new holding management will contribute to better fertilizer distribution in the future, as the subsidy is quite complex and sometimes very political.

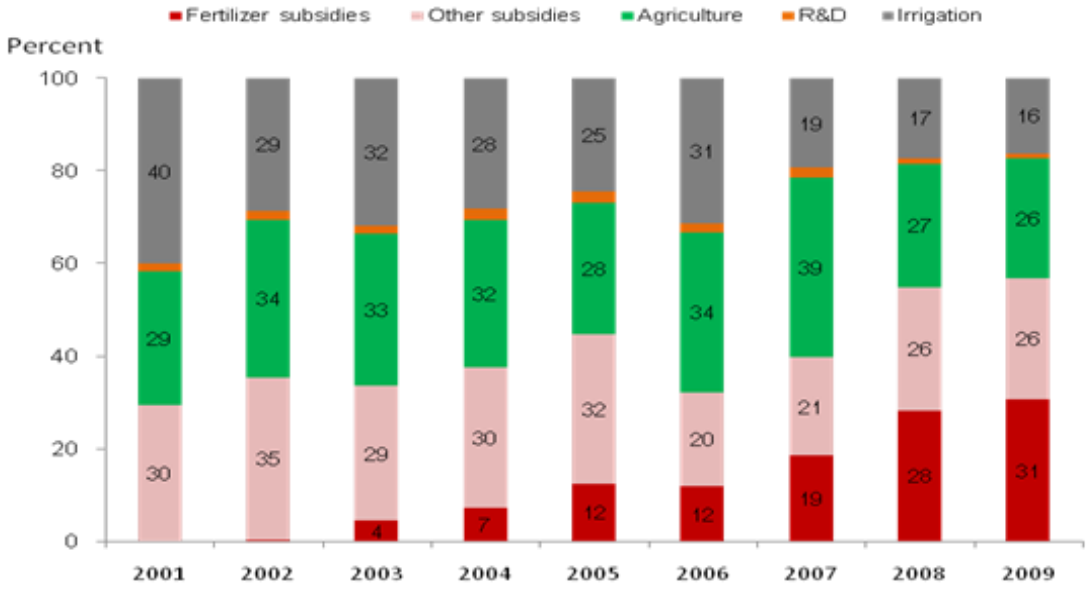
Figure 3.3.2—Fertilizer Zoning in Indonesia (Ministry of Trade Decree 7/2009)



The seed industry is also dominated by government agencies or state companies, PT Sang Hyang Seri and PT Pertani, which produce and multiply seed for rice and other crops. Private enterprises in the seed industry include PT Pioneer and PT East West, and they produce mostly food and horticulture crops seed, which in general have a higher price and immediate returns. Generally, extension agents and other government officials at the local level distribute high-yielding or improved seed to farmers. The private seed industry generally focuses on estate crops, hybrid corn, and some high-valued horticultural crops. In horticulture, private companies are active in providing seed for crops that are exported or processed into high-value products. In such cases, large agribusiness companies with international trade networks or local processing facilities contract with local farmers for the production of specific commodities and provide them with seed along with other inputs and technical advice.

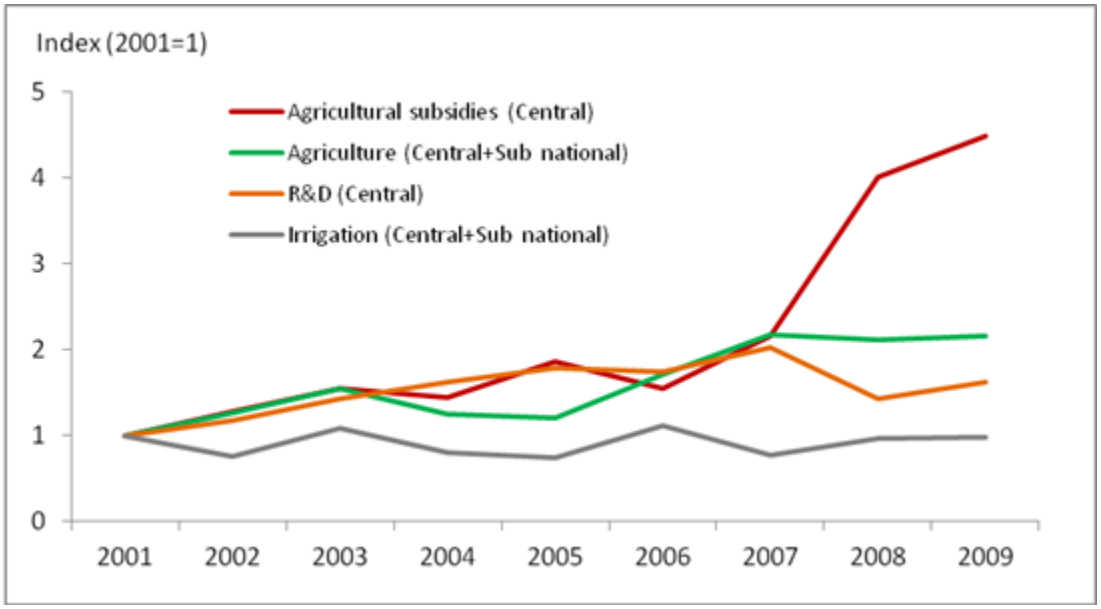
Fertilizer subsidy has become a public issue and triggered political debates because the subsidy has been given to the fertilizer industry, especially to cover the significant increase in gas prices during the global financial crisis. Economists generally compare public spending allocated to private goods against that allocated to public goods, such as irrigation infrastructures, research and development (R&D), and programs in the agricultural sector. Figure 3.3.3 clearly shows that in 2009 fertilizer subsidies were 4.5 times greater than the 2001 level, while irrigation remained at the same level. The fertilizer subsidy has been somewhat controversial because farmers' fertilizer use has been very high in the past few decades, and even overused in some food crop systems, especially rice. Meanwhile, fertilizer use with cash crops or estate crops and plantations, such as coffee, cocoa, pepper, and palm oil, is not as extensive as in the food sector. The fertilizer supply chain and marketing system may not be operating at the most efficient level, posing another question of the effectiveness of public spending on the agricultural sector.

Figure 3.3.3—Budget allocated for fertilizer subsidy, irrigation, R&D, and agriculture



Previous studies suggest that there is a relationship between public spending and growth in the agriculture sector, with significant implications for input policies in general. For example, spending on public goods has a positive impact on growth, while spending on private goods may have a negative impact on growth (World Bank 2012). Even though the debate on public spending for fertilizer subsidies is not as heated as the debate on energy and fuel subsidies, the rational consequence of fertilizer subsidies on agricultural transformation in Indonesia may be quite significant.

Figure 3.3.4—Index of public spending on agricultural subsidies, R&D, and irrigation



Notes: Subnational 2007 spending was from budget data. Subnational 2008–09 spending was estimated. Post-2009 subnational spending on agriculture data is not available.

Source: World Bank staff calculation (2009) using Ministry of Finance data.

In addition to the issue of allocative efficiency among government programs to improve yield and crop production, the excessive subsidy on chemical fertilizer has generated dynamic disequilibrium in the fertilizer market, as explained previously. Farmers who have been using cheap fertilizer and overuse chemical fertilizers may have a low need to achieve optimal use of fertilizer application

once the price is increased. This may not be an ideal condition given that Indonesia has planned to increase production and achieve special targets, such as self-sufficiency in some crops. Moreover, cheap chemical fertilizer has prevented further development of organic fertilizers, and hence the sustainability principles of agricultural development.

Indonesia passed Law 19/2013 on Farmers' Protection and Empowerment to protect farmers in cases of natural disasters, droughts, and other losses and to increase empowerment programs and technological change. Although agricultural input subsidies are not a short-term "quick fix," the country needs medium to long-term investment in input subsidies if they are to build up farmers' knowledge, capital, supply systems, and wider economic growth. However, the risks of their diversion, capture, and inefficiency also grow over time, posing major political and technical challenges. In Indonesia, input subsidies should not be totally removed, but rather need to be sharpened, in terms of target beneficiaries and disbursement mechanisms. The so-called smart subsidies are aimed at improving effectiveness, efficiency, and productivity and to keep ahead of fraud and rent-seeking behavior.

POLICY PROCESS OF AGRICULTURAL INPUT FOR FOOD SECURITY

Policy Context of Agricultural Input Subsidy

As mentioned previously, agricultural input policy is part of a broader agricultural development policy in the country. The current administration of President Susilo Bambang Yudhoyono (SBY) is continuing the broader policy strategies on revitalizing agriculture stipulated during his first term in office. The input price subsidy, distribution, and farmers' direct subsidy are among the important components of the agricultural input policy in Indonesia during his administration. In 2004, fertilizer distribution was tightly controlled with predetermined distribution areas for each fertilizer company, designed to prevent leakage to different market zones. The fertilizer company can only distribute fertilizer to warehouses within their predefined territory, and warehouses can only distribute fertilizer to retailers (kiosks) in the districts up to the predetermined total volume needed by the district. Retailers can only provide fertilizer to farmers/farm groups in their area, and farmers can only buy subsidized fertilizer at a specified kiosk. As a further measure to prevent leakage, fertilizer producers are only allowed to export fertilizer after the domestic demand has been fully met. The maximum retail price (HET) of urea was held fairly constant during the president's first term of 2004–2009.

However, in the current second term of President Yudhoyono's administration, the price of energy sharply increased during the late 2000s. The budget for fertilizer subsidy increased significantly from about Rp 1.2 trillion (US$12 billion) in 2004 to Rp 17 trillion (US$1.7 billion) in 2013. A further factor contributing to the budget increase was an expansion in the quantity of subsidized fertilizer being distributed, particularly a compound NPK fertilizer. The current administration had to implement a dual-pricing system for subsidized and nonsubsidized fertilizer. Fertilizer companies have been encouraged to produce more nonsubsidized fertilizer so they can increase revenues generated from fertilizer sold at the market price. Fertilizer companies have also been allowed to distribute nonsubsidized fertilizer outside their marketing regions. Nevertheless, despite the tight control at the policy and field levels, the dual-pricing system for fertilizer is experiencing some problems, with shortages and delays caused by distortions and inefficiencies (Rachman and Sudaryanto 2010).

As mentioned in the previous chapter, one major issue is that the price subsidy paid to manufacturers does not necessarily transfer down to producers—only 10 percent of farmers paid the HET price or below for urea in 2007 (Osorio et al. 2011). In reality, many farmers who operate more than 2 hectares also received the subsidy by splitting land into several plots on behalf of their family members (OECD 2012). Because of the price disparity between subsidized and nonsubsidized fertilizer in the domestic market, and the frequent disparity between the domestic price of subsidized fertilizer and the price in the international market, there is a strong incentive to illegally sell product to farmers ineligible to purchase the subsidized product or to smuggle subsidized fertilizer abroad. The only supervision of the program comes in the form of a reporting system, with no field monitoring. A second issue is that the lack of competition in the distribution system removes the incentive for manufacturers to innovate and invest in producing and distributing fertilizer more efficiently. Accordingly, there is a high transportation cost associated with distributing fertilizer.

The government has taken action to deal with these concerns, such as by commencing Direct Fertilizer Aid (*Bantuan Langsung Pupuk,* BLP), which is mostly based on free distribution of organic and NPK fertilizers to farmers who participate in field schools. It has focused its distribution on farmers in areas that fall below the average national/provincial/district productivity rates. It has also tightened the distribution system. As of January 1, 2009, the distribution of subsidized fertilizer from retailers to farmers/farmers' groups has been implemented closely based on the RDKK. Retailers are only allowed to sell subsidized fertilizer to farmers registered with an RDKK, verified by the village head, district head, and regent.

Table 4.1.1—Quantity of subsidized fertilizer provided to farmers, 2003–2010 ('000 tons)

Description	2003	2004	2005	2006	2007	2008	2009	2010
Distributed through MRP (HET) system								
Urea	4.339	4.239	4.027	4.300	4.300	4.800	5.500	4.931
SP-36	1.000	800	600	700	800	800	1.000	850
ZA	715	600	400	700	700	700	923	850
NPK	300	400	230	400	700	900	1.500	2.100
Organic						345	450	750
Distributed through DFA (BLP) system								
Organic-granule						152	195	293
Organic-liquid ('000 liter)						1.010	1.297	1.955
NPK						51	65	98

Source: Ministry of Agriculture 2011.

In addition to the distribution of organic fertilizer through the BLP program, two other support measures have been introduced. In 2006, the government began distributing an organic fertilizer–making unit (*Unit Pembuat Pupuk Organik*, UPPO) to farmers' groups free of charge. A UPPO consists of 35 cows, an animal enclosure, an organic fertilizer processing tool, a simple compost house, a fermentation tank, and three-wheeled vehicles. Each UPPO is capable of producing 135 tons of organic fertilizer per year from livestock manure. As of the end of 2009, 1,345 UPPOs had been distributed. In 2008, organic fertilizer was included as a product eligible for price subsidies through the HET system. To increase the use of organic fertilizer, the HRP of organic fertilizer was reduced from Rp 1,000/kg (US$103/ton) in 2008 to Rp 500/kg (US$48/ton) in 2009 (OECD 2012).

Seed subsidies are also used as an instrument to achieve several targets of self-sufficiency in five major foods: rice, maize, soybean, sugar, and beef. The main consideration is that seed, especially high-yielding seed, is an important agricultural input, accounting for more than 5 percent of total production costs. Many farmers are involved in the traditional or informal seed system, especially for the composite varieties that farmers can reproduce themselves without any Progrsignificant reduction in yield. The government wishes to promote the use of good-quality seed to improve productivity. As an incentive for farmers, the government has subsidized high-yielding seed. As with fertilizer, the policy instrument for seed subsidies is allocating the process to two major SOE seed producers, PT Sang Hyang Seri and PT Pertani. The main idea is that these two companies can sell high-yielding seed at a lower price so that farmers can have easy access to such an important production factor. The amount of subsidized seed needed is very much dependent on the bottom-up policymaking process at the local and provincial levels. Although not all provinces have conducted the required bottom-up policymaking process, from farmers' group at the village level to the Food Crop Service Office (*Dinas Pertanian Tanaman Pangan*) at the local level, the quota of seed subsidy has been determined at the central level—that is, the Ministry of Agriculture. The subsidized seed will be made available at appointed stores and retailers throughout rural areas. Farmers must register their purchases, and it is illegal for farmers to on-sell subsidized seed. Table 4.1.2 shows the expenditure of subsidized seed for food crops (rice, maize, and soybean) in 2005–2010.

Table 4.1.2—Expenditure of subsidized seed for food crops, 2005–2010 (Rp billion)

Program	2005	2006	2007	2008	2009	2010
Price subsidy	88.0	99.0	71.3	110.0	120.5	93.7
National Seed Reserve (CBN)		37.9	86.1	177.0	372.2	261.1
Aid of high-yielding seed (BLBU)			222.5	597.5	1.035.2	1.642.6
Total	**88.0**	**136.9**	**379.8**	**884.5**	**1,527.9**	**1,997.4**

Source: Ministry of Agriculture 2011.

There are at least three types of subsidies in Indonesia under President Yudhoyono's administration. The price subsidy for seed is the state budget allocated to two SOEs at about Rp 100 billion (US$10 million) annually, aimed at producing high-yielding seed at affordable prices for food crop farmers. The National Seed Reserve (*Cadangan Benih Nasional*, CBN) provides free certified rice, maize, and soybean seeds to farmers, especially those who have been affected by natural disasters or are willing to demonstrate new seed varieties within their village. The two SOEs are required to hold stocks equivalent to 30 percent of the annual planting requirements in

case of natural disasters. The Direct Aid of High-Yielding Seed (*Bantuan Langsung Benih Unggul*, BLBU) provides farmers with free certified seeds for non-hybrid paddy, hybrid paddy, hybrid maize, composite maize, and soybean. The government can supply only about 25 percent of the seed demanded by farmers through this process because of budgetary constraints. To receive the CBN and BLBU seed freely, farmers must participate in field schools, a central government program implemented at the local level. These programs have increased the use of certified seed from 40 percent in 2005 to 63 percent in 2010. In addition, the availability of high-yielding seed at market prices in rural areas has contributed to the increasing figure.

In addition to fertilizer and seed subsidies, Indonesia has implemented several program supports for other agricultural inputs, such as subsidized credit; rural financing schemes; and extension, training, and empowerment programs. Subsidized credits are available in several forms, either to improve the feasibility of farm management or to increase the bankability of farm businesses, especially among smallholders. Large-scale farmers and farm enterprises normally obtain credits from banking and non-banking sectors at a market interest rate. Indonesia has provided subsidized credit to the agricultural sector since the 1970s, when the BIMAS program disbursed credits for rice production at 12 percent per year, a rate below the annual rate of inflation and interest paid on savings. BIMAS credit was discontinued in 1984 when the default rate reached 55 percent. This high rate was especially due to moral hazard among borrowers, because periodic debt forgiveness created the expectation that sooner or later unpaid loans would be forgiven (OECD 2012).

The current administration has also implemented several agricultural financing schemes. The first scheme is to maintain the feasibility of farm enterprises, such as through food and energy security credits (*Kredit Ketahanan Pangan dan Energi*, KKPE), cattle business development (*Kredit Usaha Peternakan Sapi*, KUPS), biofuel development credit, and estate revitalization (*Kredit Pengembangan Energi Nabati-Revitalisasi Perkebunan*, KPEN RP). Farmer-borrowers pay an interest rate of 6 percent per year, and the government pays the difference between the announced interest rate and the market rate. The second scheme is simply to improve the bankability of farm enterprises, known as people-based small business credit (*Kredit Usaha Rakyat*, KUR). Borrowers pay the market interest rate, but the government provides credit guarantees through two SOEs, PT Askrindo and PT Jamkrindo. The third scheme is to improve both feasibility and bankability for small-farm enterprises, where the government provides financial and technical assistance to small-scale farmers.

The performance of these subsidized credits is not very good. As of January 2013, the realization of credit disbursement was Rp 3.9 trillion, or 43.2 percent of the targeted amount of Rp 8.8 trillion for food security credit (KKPE). For the same period, the realization of cattle business development (KUPS) was only Rp 350 billion, or less than 10 percent of the targeted amount of Rp 3.9 trillion. As of January 2012, the realization of biofuel credits was only Rp 5.63 trillion, or 14.6 percent of the targeted amount of Rp 28.6 trillion. The main reasons for such low performance include the rigidity of administrative procedures, farmers' lack of tax IDs and land certificates, and written recommendations from the technical agency at the local level. Interestingly, the realization of small business credit (KUR) as of April 2013 was Rp 112 trillion, or 112 percent of the targeted amount of Rp 100 trillion. Banking institutions are likely to prefer credit that has been guaranteed by third-party agencies, instead of simple subsidies of the interest rate. In the case of KUR, the financial risks of default or a nonperforming loan would be shouldered by the credit agencies, instead of by the executing banking sector (Arifin 2013).

The financing scheme called the Rural Agribusiness Development Program (*Pengembangan Usaha Agribisnis Perdesaan*, PUAP) is an example of the third group of credit subsidies to manage the problem of capital shortage at the farm level. In the official document of PUAP, this program is intended to reduce poverty and unemployment levels in rural areas by increasing product quality, boosting productivity, and stimulating the expansion of agribusiness activities. The PUAP program also aims to improve the performance of federated farmers' groups (*Gapoktan*) through concerted efforts of extension programs in 70 thousand villages in Indonesia. The government has also implemented several programs on agricultural extension; training in management, leadership, and entrepreneurship; agricultural education; and empowerment of farmers, farmers' institutions, and competitive farming. Foreign-assisted programs to improve extension services, such as the Farmer Empowerment through Agricultural Technology and Information (FEATI) program, has been working in 68 districts. In addition, the government program of Integrated Crop Management Field Schools (*Sekolah Lapang Pengelolaan Tanaman Terpadu*, SL-PTT) has been an important method for transferring knowledge to farmers since the late 1980s. As mentioned previously, free access to subsidized fertilizer and seed has become a significant incentive for farmers to participate in the field schools. Crops covered are rice, maize, soybean, other beans, and sweet potatoes, although the focus is primarily on rice. During the 2009 cropping season, about 85,000 farmers' groups participated in field schools.

In terms of research and development (R&D), a number of concerns have been raised regarding the performance of agricultural R&D in Indonesia (OECD 2012). Expenditure on research is relatively low. After adding in private-sector agricultural R&D spending,

the intensity with which Indonesia invests in agricultural research (0.27 percent) is roughly the same as Lao's PDR (0.24 percent) and much lower than that of Malaysia (1.92 percent) and the Philippines (0.46 percent). Concerns have also been raised regarding the type of expenditure undertaken. The quality of research has been undermined by a significant increase in the salaries for non-research staff and the Indonesian Agency of Agricultural Research and Development's operational and maintenance spending. A study by Warr (2011) suggests that the level of research intensity in Indonesia is particularly low by international standards, and even six times lower than that of Thailand, whose research intensity is not high by international standards. In the past three decades or so, Indonesia's research intensity has been declining, which indicates underinvestment in agricultural research within Indonesia. Given the government's objective of raising the level of Indonesia's food self-sufficiency—combined with the country's rapid population growth; diminishing returns on traditional factor inputs; declining availability of arable land, fresh water supplies, and other natural resources; concern over climate change and environmental degradation; and high fuel and fertilizer prices—it is clear that agricultural research deserves a much higher policy priority than it has received in recent years.

Policy Actors in Input Use and Food Security

There are at least three levels of hierarchy in Indonesian public policy: the strategic-political level, the organization level, and the implementation level. Policy actors involved in agricultural inputs are very much dependent on the hierarchical level of public policy. A policy on agricultural input is normally a subset of a more strategic law on food security or agricultural development in general. However, the ideological spirit comes from the Basic Law of 1945 (*Undang-Undang Dasar*, UUD 1945) and its subsequent amendments. A series of specific laws related to food security and agricultural development in general have also been stipulated since Indonesian Independence in 1945 up to the most recent laws just passed in 2013. As it is normally adopted in other parts of the world, a law in Indonesia has not only a regulating principle but also an obligation and punishment principles. It is basically a formal relationship between the state and society. Public policy at the organizational level is related to agricultural inputs and has the purpose of connecting or translating mandates stipulated in the law into the organizational setting of political society, business society, and civil society. A more operational public policy is actually a specific regulation or procedures, including personnel and budget to implement a specific policy objective, on either agricultural inputs or agricultural outputs, and even food security and agricultural development in general. Each level of hierarchy in public policy is explained below.

First, a strategic-political level of public policy is manifested in the Constitution and/or a law, which is formulated in the semi-bicameral parliament office, which includes a house of representatives (*Dewan Perwakilan Rakat*, DPR) and a house of senators (regional) representatives (*Dewan Perwakilan Dearah*, DPD). The government (executive branch) and parliament (legislative branch, or DPR) work together to formulate laws. In this case, policy actors consist of parliament members in a specific commission and government officials working in agricultural development affairs. A series of political and technical discussions take place inside and outside the parliament building, involving either directly or indirectly the stakeholders—that is, business and civil society. Other than the process of drawing up a constitutional amendment, the government generally plays a very important role in drafting the law or any specific bill, including those related to agricultural inputs and food security.

Academics, professional organizations, farmers' organizations, business organizations, chambers of commerce, and other civil society groups usually play active roles in the discussions of law drafts. Since the fall of President Soeharto, some initiatives have come from parliament members, even though the marathon discussions involve government offices. Within parliament, there is a legislative agency (*Badan Legislatif*, Baleg) responsible for determining priorities and targets of specific laws. There are at least two recent laws related to agricultural inputs and food security that were initiated by parliament and discussed thoroughly with government officials and other stakeholders. These are Law 18/2012 on Food and Law 19/2013 on Farmers' Protection and Empowerment. At the time of this writing, the role of senators (DPD) is less significant in formulating a law, compared to the role of the house of representatives (DPR), although DPD is also involved in discussing the contents of these two laws. In addition, Law 19/2003 on State-Owned Enterprises stipulates the principles and business mandates of fertilizer and seed producers in the country.

In 2003, Indonesia officially inaugurated the Constitutional Court (*Mahkamah Konstitusi*, MK), through Law 24/2003 on Constitutional Court. The main responsibility of the court is to ensure that any existing law in Indonesia is not in conflict with or acting against the Constitution of UUD 1945. An individual or a group of individuals can propose a judicial review by the Constitutional Court to examine an article or a fraction of article of any existing law, whether it has a conflict or potential conflict with the Constitution. A team of constitutional judges will then be established to examine the proposal. Then there are hearings and testimony before the court makes a decision. In a case where an article is against the Constitution, the court has full authority to cancel the article, and the court's decision is final.

Second, an organizational level of public policy has internal and external relationships and institutional arrangements. A law is sometimes not operational unless it clearly explains which government agencies are responsible for specific affairs. In Indonesia, an organizational-level public policy is stipulated in government regulations, presidential regulations, and presidential decrees. These regulations usually refer specifically to a certain article in a law, but they may also refer to two laws or more, depending on the urgency of specific affairs. Government offices are the main actors in formulating these regulations, especially under the leadership of the president and the minister of state secretariat, and parliament members are not formally involved. As with policy formulation at the strategic level, academics, professional organizations, and other civil society organizations are normally invited by the government to discuss the substantial issues in formulating such regulations. There are several government regulations related directly and indirectly to agricultural input policy, such as Government Regulation 68/2002 on Food Security, Government Regulation 25/2012 on Land Information System, and Government Regulation 30/2013 on Financing the Protection of Agricultural Land for Food Production. Some government regulations are in the process of being formulated, especially to implement new laws related to food and agricultural issues, such as Law 18/2012 and Law 19/2013. Another example of specific regulation for subsidized fertilizer is the controversial Presidential Regulation 77/2005 on Subsidized Fertilizer as a Specific Monitoring Good. This regulation has several interpretations, which could influence the efficiency level of fertilizer in general. On one hand, this regulation could prevent the leak of subsidized fertilizer to non-target groups and to non-distributional zones, and thus contribute to the effectiveness of public funding use. However, this it could also mean that if subsidized fertilizer is found to spread outside its marketing zones, the producers, distributors, and retailers are all acting illegally and would be subject to prosecution. Given the credibility of the legal system in Indonesia, this regulation could generate a considerable burden of transaction cost and a high-cost economy in general.

Third, an implementation level of public policy has an operational element and sometimes clearly mentions persons or agencies responsible for such matters. The policy hierarchy at this level is ministerial regulation and/or director general's regulation at the central government level and governor regulation and mayor/regent regulation at the regional government level. At the central government level, policy actors include a person or group of persons led by the minister if the scope is quite general, or by a director general if the scope is very specific. As mentioned earlier, the minister of agriculture is responsible for issuing ministerial regulations for the demand of subsidized fertilizer and high-yielding seed across the country each year. The minister of trade is responsible for issuing ministerial regulations on the zoning of fertilizer distribution. The minister of state-owned enterprises is responsible for regulating all SOEs' contribution to economic development and state revenues.

The following agencies are directly and indirectly related to agricultural input policies and food security in Indonesia.

- Ministry of Agriculture: Food production policies, estates crops, livestock, agricultural inputs and infrastructures, land management, irrigation, processing and marketing, human resource development (extension, education, and training), research and development, and strengthening coordination of food security.
- Ministry of Trade: Distribution of food and agriculture systems, agricultural inputs, international trade of food products, domestic distribution, futures commodities, international cooperation, and economic diplomacy.
- Ministry of Industry: Industrialization strategies, industry growth, production support for food industry, agro-industrial policies, development of small and medium industries in food and agriculture, and technical standardization of food and agricultural commodities.
- Coordinating Ministry of Economic Affairs: Economic policy coordination (including on agricultural inputs, food security, and economic development in general) and ministerial economic portfolio coordination (although it does not have implementing power or technical expertise).
- Ministry of Home Affairs: Food security in the region and the province; food and agriculture policy coordination among districts; incentives for food zoning and production; food security appropriations; and regional budgeting, accountability, and monitoring.
- Ministry of Finance: Budgeting and financing, state revenue from taxes, customs duties, financing specific expenditures for specific regions, surveillance of food commodities in and out of state boundaries, and supervision of financial institutions related to food and agriculture activities.
- Ministry of Marine Affairs and Fisheries: Development of fisheries and aquaculture to support food security; supervision and control of marine resources and fisheries, coastal communities, and small islands; and processing and marketing fishery products.
- Ministry of Social Affairs: Prevention of symptoms and cases of food insecurity, extreme poverty, and food shortages; rehabilitation and reconstruction of disaster-affected areas; and empowering people to face food insecurity.

- Ministry of Public Works: Development and maintenance of facilities and infrastructure (roads, bridges, and irrigation and drainage networks), and spatial policy for regionalization and zoning of food and agricultural commodities.
- Ministry of Forestry: Forest production, forestry spatial planning, natural resource conservation, rehabilitation and social forestry to promote food security, forest land use for food production and agricultural support, preservation of germplasma, and forest resource strategies for strengthening food security.
- Ministry of Energy and Mineral Resources: Development of oil and gas, including those available to fertilizer industries; new and renewable energy and energy conservation; energy feedstock from agriculture; and other alternative energy sources.
- Ministry of State-Owned Enterprises: Development of state-owned enterprises; restructuring, profitization, and privatization of SOEs to improve financial and technical performance; and public-service obligations for SOEs in the fertilizer industry, the food industry, and on plantations.
- Ministry of Cooperatives and Small-Medium Enterprises: Development of SMEs in strengthening food security, SME policy on food and agriculture, networking and marketing food businesses, support for SMEs in the food sector.
- Ministry of Transportation: Development of transportation facilities, port services, and other transportation facilities on sea, land, and air; distribution system of agricultural inputs and outputs; and monitoring the movement of agricultural commodities.
- Ministry of Development Planning: Policy and planning strategies, coordination of food and agricultural policy and planning among government agencies, coordination of central and regional food and agricultural policies, coordination of regional policy, and decentralization of development policies.
- Ministry of Research and Technology: Research and technology development strategies for food and agricultural sectors, from upstream raw materials and production levels up and downstream; agrifood engineering technologies to support the discovery of new varieties and technologies that can improve the productivity and efficiency of food commodities; and application of technology in society.
- Ministry of Defense: Supervision of regional interdependence and defense systems in creating and strengthening food security, network security, and distribution of national food stocks. In general, a segment of food security should be an integral part of a defense strategy and national defense.
- Perum BULOG: Government assignments (public service obligation, PSO) for procurement of strategic foods, security for staple foods, government food stock management, and distribution of staple foods to certain segments of society, especially the staple food of rice and others determined by the government.

Key Policy Constraints to Promoting the Seed and Fertilizer Industry

This analysis on policy constraints to promoting the seed and fertilizer industry in Indonesia is derived from interviews with relevant resource persons and available literature during the desk research activities. Due to differences in characteristics of the seed and fertilizer industries, the examination on key policy constraints will be separated. The government has encouraged the private sector to participate fully in seed industry development, although there are two major state-owned enterprises currently producing agricultural seed, mostly for strategic food crops. Private companies have been in the seed-producing business in Indonesia in the last decade or so, especially in producing in maize and horticultural crops. In the fertilizer industry, five major fertilizer producers remain very active and currently produce about 7 million tons of urea and other fertilizers.

Seed Industry

Policy constraints to promoting the seed industry can be summarized as follows:

(a) Farmers' Economies of Scale

The first and foremost policy constraint to promoting the seed industry in Indonesia is the characteristics of Indonesian food crop farmers, where the majority (54 percent) control farmland of 0.5 hectare or less. This small landholding is at the root of any discussions on economies of scale, production efficiency, and government program effectiveness. Some of these small farmers have access to high-yielding rice seed at a subsidized price, which is lower than the market price. But, some others do not have access at all, despite some government programs to promote the use of high-yielding seed and budget subsidies on agricultural input policies announced every year.

High-yielding seed used by these small farmers could come from the seed propagation program convened by either the central or the local government and commissioned by the state-owned companies PT SHS or PT Pertani. Heads of farmers' groups are actively

involved in the seed propagation program and responsible for distributing the produced seed to all group members. In this case, when the price of seed produced commercially by the seed industry, either foreign or domestic, becomes far too expensive for small farmers' standards, the share of sales of such seed is small.

Interestingly, smallholder maize farmers easily adopt hybrid seed, produced commercially by PT BISI, a subsidiary company of the Charoen Pokphand Group in Indonesia. As mentioned previously, the proportion of maize famers adopting hybrid seed is about 39 percent, indicating prospective seed industry development in Indonesia. Some private sectors are also actively developing hybrid seed for rice in Indonesia. Similarly, small-scale horticulture farmers also actively grow high-yielding seed from the private sector. At least six companies were established over the past decade to propagate seeds and seedlings for vegetables, fruits, and floriculture, and two of these had breeding programs. Several of these companies are affiliates or joint ventures with foreign multinationals. Three Dutch firms have local affiliates, which produce seed and seedlings for the domestic market and for export. East-West Seeds maintains a breeding program in Indonesia for vegetable crops. In short, for horticulture, farmers' economies of scale may be different so that their landholding may not serve as a policy constraint for the development of the seed industry.

(b) Unclear Policy on Biotechnology

Research on biotechnology to develop high-yielding seed has been implemented in Indonesia for a while and more intensively since the 1990s. The biotechnological approach for paddies has become more familiar to many since the launching of "golden rice" in 2001, which was hoped to help millions of people at risk of blindness or death due to deficiencies in vitamin A and iron. The challenge is not only to increase the yield so as to be able to sufficiently overcome the land conversion, but also to improve the nutrient content of, and the added-value to, the rice. Indonesian scientists from public research institutes and universities are currently developing transgenic sugarcane for paddies. Private foreign companies are developing transgenic maize. Their biosafety and environmental safety for multi-seasons and multi-locations are now being field tested by the Agricultural Agency for Research and Development (AARD) at the Ministry of Agriculture.

Breeding new varieties is still at an early stage in the private sector (Fuglie 1998). Most activity involves transferring varieties developed elsewhere for local screening and production. Seed companies are also transferring improved seed propagation techniques, such as micro-propagation methods (tissue culture). Formal linkages with foreign multinational companies provide the principal source for new technology. Locally produced seed faces competition from imported seed and from varieties produced and developed by public agricultural research institutes. More than 20 companies import vegetable seed for direct sale, especially from Taiwan. Public research institutes are also engaged in seed production and distribution. Competition from public seed research has reduced incentives for the private seed industry.

Genetic engineering has been used on soybean, which has been modified in such a way that it becomes tolerant to glyphosate. In Indonesia, research is focusing on producing soybean varieties that are tolerant to aluminum. Biotechnology is not the same as the transgenic approach. The product "soybean plus" refers to soybean containing a microbe that is able to conduct nitrogen-adding processes. The microbe, Rhizobium bacteria, can be found in the soil. In fact, 80 percent of the air contains nitrogen, but plants such as soybean cannot directly use it. Properly mixing Rhizobium with soybean seeds infects the roots of the growing seeds with the bacteria, which naturally catches and transfers nitrogen to the roots, saving on nitrogen fertilizer (urea) use by up to 60 percent (Siregar and Arifin 2010).

However, the policy behind biotechnology development is not clearly defined, except that the government is planning to formulate one. Indonesia has ratified the Cartagena Protocol through Law 21/2004 and Government Regulation 21/2004 on Biosafety of Transgenic Products and the implementing rules of Ministerial Regulation 67/2006 on Conservation and Utilization of Plant-Genetic Resources. Further, the release of transgenic products will be made following the recommendations of the Special Committee on Food Safety and Biosafety of Transgenic Products (KKH-PRG). This committee has not been quite effective yet, and ministries where such activity takes place have played weak supporting roles. The main argument is that any activities related to biotechnology protocols must comply with Law 32/2009 on Conservation and Management of the Environment. The controversial case of Bt cotton trials in Sulawesi has prevented scientists and NGO activists from moving forward significantly and making specific recommendations for biotechnology development in Indonesian. The focus on seed development using biotechnology needs to wait a little longer until the new policy has been formulated.

(c) Slow Movement of the Triple-Helix Partnership

The development of the seed industry in the future and innovation in general requires a long-term partnership among the academic community, the private sector, and the government, called the triple-helix partnership. Linkages between public and private research

and technology transfers are limited but growing. Most private companies obtain most of their technological innovations from public and private research institutions or companies outside of Indonesia, rather than from public research institutions within the country. Reasons for this include (1) a public agricultural and research policy emphasis on smallholders and food crops; (2) varying quality in public research programs, with many of the best public researchers and facilities concentrated in Bogor; and (3) the availability of technologies in other countries that can be imported with relatively little adaptation (Fuglie 1998).

Unfortunately, the progress of the triple-helix partnership on seed development has been quite slow, particularly because funds for R&D from the private sector are very small. On the other hand, some private-sector seed companies are really interested in developing high-yielding seed, including those using biotechnology for strategic food crops such as rice and maize. Probably the most important government policy supporting private research and technology transfer pertains to the supply of skilled technical and scientific staff. Private companies make use of public-sector agricultural researchers as consultants or hire them as permanent staff. However, the availability of scientific personnel at the advanced degree level in agricultural fields is still very limited in Indonesia. Private companies have had difficulty finding and hiring staff at this level, especially outside Java.

An improvement in this arrangement would include elements of civil society, making it a quadruple-helix partnership, to increase the breadth of agricultural development constituents. Participation by farmers' groups and other civil society members could prevent a repeat of the very controversial case of small farmers being prosecuted in Nganjuk, East Java, after propagating maize seed that was allegedly developed by a foreign-affiliated seed company. In August 2013, the Constitutional Court overruled the District Court of Nganjuk's verdict, ruling that Articles 9, 12, and 60 of Law 12/1992 on Farming Cultivation were unconstitutional. This implies that smallholder farmers will no longer need special permission from the government to collect local seed, produce their own seed, or to distribute it.

(d) Business Perception on Law 13/2010 on Horticulture

Limitations on foreign seed companies might be viewed as a policy constraint to promoting the seed industry in the future. This limitation may be true or not, depending on the governance structure of the policymaking and policy implementation process. Actually, there may be a popular business misperception among foreign companies on Law 13/2010 on Horticulture, especially Article 100, which stipulates that the government encourages domestic investment in horticulture businesses. Foreign investment in such businesses is limited only on large-scale businesses, where the ownership of foreign shareholders cannot exceed 30 percent. Because foreign companies, such as East-West Seed, Syngenta, and Seminis, own the majority of the horticultural seed industry in Indonesia, these companies believed that they would be out of business by 2014. Such a reaction or misperception is actually overexaggerated, given that the seed industry will develop better, and the market structure of the seed industry will be far healthier, if oligopoly or oligopolistic behavior is reduced.

It is quite common for foreign companies to keep their funds in Indonesian banks at amounts similar to their shareholdings, and they are not allowed to apply for financial credit from state-owned banks or regional government–owned banks. Moreover, any foreign company refusing to follow the laws of the Investment Coordination Bureau (BKPM) and the Tax Office at the Ministry of Finance will not be issued a permit to operate in Indonesia. The seed companies are getting together to apply for a judicial review to fight against the implementation of this law. In the coming days a clearer picture is expected to unfold and many significant changes may be seen with respect to the seed industry.

Fertilizer Industry

Unlike the seed industry, the fertilizer industry has developed quite well since the 1970s and has been associated with strong government programs to increase food production, especially to achieve self-sufficiency in rice, which was accomplished in the mid-1980s. Except for in 1998, when rice imports reached a record high of nearly 6 million tons, rice production has maintained a level of self-sufficiency or the import volume has been less than 10 percent of production. The fertilizer industry in Indonesia has achieved quite an advanced stage of development through five state-owned enterprises under one holding company, PT Pupuk Indonesia. The private sector so far is not interested in establishing a fertilizer-producing plant, especially to produce chemical fertilizers on a large scale, simply because it cannot compete with the state-owned enterprises under the current heavy subsidy regime.

Since the 1990s, the fertilizer industry has also developed organic fertilizer using farmers and small-scale enterprises across the country to produce compost either from livestock waste or from crop biomass. All five existing fertilizer producers generally provide the necessary microbes to stimulate composting. These state-owned enterprises conduct the quality controls and provide labeling. The demand for organic fertilizer is growing, mainly due to chemical fertilizer overuse and its damaging effects on soil quality. Increasing

awareness among consumers on sustainable agriculture and the sustainable development strategy in general has also contributed to the growing demand for organic fertilizer. The current heavy subsidy on chemical fertilizer is the greatest policy constraint to promoting the organic fertilizer industry.

Similarly, biological fertilizer, or simply biofertilizer, has developed quite well in the past decade, as a result of R&D among research institutes and universities across the country. Biofertilizer captures additional nutrients through the natural process of nitrogen fixation, solubilizing phosphorus and stimulating plant growth. Theoretically, biofertilizer use would reduce the need for chemical fertilizers and pesticides. The microbes in biofertilizers also restore the soil's natural nutrient cycle and build soil organic matter. The private sector in Indonesia has commercially produced many biofertilizer products using microbes of legume-nodulating bacteria (LNB), such as Rhizobium, Azotobacter, and Azospirillum. Unfortunately, the use of biofertilizer and the development of the biofertilizer industry in Indonesia are quite limited, mostly because of the current policy of subsidizing chemical fertilizer.

Meanwhile, chemical fertilizers have also experienced episodes of scarcity in the food production centers in rural areas. Frequent fertilizer scarcity is actually an outcome of the cheap price of subsidized fertilizer and usually occurs before the planting season from September to October and from March to April every year, which obviously affects the production performance of strategic food crops and the quality of food security in Indonesia. The historical pattern of the fertilizer distribution system (closed, semi, open, and closed again) may also determine the level of fertilizer scarcity, and thus the disparity between the maximum retail price (MRP or HET) and the actual price paid by farmers in the field.

Elsewhere, at least six major nodes of fertilizer shortages have been identified (Arifin 2003), (1) production node, (2) distribution node, (3) institutional node, (4) price node, (5) subsidy node, and (6) trust node, especially among fertilizer stakeholders. Brief explanations on the above nodes can be summarized as follows.

(1) Production Node: Supply of Gas vs. Individual Company's Performance

Although Indonesia is the third largest urea producer in the world, after China and India, and supplies about 6 percent of the world's urea, the industry performance remains problematic, due mostly to the supply security of gas. During the recent energy crisis, three major fertilizer companies did not obtain an adequate supply of gas, disrupting production performance.

As is widely known, natural gas is the largest component of the cost of fertilizer production, with compositions ranging from 50 to 60 percent for urea, 25 to 35 percent for ZA, and 40 to 50 percent for phosphate rock and phosphoric acid for SP-36. Indonesia does not have long-term natural gas reserves that are specifically used for the fertilizer industry. As a result, the price of gas for the fertilizer industry follows the world price of natural gas, which is inherently determined by a formula based on world oil prices. The gas company, which is also a state-owned enterprise, prefers to sell gas on the world market, which garners higher foreign reserve earnings for the country. On the other hand, the cost of fertilizer production is far above the selling price.

(2) Distribution Node: Agriculture vs. Trade

Fertilizer scarcity in food production centers occurs simply because there is a gap between the demand for and the supply of fertilizer. During times of chronic fertilizer scarcity, the fertilizer zoning policy (Ministry of Trade Decree 07/2009) simply cannot overcome the scarcity problem because the market for fertilizer in rural areas does not follow the market mechanism. In this case, the food production target may be in trouble because of problems with fertilizer distribution. During the fertilizer scarcity period in 2010, for example, the technical requirement of urea to achieve national food targets and agricultural production was 6.3 million tons, but the Ministry of Agriculture decree mentioned only 5.5 million tons. The technical need for superphos was 3 million tons (but only 1 million tons in the decree), ZA was 1.6 million tons (vs. 923 thousand tons in the decree), NPK was 3 million tons (vs. 1.5 million tons in the decree), and organic was 4.7 million tons (vs. 450 thousand tons in the decree).

(3) Institutional Node: RDKK Is Not Easy to Implement

The institutional node might start from the quality of coordination between authorities and agencies responsible for fertilizer production, distribution, and consumption. Also, the institutional node in this case could include cultural institutions, where the demand for fertilizer is determined by an institutional arrangement called Definitive Plan of Group Needs (RDKK), as explained earlier. Problems in data reporting systems, due to chaotic data management at the autonomous regional level following decentralization, have serious implication on food production targets and, more importantly, on farmers' welfare. The government needs to involve civil society organizations that have usually worked very closely with farmers at the field level.

(4) Price Node: HET Disparity vs. Actual Price

The disparity between the maximum retail price (HET) and the actual price paid by farmers is too wide, with the actual price nearly twice the HET, and this is a complicated situation to try to solve by conventional means. Such a disparity provides incentives for rent seekers and speculators, who tend to sell subsidized fertilizer to commercial markets. Interestingly, in some areas, the psychological uncertainty of the retail price makes many farmers purchase fertilizer earlier. Some farmers might agree to raising the maximum retail price (HET) as long as it is lower than the price procurement (HPP) of dry rice—recall the Farm Formula of 1:1 at the start of this paper. The government should make efforts to improve property rights in the fertilizer economy by prosecuting rent seekers in the distribution and retail sectors. This kind of business is generally affiliated with the economic and political elites in the region.

(5) Subsidy Node: Gas Subsidy vs. Price Subsidy

In 2001, the government introduced gas subsidies for urea and price subsidies for non-urea (ZA, SP-36, and NPK) fertilizers. A gas subsidy means that the government sets the price of gas sold to fertilizer producers at a certain level, and the government bears the difference between the market price and the benchmark price. A price subsidy means that the government also bears the difference in HET fertilizer prices and the cost of fertilizer production, including price margins and distribution costs. Meanwhile, the basic problem in economic science is that subsidies create distortions and do not directly benefit the farmers as the ultimate consumers of subsidized fertilizer, and this has now become an issue of public finance. The criteria should be extended to the principles of budget allocative efficiency and the business performance of state-owned enterprises. Therefore, the government should conduct a complete review of subsidized fertilizer distribution mechanisms (and agricultural protection in general) before implementing it at the mass level.

(6) Trust Node: Cost Audit vs. Retail Price

Accounting audits and performance audits of SOE fertilizer producers need to have a strong basis in the dynamics of tolerable distribution costs (due to external factors, the rise in world oil prices), especially if the state must bear the increased cost of fertilizer production. An audit of the effective HET price is also important because the fertilizer industry prefers a higher HET price, and thus greater economic revenue for fertilizer producers. Both of these dimensions make the fertilizer industry unwilling to leave the comfort zone that has so far been used as a corporate strategy. Such a social capital node requires an audit strategy and rational options between the gas subsidy (production cost) and the price subsidy (HET). This step requires authoritative policy leadership that implements accountability principles and good governance.

Policy Process for Improving the Role of Inputs for Agricultural Development

There are at least three stages in the policy process for improving the role of inputs for agricultural development, (1) policy formulation, (2) policy implementation, and (3) policy evaluation. Policy changes usually take place within the policy process outlined above, although some variations do occur. There has been no standardized timeframe for completing one cycle of the policy process, but unwritten consensus and common practice are normally five years, similar to the term period of political society: president, governor, regent, mayor, and parliament members. In some special circumstances, the policy process and policy changes occur in a very short time span, one year or less. The timeframe is very much dependent on the interactions among actors, policy outputs and policy outcomes, and policy assessments that continuously provide feedback for a better future.

The policy process is influenced by a number of underlying factors that have shaped the process in the past and will shape its future. Such factors include the political system and its degree of openness, the socioeconomic environment, historical factors, and the nature of the country's institutions. These macro factors mold the policymaking environment and shape the institutions that govern the process. They may promote or hinder the participation of various individuals and organizations, including civil society organizations, committees, and researchers. A comprehensive analysis of the policy process seeks to identify the characteristics of an ideal system, such as inclusiveness, use of evidence, mutual accountability, transparency, predictability, collective action, and openness (Babu 2013).

First, policy formulation in the role of inputs for agricultural development has occurred since President Soeharto's era in the 1970s. The policy formulation in the current administration differs significantly from the Soeharto era, which mostly used the command system or linear order. During the Soeharto era, a policy decision taken at the central level was usually followed properly at the provincial and district levels. The strong position of the government's political party (Golkar) in the old days may have simplified the policy process of any decision. The policy variables that influence the performance of any outcome are likely to be the capacity of the bureaucracy; human resources at the central and local levels; and access to new technology, innovation, and information systems. Now, under the multiparty system, where the government consists of a coalition of many parties, policy formulation is far more dynamic, where policy actors are willing to be influential and their economic and political interests are likely to be heard and accommodated. Policy

formulation at the political level is far more "noisy," with active public debates inside parliament, outside parliament, and in the media. One way or another, this process has influenced policy formulation, including the role of agricultural inputs in the development process.

Although there is no specific law devoted solely to agricultural input affairs, public debates on agricultural subsidies have garnered significant attention, at least once a year, during the technical and political discussions on the annual state budget. The discussion starts after the president delivers a political speech, along with the state budget draft, to parliament on August 16 each year. All stakeholders in agricultural input subsidies and/or agricultural development in general pay special attention to the amount of subsidies proposed by the government, including those for fertilizer, seed, and food for the poor. Such stakeholders include journalists, academics (mostly economists), government officials directly involved in input subsidies, officials from the fertilizer and seed industries, farmers' associations or lobbyists, civil society organizations, related state-owned enterprise officials, and some elements of provincial and district governments. These actors start making comments, which are usually broadcast by the media (television, newspapers, and magazines). Academics and journalists write opinions and columns expressing their concerns for and expectations of the government proposal. Meanwhile, parliament members hold a series of working sessions with government officials, SOE officials, academics, and civil society organizations. These joint sessions and public debates usually take place for two to three months, before the budget is officially approved in a parliament plenary session before or around the first week December each year. After the state budget draft is approved in parliament, the president signs the draft to become law. The president or executive branch has a full month to make an appeal or submit an objection to the law draft. If there is no objection within a month, the president has to sign the law, and starting from the date signed, the law is officially effective. In Indonesia, the state budget is law, so it has the power and authority of other existing laws.

The process for formulating a specific law follows the procedures similar to the state budget. The most recent examples are the formulation of Law 18/2012 on Food and Law 19/2013 on Farmers' Protection and Empowerment. It started from the initial draft proposed by parliament, particularly Commission IV on Agriculture, before it was intensively discussed in the Ministry of Agriculture, from both political and technical dimensions (see Figure 4.4.1 and Figure 4.4.2). Specific agencies in the Ministry of Agriculture responsible for discussing the law draft are the Agency of Food Security for law draft on food and the Agency for Human Resources for the law draft on farmers' protection. Several stakeholders are invited to contribute to the drafts, including academics, particularly the Indonesian Society for Agricultural Economics (Perhepi); the Indonesian Economists Association (ISEI); the Indonesian Agricultural Extension Association (Perhiptani); the Expert Working Group of the National Food Security Council (Pokja Ahli); the Special Working Group of the National Food Security Council (Pokja Khusus); the Federation of Farmers' Coalition (FSPI); farmers' political lobbyist groups (HKTI and KTNA); the Indonesian Chambers of Commerce and Industry (Kadin); and the Association of Indonesian Food and Beverage (Gapmmi). The public debates and discussions take place for nearly two years, from the initial meeting to the plenary sessions in parliament. Many stakeholders feel obliged to contribute to the law draft, given that the previous law was in place for more than 16 years, and out of date in some senses.

Figure 4.4.1—Actors in the policy process of agricultural inputs and food security in Indonesia

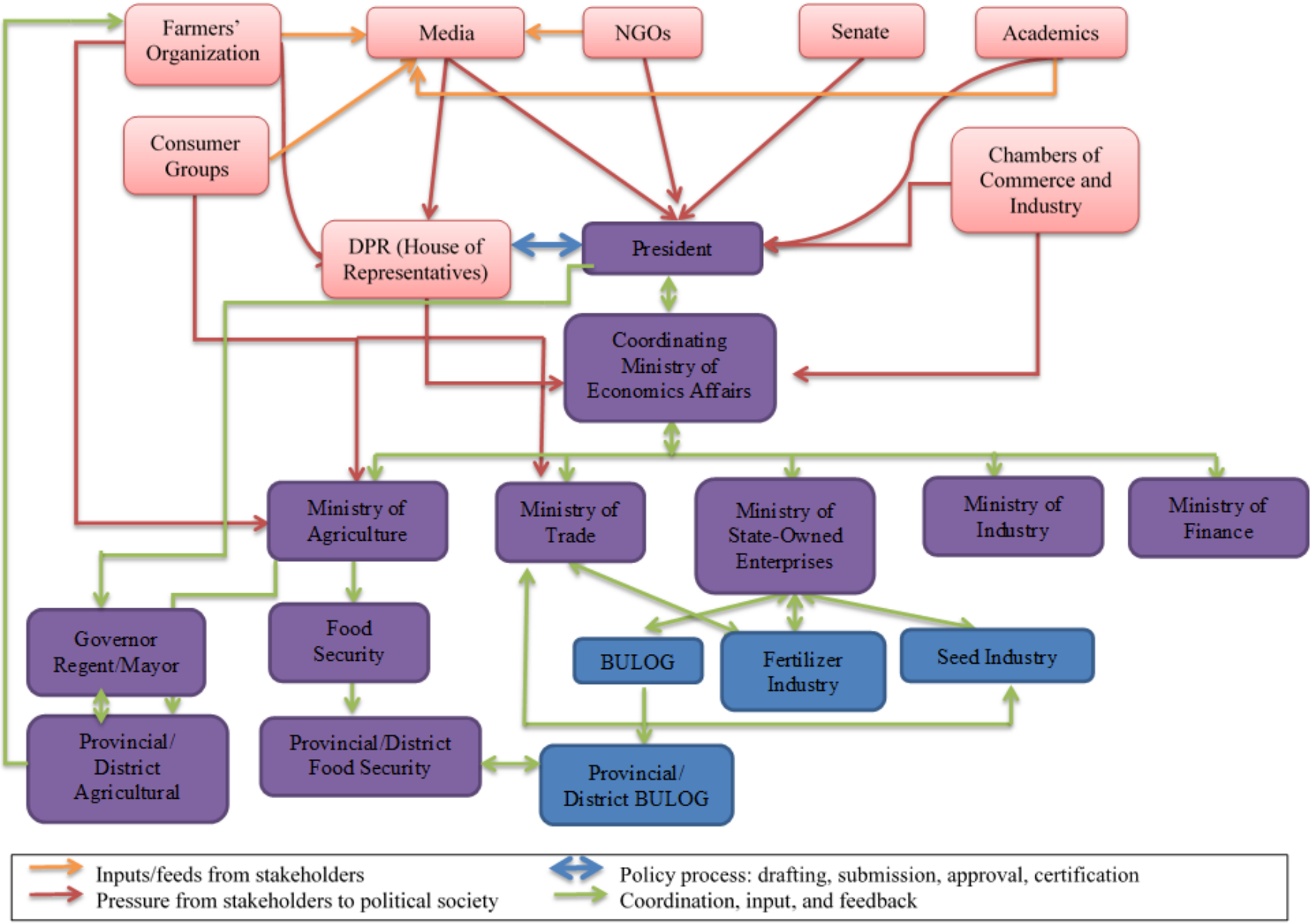
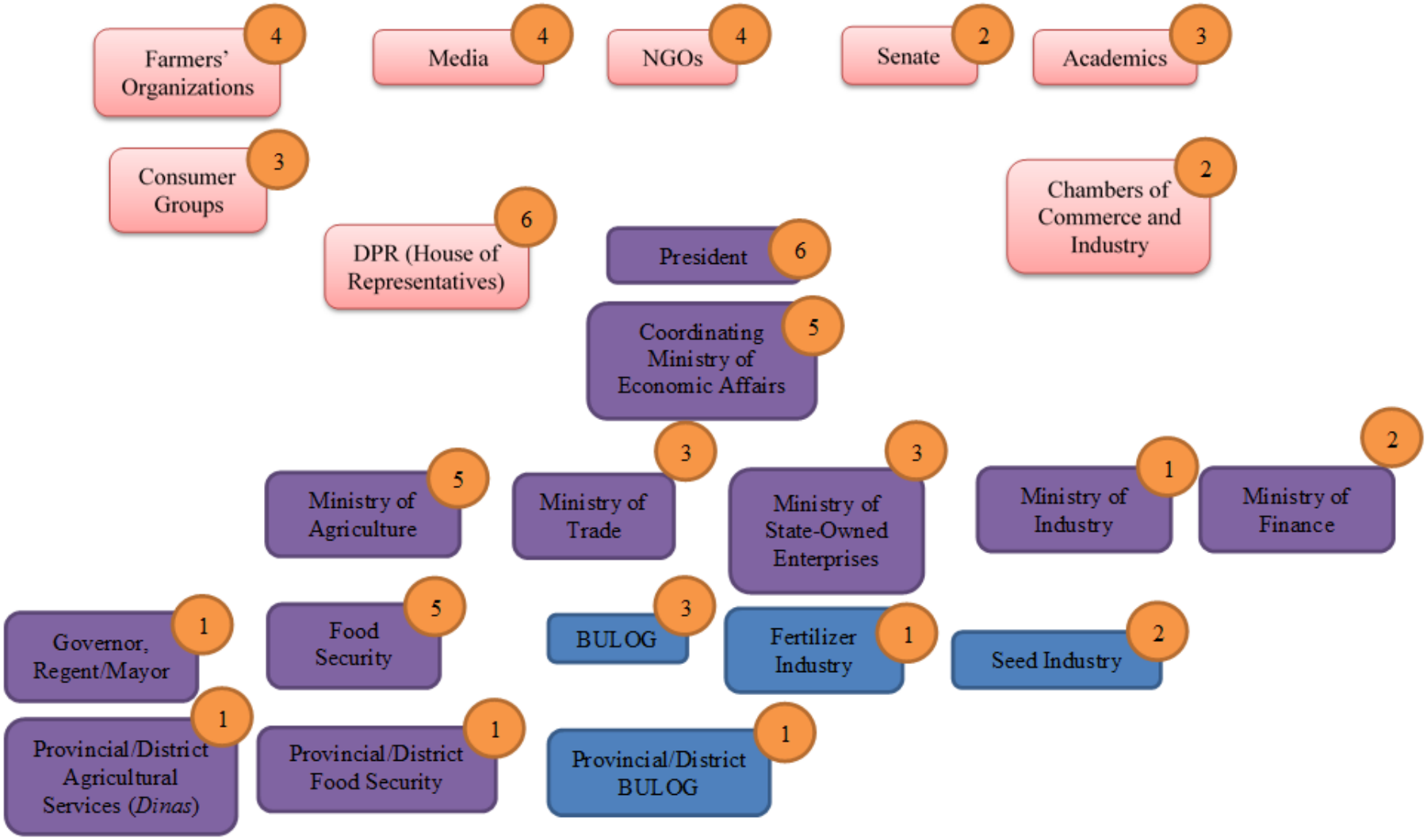


Figure 4.4.2—Influence level of actors in the policy process of agricultural inputs and food security in Indonesia



Notes:

1. Smallest Influence
6. Highest Influence

One should note that for the organizational level and implementation of public policy, these stakeholders do not actively play important roles in the formulation stages. Government officials have generally thought that the policy format of government regulations is primarily the responsibility of government agencies, so that the political process is far different from the policy formulation of a law. Some agencies have involved academics and professionals in discussing a draft of government regulations. For example, at the time of this writing, the Agency of Food Security in the Ministry of Agriculture has been discussing the draft of Government Regulation on Food Security as an organization arrangement of Law 18/2012 on Food, as an improvement of Government Regulation 68/2002, which was based on the old Law 7/1996 on Food. This agency has also been discussing the draft of the Presidential Regulation on Institutional Arrangement of the Agency of Food Security in the future, such as mandated by Law 18/2012. In the future, the Agency of Food Security will have more discretionary power and coordinating authority for food production; distribution and trade (availability); food consumption and price stabilization; nutritional dimension of food and nutrition quality of the people living in remote areas (accessibility); and food utilization, such as food safety, the quality of artificial flavors and colors, and health dimensions of food (utilization). A new dimension of food sovereignty and food reliance stipulated in the new law has triggered significant discussion and public debates on how the state responds to the new mandates.

Second, the implementation process of agricultural inputs for food security and agricultural development in general is quite straightforward. The Ministry of Agriculture—that is, Directorate General of Agricultural Inputs and Infrastructures and Directorate General of Food Crops—makes an estimate of the demand for fertilizer, which is stipulated in the ministerial decree issued during the planting season at the end of the calendar year. As mentioned earlier, the amount of demand for fertilizer is obtained through a bottom-up process, from farmers' groups in rural areas, and endorsed by the Agricultural Services in all districts and provinces in Indonesia. The decree on fertilizer demand also states the maximum retail price (HET) of subsidized fertilizer, namely urea, superphos, NPK, and organic fertilizers. This decree is sent to and discussed by the Coordinating Ministry of Economic Affairs, which then announces the policy to the public. This decree is normally used by the fertilizer industry as one of the drivers to formulate the production and business plans for the year. The fertilizer industry considers the price of gas as an important, if not the most important, driver in formulating the plan. For subsidized seed, the policy process is not as complicated because there are only two SOE seed producers that are involved in the production and distribution of subsidized seed, especially high-yielding and standardized seed. The Ministry of Agriculture also determines the demand for subsidized seed every year.

Technical details of policy implementation require intensive communication between the Ministry of Agriculture in the central government and Agricultural Services at the provincial and local levels. These groups of officials also communicate directly with district managers in fertilizer industries all over the country, because the headquarters of fertilizer producers determine the allocation of subsidized fertilizer. The managers are also required to follow the principles stipulated in the Ministry of Trade decree—the latest is Decree 07/M-DAG/PER/2/2009 on Supply and Distribution of Subsidized Fertilizer, dated February 9, 2009, a revision of Decree 21/M-DAG/PER/6/2008. Two ministries having two different decrees might certainly raise the complexity of policy implementation in the field. In addition, Presidential Decree 77/2005 on Subsidized Fertilizer as a Specific Monitoring Good is usually used by law enforcement officers (police and district attorneys) to prosecute fertilizer distributors and managers if the fertilizer distribution does not match the rules and regulations outlined in the presidential decree.

Third, policy evaluation to improve the role of agricultural inputs in agricultural development is a continuous process of assessing the policy outcome and the ideal condition that requires a proper change in management. The policy outcome may start from observations on the patterns of interactions among actors and subjects, on the gainers and losers by how much, and on the quantification of the benefits and costs of the policy output. The ideal condition is an ideological representation based on a theoretical foundation, empirical experience, and imagined interactions among political, business, and civil society. This continuum obviously requires high-level stamina and sufficient endurance on the part of policy analysts and policymakers alike, because the evaluation process can involve healthy public debate, using both head and heart. After conducting policy studies, a policy analyst may come up with a series of options and recommendations that may then become follow-up actions in the real world. A policy change will not take effect unless the results of the policy evaluation are presented properly and communicated appropriately to policy leaders and decisionmakers. Policy evaluation sometimes require policy advocacy that is normally conducted by individuals or groups with a passion for change management for a better future.

The policy evaluation on fertilizer subsidy in 2010 is a perfect example of how the results of analysis and evaluation may not translate into significant changes for efficiency and effectiveness. The policy evaluation started because of fertilizer shortages, due to some factors explained above, obliging the Coordinating Ministry of Economic Affairs to facilitate academic and policy discussions on the issue. Five leading universities and research institutes with credible experience in conducting research on agricultural and food policy were assigned to conduct the policy evaluation. These were the University of Lampung (UNILA), Bogor Agricultural University (IPB),

Gadjah Mada University (UGM), Padjadjaran University (UNPAD), Brawijaya University (UB), and the Indonesian Center for Agricultural Socio Economic and Policy Studies (ICASEP), which performed the policy evaluation within a period of three months. After several internal discussions and focus group sessions involving stakeholders, these academic institutions recommended sharpening agricultural input policies for the future. The Coordinating Ministry followed up on the recommendation and assigned ICASEP to conduct a pilot project and action research on implementing a direct fertilizer subsidy to farmers in the fiscal year 2010. These actions were conducted in the district of Karawang in West Java, one of the major rice-producing centers in Indonesia. ICASEP chose two subdistricts, Karawang Barat and Cikampek, to conduct the action research, asking farmers' groups to open up an account at Bank Rakyat Indonesia (BRI) at the local or unit office, as required by the ministerial decree. The Treasury Office then transferred the amount of the direct subsidy to those accounts on October 2010, or before the planting season. The funds were withdrawn by the head or officials of the farmers' groups and distributed to farmers based on their initial information. Using this method, the HET price at kiosks for a 50 kg package of fertilizer was actually the price announced in the ministerial decree, and all demand for fertilizer was fulfilled based on the definitive plan proposed by the farmers' groups (RDKK).

The main problem with this experiment was that farmers in the study area had to buy fertilizer at the market price, which was nearly twice the subsidized price. The constraints in the amount of cash advances provided to farmers to buy fertilizer are quite serious. The majority of farmers were reluctant to allocate their tight daily expenditures to purchase fertilizer at the nonsubsidized price, although later they obtained reimbursement through the farmers' group. Moreover, at nearby villages outside the two study locations, farmers could easily get fertilizer at the subsidized price. Attending the plenary meeting in Bogor to disseminate the results of this pilot project were local government leaders, parliament members, farmers, extension agents, stakeholders, NGOs, and fertilizer distributors and retailers in Karawang. Generally, they did not accept the ideas of a direct subsidy on fertilizer, especially because small farmers had to pay the market price in advance and obtained reimbursement later. As a result, the plan to extend the direct subsidies in 12 other regions was cancelled. The fertilizer subsidy remains, using the methods and mechanisms adopted in recent years, where the subsidy is given to five fertilizer producers to manufacture fertilizer at an affordable price using the Ministry of Agriculture's decree on the maximum retail price (HET).

CONCLUDING REMARKS: POLICY RECOMMENDATIONS

Summarized Conclusions

The study has examined the roles of input policies, mostly seed and fertilizer, on transforming Indonesian agriculture. In general, large-scale input policies such as those in Indonesia have led to substantial increases in input use, contributing to agricultural development and structural transformation in general. However, input subsidies may create considerable uncertainty and risks for input suppliers and directly undermine the incentives for private investment in input supply systems. Excessive use of fertilizer by food crop farmers could lead to inefficiency and dynamic disequilibrium on input uses, where reduced access to inputs could have serious implications for the growth performance of the agricultural sector. Agricultural transformation in Indonesia is also determined by a number of drivers at the macroeconomic, financial, trade, industrial policy, and strategy implementation levels.

Five specific questions of this study have been answered thoroughly, as follows:

First, the key drivers of change in seed and fertilizer policy can be summarized as (1) the agricultural development strategy, (2) major long droughts, (3) the economic crisis, and (4) the multiparty political system. The agricultural development strategies of different policy regimes in the history of modern Indonesia generally put emphasis on increasing food production and achieving self-sufficiency in strategic foods through promoting the use of high-yielding seed and chemical fertilizers. Major long droughts that influenced agricultural input policy were the El Niño drought season in 1987–1988 and 1992–1993, and the drought in 2007–2008. Economic crisis is an important driver of agricultural policy changes in Indonesia, such as in 1998 and 2008. The multiparty system has substantially changed how agricultural input policy is formulated, with political considerations and interests among political parties. An agricultural development program, based on agricultural input policies formulated at the central level, is not always translated into action at the provincial and local government levels.

Second, an agricultural input policy reliant on heavy subsidies for chemical fertilizer and high-yielding seed have put some burdens on state budgets. Although the amount of fertilizer subsidy is not as heavy as the energy subsidy, for example, the consequences of a fertilizer subsidy on agricultural transformation in Indonesia may be quite serious. Farmers have been trapped in a dynamic disequilibrium, with actual fertilizer application at one end of the spectrum and potential fertilizer application at the other end, mostly due to the relatively lower price. The level of farmers' dependence on chemical fertilizers is very high, and the application of chemical fertilizers tends to be overused in some places. Once these subsidy practices experience governance problems, the consequences of economic inefficiency and growth performance could be more significant. Spending on public goods such as research, extension, and infrastructure has a positive impact on growth compared to heavy subsidies for

private goods such as seed and fertilizer. Moreover, the agricultural input subsidy system is currently shifting the state budget allocation from fertilizer subsidies to the fertilizer industry (and the gas industry in order to allocate gas production for domestic needs).

Third, the policy process that contributes to agricultural development in Indonesia starts with policy formulation, policy implementation, and policy evaluation. Policy actors involved in agricultural inputs are very much dependent on the hierarchical level of public policy, whether on a strategic-political level, an organization level, or an implementation level. Agricultural input policy is normally a subset of a more strategic law on food security or agricultural development in general. Public policy at the organizational level can connect and translate mandates to political society, business society, and civil society. A more operational policy includes a specific regulation, procedures, personnel, and budget, on either agricultural inputs or agricultural outputs, even for food security and agricultural development in general. Technical details of policy implementation require intensive communication between central government and local government officials, and the third party involved, if any. Finally, policy evaluation is a continuous process of dialogue between the policy outcome and the ideal conditions that require a proper change management. The policy process on the roles of agricultural inputs in transforming agriculture in Indonesia has somehow followed the procedures, although goal sharpening and target improvement need to be employed.

Fourth, key policy constraints in promoting the seed industry include (1) farmers' economies of scale, (2) unclear policy on biotechnology, (3) slow movement of triple-helix partnership, and (4) business perception on Law 13/2010 on Horticulture. Farmers' economies of scale refer to the inefficiency and productivity of landholding size, especially in food crops. Some small farmers have access to high-yielding rice seed at a subsidized price, lower than the market price. But some others do not have access at all, despite some government programs to promote the use of high-yielding seed and budget subsidies on agricultural input policies announced every year. Research on biotechnology to develop high-yielding seed has been implemented in Indonesia for a while and more intensively since the 1990s. However, the policy behind biotechnology development is not clearly defined, except that the government will formulate a promotional policy. For innovation and development of the seed industry to take place, there needs to be a long-term partnership among the academic community, the private sector, and the government. Private companies might make use of public-sector agricultural researchers as consultants or hire them as permanent staff. However, the availability of scientific personnel at the advanced degree level in agricultural fields is still very limited in Indonesia, especially outside Java. The seed industry, especially in the horticulture sector, sees Law 13/2010 on Horticulture as a policy constraint to promoting the seed industry in the future. This limitation could be true or false depending on the governance structure in the policymaking and policy implementation process.

Policy constraints to promoting the fertilizer industry in Indonesia are all related to the government's heavy involvement and subsidy policy to increase food production, especially to achieve self-sufficiency in rice. The fertilizer industry in Indonesia has quite advanced development through five state-owned enterprises under one holding company of PT Pupuk Indonesia. The private sector so far is not interested in establishing a fertilizer producing plant, especially to produce chemical fertilizers on a large scale, simply because it cannot compete with the state-owned enterprises under the current heavy subsidy policy. Similarly, the organic and biological fertilizer industry could face serious constraints because of the heavy subsidy on chemical fertilizer under the current policy. The case of fertilizer scarcity is actually an outcome of the cheap price of fertilizer due to the subsidized fertilizer production process.

Fifth, the strategies to improve the policy environment for promoting sound input use should be based on the fact that agricultural input subsidies are not a short-term "quick fix." The medium to long-term investments in input subsidies are needed if they are to build up farmers' knowledge, capital, supply systems, and wider economic growth. Agricultural input subsidies in Indonesia may not be totally removed, but rather be sharpened, in terms of target beneficiaries and disbursement mechanisms. The so-called smart subsidies are meant to improve effectiveness and efficiency of input use and productivity and to keep ahead of fraud and rent-seeking behavior.

Policy Recommendations

The study recommends the following policy changes.

First, continue sharpening the formulation, organization, and implementation of agricultural input subsidies, starting with identifying farmers by name and address, so that policy evaluation can be conducted using evidence-based information to improve accuracy and objectivity.

Second, determine an exit strategy for agricultural input subsidies by integrating efficiency improvement with bureaucratic reform, strengthening administrative systems, and increasing economic governance.

Third, evaluate the crucial level of moral hazard among farmers or fertilizer users and determine the degree of fungibility of fertilizer and subsidy given to farmers, especially food crop farmers who have a fairly complete database. The degree of fungibility in this case is a level of how fertilizer and seed subsidies increase agricultural productivity.

Fourth, improve the policy enforcement mechanisms of agricultural inputs by continuously improving the capacity of implementation actors at all levels of government, from central, to provincial, to local levels. The enforcement structures could be improved by providing clear rewards and punishment for nongovernance practice and deviation from the rules and regulations at all levels of government.

Fifth, improve the institutional arrangement of agricultural input subsidies, which should involve an action-research not only to fix the system of fertilizer distribution and licensing requirements, but also to improve the enforcement structure of any public policies being issued. For example, the planning and reporting system of fertilizer and seed demand at the farm level under farmers' groups (RDKK) could be monitored and accessed by relevant government officials at the local, provincial, and central levels.

Sixth, shift to a more decentralized subdidy mechanism by conducting a thorough assessment on the level of distinctiveness and location-specific subsidies, in accordance with custom and specific local knowledge. Revive the roles of agricultural extension agents (PPLs), rural cooperatives (KUDs), and other civil society organizations that could play a very important role in increasing agricultural production in the field, especially the planning, distribution, and supervision of fertilizer and seed use. These local-level institutions used to have a reward and punishment system, which has its own incentive to contribute to agricultural transformation in Indonesia.

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