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Strengthening Food Security Policy: Reforms on Hybrid Maize Seeds Delivery Mechanism

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Foreword

The paper of “Strengthening Food Security Policy: Reforms on Hybrid Maize Seeds Delivery Mechanism” is a study prepared by CIPS (Center of Indonesian Policy Studies) through the cooperation of the Indonesian Government (BAPPENAS) and the Australian Government (DFAT). This study is based on the experience of the AIP-PRISMA program in collaboration with the Regional Government regarding the distribution of hybrid maize seeds through the UPSUS program. The cooperation with local government is done through mapping the hybrid maize seed distribution in UPSUS Program by considering the market condition, which includes the private sector presence - in this case, the producers of hybrid maize seed in the area. The UPSUS program is one of the main activities in the National Priority of Food Security aimed to increase the production and productivity of maize in Indonesia. It is expected that the results of this study can be an input for improving the implementation of UPSUS Maize Program, particularly related to the distribution of maize seeds to be more targeted.

Our high appreciation goes to the Australian Government (DFAT) and CIPS for the collaboration in the preparation of this study. This study would still require improvements for future policy. Therefore, we would appreciate constructive feedback and suggestions from the reader are welcome.

Jakarta, July 2018
Director of Food and Agriculture BAPPENAS

Anang Noegroho

Foreword

The Australian Government has supported Indonesia's food and agriculture development for over 20 years to increase its food security and support continued economic growth. Since 2013, in collaboration with BAPPENAS, we are supporting a market systems development program known as the Australia Indonesia Partnership for Promoting Rural Incomes through Support for Markets in Agriculture (PRISMA).

One of its successful interventions is in the maize sector. PRISMA worked with the district government of Sumenep and private sector partners to trial a more effective targeting mechanism for the distribution of maize seeds for poor farmers through the UPSUS program by considering the markets. Building on the lessons learned from this intervention, Bappenas and DFAT has commissioned the Center of Indonesian Policy Studies (CIPS) to conduct a research to review various aspects of the implementation of UPSUS for maize seeds in Sumenep and Dompu, one of the centers of hybrid seeds in Eastern Indonesia. We hope that the research findings and recommendations could be used as a policy paper for decision makers to improve the implementation of the UPSUS, especially in regards to the distribution mechanism of maize seeds.

We highly appreciate the collaboration with Bappenas and CIPS in providing their inputs to this research. We hope that this study will be useful for the development of agriculture in Indonesia.

Minister Counsellor (Acting)
Department of Foreign Affairs and Trade
Australian Embassy Jakarta

Kirsten Bishop

Executive Summary

From 2009 to 2017, Indonesia produced an average of 18.8 million tons of maize per year. This failed to meet the domestic demand by an average of 2.4 million tons per year during the same period. Since imports have been severely restricted in recent years, domestic maize prices have become much higher than international prices and also caused domestic price increases for other food commodities. Since 2015, the government's UPSUS program addresses the shortage by attempting to increase domestic maize production. Farmers are being provided with hybrid maize seeds free of charge.

“The UPSUS hybrid seed subsidy program is most effective in areas with semi-strong maize markets because here it supports the transition from traditional to hybrid maize types with positive effects on production levels.”

To improve the overall effectiveness of the UPSUS hybrid maize seed subsidies, local maize markets need to be categorized by their particular strength. Thin maize markets produce little maize because farmers opt for other crops such as vegetables and fruits as their primary source of income; in semi-strong maize markets most farmers plant traditional types of maize and there are two to four private seed companies plus one off-taker; in strong maize markets all farmers plant hybrid maize, with five or more private seed companies and at least two off-takers. Moreover, the maize market types also differ by the dominance of maize and dry land agriculture in the local markets, as well as the local adoption of Good Agricultural Practices (GAP).

The UPSUS hybrid seed subsidy program is most effective in areas with semi-strong maize markets because here it supports the transition from traditional to hybrid maize types with positive effects on production levels. Since absorption rates of UPSUS seeds in thin and strong maize markets are lower, distributing seeds in these markets appears to contribute to the emergence of black-markets where farmers illegally sell their UPSUS seeds to finance other needs.

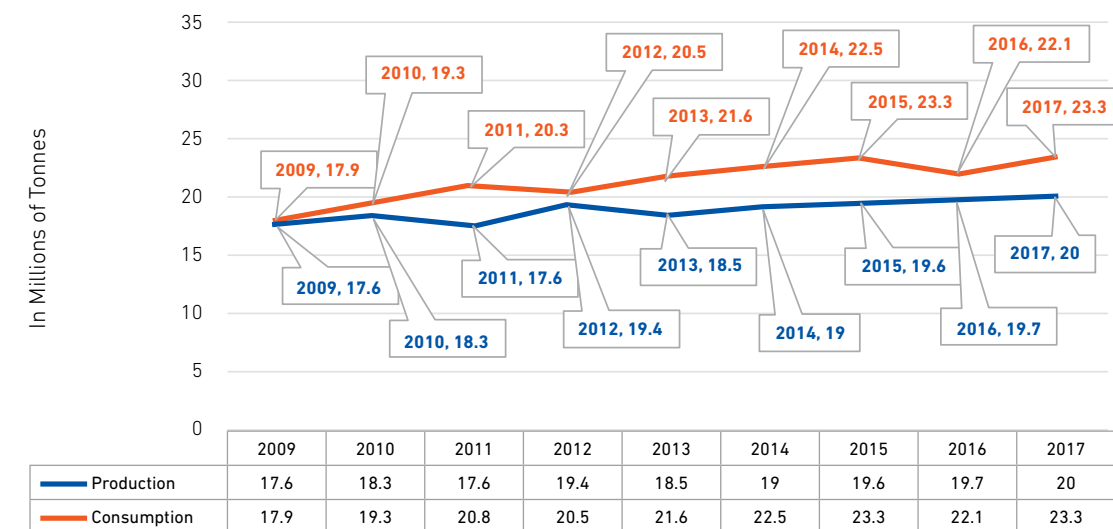
The current quota system of the 2018 Technical Implementation Guideline of Maize Cultivation mandates that 65% of all UPSUS seeds must come from the Research and Development Agency of the Ministry of Agriculture (Balitbangtan) and licensed domestic producers. Since these seeds are of lower quality than the 35% of seeds that originate from the private sector, this quota system hinders the farmers from receiving the quality best suited to increase production levels. We propose three policy reforms for the UPSUS seed subsidy program to improve its effectiveness: Firstly, Ministry of Agriculture (MOA) regulation 03/2015 section III(B) must add a classification matrix to assess the strength of local maize markets and then reduce the distribution of UPSUS seeds to mainly districts with semi-strong markets. The development of local maize markets should be periodically assessed and the distribution of seeds should be terminated if markets have become strong enough to end the subsidy in favor of market mechanisms. Intensive capacity-building programs should facilitate this development of markets. Local governments need to create partnerships with the private sector and develop functioning seed markets for a sustainable agriculture once the UPSUS program has ended in their district. Secondly, the current quota of 65% maize seeds from Balitbangtan and other licensed producers as stipulated in the 2018 Technical Implementation Guideline of Maize Cultivation should be abolished. Farmers should receive seeds of the quality they request.

Current Maize Supplies

Maize is an important crop for achieving food security in Indonesia due to its strategic value both for human consumption as well as one of the main components of animal feed. According to Ministry of Agriculture (MOA) of Indonesia (Panikkai, Nurmalina, Mulatsih & Purwati, 2013, p. 41), it is estimated that 58% of the national demand for maize is for livestock feed, while 30% is for human consumption and the rest is for other industries, such as sugar, glucose, and oil. The poultry industry consumes about 87% of livestock feed supplies, while the rest is being consumed by aquaculture, cattle and swine (USDA, 2018a).

However, as shown by Figure 1, there has been deficit between the Indonesian maize production and domestic consumption since 2009. Between 2009 to 2017, Indonesian maize production failed to meet the national consumption by an average of 2.4 million tons per year.

Figure 1
Indonesia Maize Production and Consumption, 2009 - 2017



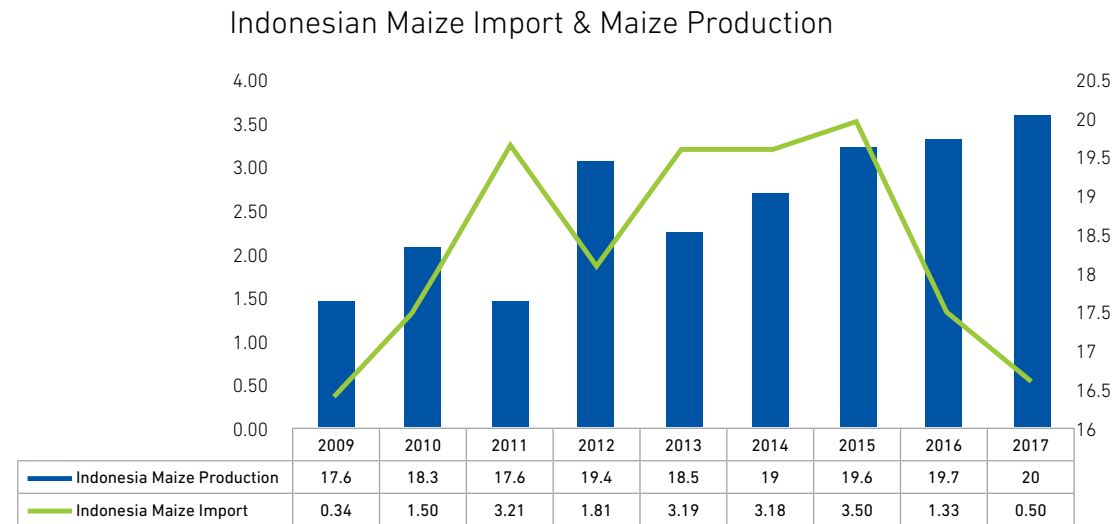
Source: OECD-FAO Agricultural Outlook (2018)

The resulting shortage of maize has not been overcome by imports. Regulations by the Ministry of Trade on maize imports (MOT 20/2016 and 21/2018) allow for the importation of maize to fulfill food, feed, and industrial raw material demand. However, feed maize can only be imported by the state-owned trading company BULOG, which otherwise shares the right to import maize for food or industrial raw materials with private companies (USDA, 2018a). Regulation MOT 20/2016 requested, both, a recommendation by the Ministry of Agriculture and the approval of the Ministry of Trade.¹ Both ministries were applying the national food self-sufficiency agenda and severely reduced imports from 3.5 million tons in 2015 to 1.3 million tons in 2016. Imports hit a low level of 500,000 tons in 2017. Figure 2 demonstrates that imports have not adequately compensated insufficient production levels, especially since imports were severely restricted

¹ MOT 21/2018 replaced MOT 20/2016 and does not require BULOG to receive an import recommendation by the Ministry of Agriculture anymore.

after 2015. The maize shortage reached 3.1 million tons on average per year after 2015 and was 37.9% higher compared to the average deficit from 2009 to 2015.

Figure 2
Indonesian Maize Imports 2009 - 2017



Sources: For years 2009-2016 data are collated from BPS (MOA, 2016a; MOA, 2016b). For 2017, data from United State Department of Agriculture (USDA, 2018a). For Indonesia Maize Production data from OECD-FAO Agricultural Outlook (2018)

Insufficient domestic maize supplies and import restrictions have also led to illegal importation as shown in several media reports and a press release by the Indonesian parliament. In January 2016, the Ministry of Agriculture (MOA) discovered 353,000 tons of maize illegally imported to Indonesia through five ports in Indonesia (Detik.com, 2016; Republika.co.id, 2016; Tempo.co, 2016). The importers publicly acknowledged that they imported the maize because they faced a lack of supply in domestic animal feed maize.²

“Between 2009 and 2017, the average maize prices in Indonesia were more than twice more expensive compared to the international markets”

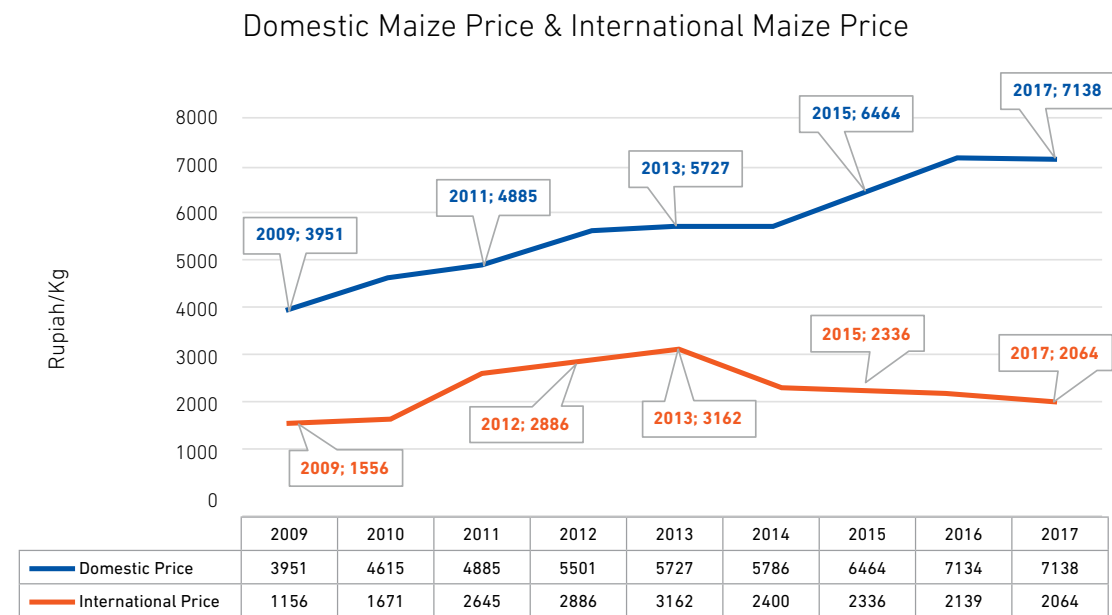
In February 2016, BULOG planned to purchase 445,000 tons of maize imported by Indonesian Feed Mills Association (*Gabungan Perusahaan Makanan Ternak / GPMT*) (House of Representatives, 2016).³ The transaction ultimately failed to materialize as the imported maize did not have an import recommendation from the MOA.

Meanwhile, the shortage caused an increase of Indonesian maize prices. Between 2009 and 2017, the average maize prices in Indonesia were more than twice more expensive compared to the international markets (The World Bank, 2017). In 2017, domestic prices were even three times higher than in the international markets (Figure 3).

² The news articles are available under these links: <https://bisnis.tempo.co/read/740700/kisruh-jagung-impor-masih-berlangsung>; <https://www.republika.co.id/berita/%20nasional/daerah/16/01/14/o0xzer219-kementan-temukan-17-ribu-ton-jagung-ilegal-di-semarang>; <https://finance.detik.com/berita-ekonomi-bisnis/d-3129862/kementan-353000-ton-jagung-impor-masuk-secara-ilegal-di-januari-2016>; <https://finance.detik.com/berita-ekonomi-bisnis/d-3129563/produsen-pakan-ternak-ke-mentan-jangan-hanya-lindungi-petani-peternak-juga>

³ The press release is available under this link: <http://dpr.go.id/berita/detail/id/12211/t/Bulog+Seharusnya+Tidak+Beli+Jagung+dari+Impor+Ilegal>

Figure 3
Maize Price Comparison Between Domestic and International Markets, 2009 - 2017



Sources: the international price are collated from The World Bank (2017); for domestic price from 2009-2016 are collated from BPS (2018) & data 2017 from Ministry of Trade (MOT 2017 & 2018)

Many other countries such as South Korea, Vietnam and Mexico import maize relative to their domestic consumption in much larger quantities compared to Indonesia. In these countries maize is considerably cheaper than in Indonesia. China and Thailand import similarly insignificant levels of maize compared to what they consume. Still, their domestic maize prices are around half the domestic price in Indonesia (Table 1). This is because China and Thailand have reached very high production levels in maize. China is the world's second largest producer of maize and planned to start exporting maize in 2016 (Reuters, 2016). Thailand is one of the leading maize exporters in Southeast Asia (Phongphanich & Peng, 2017)

Table 1: Maize Prices in Indonesia and Other Countries (2017)

Countries	Maize Import (Tons)	Domestic Consumption (Tons)++	Imports as % of Domestic Consumption	Domestic Price (IDR/kg)
South Korea*	10.200.000	10.211.760	99,9%	4.178
Thailand**	250.040	4.820.230	5,2%	3.031
Vietnam***	8.917.120	14.208.480	62,8%	3.198
China****	5.000.000	219.230.140	2,3%	3.122
Mexico*****	16.700.000	38.005.290	43,9%	3.909
Indonesia+	500.000	23.300.000	2,1%	7.138

Sources:

*: Agricensus (2018)

** : Bank of Thailand (2018)

***: collated from USDA (2018b)

****: Ren (2018)

*****: FAO (2018)

+: USDA (2018a)

++: OECD-FAO Agricultural Outlook (2018)

Existing Policies

To address the production deficit, the Indonesian Government implements various maize seed subsidy policies (Table 2), the latest scheme is named UPSUS (*Upaya Khusus / Special Efforts*). The main objective of these subsidies is to reduce the cost of farming inputs and to increase maize production levels. The National Seed Reserves program has an additional purpose, as it also serves as an insurance for farmers who experience a major harvest failure by compensating their losses with new seeds.

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Table 2: Type of Seed Subsidy Schemes in Indonesia

Type of Subsidy	Year of Implementation ***	Description
Price Subsidy*	2005 - 2017	This program provided farmers with seed at discounted prices. The government commissioned two State-owned Enterprises (SOEs) – PT Sang Hyang Seri and PT Pertani to carry out the seed production for this program.
National Seed Reserve (CBN)*	2006 - 2017	This program provided free certified seeds (rice, maize, soybean) to farmers who are either affected by natural disasters or willing to try out new seed varieties within their village (MOA 46/2006).
Premium Seed Direct Aid (Bantuan Langsung Benih Unggul - BLBU)*	2007 - 2015	This program was introduced in 2007 to provide farmers with free certified seeds (non-hybrid and hybrid of rice, maize, and soybean). (MOA 72/2007) (Perpres No. 11/2011)
Special Efforts Program (Program Upaya Khusus – UPSUS)**	2015 - Present	This program provides farmers with hybrid maize seeds for free. It also includes other components, such as improvement on irrigation networks, land optimization, the provision of fertilizers, provision of agricultural machines & tools, etc. ⁴

Sources:

* : OECD Review of Agricultural Policies Indonesia 2012 (2012, p. 157-158)

** : Ministry of Agriculture (2015a, p. 2)

*** : Ministry of Finance 2018 (2018)

⁴ This policy paper focuses in particular on the UPSUS maize seed subsidy program and does not deal with all components of the UPSUS program.

The Regulatory Framework for the UPSUS Program

The UPSUS program is stipulated under the Ministry of Agriculture (MOA) Regulation 03/2015 (MOA, 2015a), and has become the government's current approach to achieving food self-sufficiency in maize production. The general objective of this program is to increase national maize production through the improvement of irrigation systems and other supporting activities, including the provision of hybrid maize seed subsidies to farmers.

MOA 03/2015 section III (A3) & (A8) (2015a, p.7&8) regulate which farmers should receive the subsidies and several criteria of the distributed seeds, including their types and potential yields. Recipients should be farmer groups that are willing to adopt new technologies and to actively participate in the UPSUS program as assessed by the local government. The seeds are supposed to be of superior quality (*bibit unggul*) and released by the Indonesian Ministry of Agriculture at the latest one month before the expiration date. To produce the seed for this program, the government directly commissions state-owned enterprises and the private sector without any bidding process as regulated under Presidential Decree No. 172 of 2014 as Third Amendment to Presidential Regulation No. 54 of 2010 on Procurement of Government Goods/Services (MOA, 2015a, p. 12)

MOA 03/2015 section V (5.1) (MOA, 2015a, p. 17) states that in order to ensure the optimal performance of the UPSUS program, assistance from agricultural field instructors (*Penyuluh Pertanian Lapangan / PPL*) should be provided to guide the farmers from the beginning of the cultivation process until post-harvest activities.

The Ministry of Agriculture annually publishes the Technical Implementation Guidelines of Maize Cultivation, which serves as a protocol for the implementation, control, and distribution of maize seed subsidies to provinces, districts and cities. In the 2018 edition of this Guideline, the Indonesian Government stated that the amount of hybrid seed provided through the UPSUS program is 15 kg per hectare target area (MOA, 2018, p. 35)

Moreover, the Guideline lists criteria for farmers to become potential beneficiaries of the UPSUS program. The requirements include: (1) the farmers must be a member of an active village-level farmers' group (*Kelompok Petani/Poktan*) or a joint-farmers' group (*Gabungan Kelompok Petani/Gapoktan*). This group must possess land and have a complete organizational structure at least consisting of Chairman, Secretary, and Treasurer; (2) endorsement from the village head or by agricultural field instructors (*Penyuluh Pertanian Lapangan-PPL*), and; (3) being able to follow all activities stated in the Guideline (MOA, 2018, p. 27).

In addition, according to the Head of Food Crops Department in Sumenep District, there are three additional criteria to determine whether a farmers group can receive seed subsidies: the activeness of the farmer groups, the type of land⁵ owned by the farmers group, and the availability of water on the land owned by the farmers group.

⁵ The type land suitable for farming maize is dry land with adequate water, rainfed fields, terraced lands, restored peatlands, or wetlands.

“The government directly commissions state-owned enterprises and the private sector without any bidding process”

Section IV (F) (MOA, 2018, p. 34) of the Guideline prioritizes the use of domestic hybrid maize seeds of quality grade 3, produced by the Research and Development Agency of the Ministry of Agriculture (Balitbangtan) and other appointed producers, who have been licensed by Balitbangtan. They are to cover at least 65% of the total seed allocation in the UPSUS program for 2,576,600 hectares of land. Meanwhile, national and multinational companies, such as PT. Bisi International Tbk, PT. DuPont Indonesia, and PT. Syngenta Indonesia, can only contribute a maximum of 35% from the total seed allocation for the program, which covers 1,387,400 hectares of land.

Analysis

1. Seed Variety

In Section IV (F) of the Guideline it is being stipulated that all UPSUS seeds should be disease-resistant/semi-resistant/tolerant with a minimum yield of 10 tons per hectare. The varieties of maize genotypes approved by UPSUS have officially a potential yield that ranges from 8.27 - 10 t/ha (Bantimurung Hibrida Bimal 2) to 11.8 - 13.6 t/ha (BIMA 18, BIMA 17) (Table 2). However, farmer groups in Dompus and Sumenep insisted that the 65% of seeds produced by Balitbangtan and domestic producers only reach a yield of 3 - 5 t/ha, even when using proper cultivation techniques. The groups experienced much higher yields of seeds from the 35% quota for national and multinational companies, reaching 7 - 10 t/ha, which is twice as high as the seeds from the 65% quota but still lower than the officially stated 10 - 13 t/ha of BISI 2 FS 4 crossed with FS 9 and other varieties. Meanwhile, hybrid maize seeds bought without subsidy generate up to 13 t/ha.

Table 3: Potential Yield of Maize Seeds (Tons per Hectare)

Source of seeds*	Varieties of genotypes (examples)*	Officially stated potential yield/ha*	Potential yield/ha as experienced by farmers**
65% of UPSUS seeds produced by Balitbangtan and licensed domestic producers	Several varieties listed in the Guideline, incl. Bantimurung Hibrida Bima 2, BIMA 18, BIMA 17	8.27 - 13.6 t/ha	3 - 5 t/ha
35% of UPSUS seeds produced by national and international companies	BISI 2 FS 4 crossed with FS 9, BISI 18 FS46 crossed with FS47	10 - 13 t/ha	7-10 t/ha
Bought outside the UPSUS program	Pioneer P21 F30Y87 crossed with M30Y877 & NK 7328	10 - 13 t/ha	up to 13 t/ha

Sources:

*: Ministry of Agriculture (2013)

** : Focus Group Discussion with farmers in Dompus (FGD 1, Personal Communication, April 25, 2018)

Farmers reported in the field study that seeds from the 65% quota of Balitbangtan and other domestic producers do not reach the optimal production levels (FGD 1, Personal Communication, April 25, 2018). The representative of a private seed producer and the head of a farmers group (Interviewee 1, Personal Interview, April 24, 2018; Interviewee 2, Personal Interview, April 25,

“Farmers reported in the field study that seeds from the 65% quota of Balitbangtan and other domestic producers do not reach the optimal production levels”

2018) complained that the government commissions unqualified seed breeders that produce seeds of lower quality. According to an agricultural field instructor and several farmers, some seeds from the 65% quota differ in shape and color, indicating it will be difficult to grow plants with them (Interviewee 3 and Interviewee 4, Personal Interviews, April 25, 2018). In few extreme cases, the seeds emit a bad odor and are covered by mold and fleas. In this condition the seeds cannot be used at all. Farmers can generally identify these types of sub-quality seeds and refuse to plant them if they are being distributed.

Farmers tend to have particular preferences and request specific varieties of seed genotypes by specific companies that participate in the 35% quota of the UPSUS program. However, this quota is open for competition by a broad range of companies, which again reduces the chance that farmers finally obtain the seeds they actually requested.

The distribution of sub-quality seeds creates a costly disadvantage for farmers. Although they receive free seeds, the costs associated with planting (time, energy, fertilization costs, etc.) are high. They may not earn any profit by planting the seeds from the 65% quota and risk crop failure (Interviewee 2, Personal Interview, April 25, 2018). From a public expenditure perspective, it also suggests that a part of the national budget is being wasted because the seeds provided do not create the expected effects.

“From a public expenditure perspective, it also suggests that a part of the national budget is being wasted because the seeds provided do not create the expected effects.”

2. Mechanism of seed allocation

While the Guideline allocates a larger quota to the seeds produced by Balitbangtan and domestic producers, farmers can also submit a request for seeds from the 35% quota. In the CIPS field study in Dompus and Sumenep, however, all farmers submitted requests for the seed from the 35% quota. None of the interviewed farmers requested seeds from the Balitbangtan quota. Those who submitted their request are disappointed if they receive seeds from the Balitbangtan quota, which happens when the quota for seeds produced by the private sector has been exhausted. The district government agencies (Dinas Pertanian) handle applications for seeds on a First-come, First-served basis. Farmers who submit their request early have a better chance to receive their preferred seed. For those farmers who submit their request later, they will likely receive seeds from the 65% quota.

Figure 4 below shows the procedures involved in processing the request from the farmers until it reaches the seed producers. Farmers hand in their request form (CPCL) to agricultural field instructors of the Agricultural Department in the district government level. The CPCL form provides details on the eligibility of the farmers group, the varieties of seeds requested and the intended planting period. The district validates all requests and sends copies to the provincial

government and to the Ministry of Agriculture. The district then requests Proposed Activity Plans (RUK) from the farmers, which details the requested volume, the seed varieties, and also the intended planting period again. Once it has received the RUK, it compiles and summarizes the plans, procures the seeds from the producers, and distributes them to the farmers. Since there are severe differences in the seed quality between the 65% and the 35% quota, farmers are eager to receive the seeds they requested. If they receive lower quality seeds, they mistrust the local government for not acting fast enough in the First-come, First-served distribution system. Rumors appear that the current system favors farmers with better government relations.

Figure 4: Distribution Mechanism of UPSUS Hybrid Maize Seed Subsidy



Source: Collated from Technical Guidelines of Hybrid Maize Development Action 2016 (MOA, 2016a, p. 48)
 *CPCL (Calon Petani Calon Lokasi)= Farmer and Location Candidate
 **RUK (Rencana Usulan Kegiatan) = Proposed Activity Plan

“...farmers are eager to receive the seeds they requested. If they receive lower quality seeds, they mistrust the local government for not acting fast enough in the First-come, First-served distribution system. Rumors appear that the current system favors farmers with better government relations.”

The process described in Figure 4 includes several interactions between the farmers and the district government before the seeds are actually being purchased and distributed. It leads to the late arrival of hybrid maize seeds provided through the UPSUS program, which negatively impacts the planting time. If planting is delayed, the farmers risk crop failure. To prevent this from happening, farmers prefer to buy hybrid seeds or switch to other commodities to ensure successful harvests. Their purchase of hybrid seeds to avoid planting delays confirms that they can actually afford to buy commercial seeds.

A representative of the local government (Dinas Pertanian) reported in the field study that the seed subsidies' delayed arrival is due to the late production and delivery of the seeds (Interviewee 5, Personal Interview, April 23, 2018). However, a seed producers representative (Interviewee 6, Personal Interview, May 3, 2018) argued that seeds are only produced after instructions are received from the government, showing unclear communication between the government and seed producers. In addition, all farmers interviewed in the field survey responded that, if seeds arrive late and come from the Balitbangtan quota, they either sell them on the black market or they do not use them at all. If seeds appear moldy they cannot even be fed to the chicken.

3. Assistance from Agricultural Field Instructors and from the private sector

According to the head of Sumenep District Food Crop Department (H. Hidayat, Personal Interview, May 4, 2018), most recipients of the UPSUS hybrid seeds are traditional maize farmers, who often stick to conventional seed cultivation techniques. They only apply fertilizers once, plant the seed by sowing, and leave little space between seeds. This behavior lowers, both output and quality because hybrid maize requires different techniques. A seed producer representative stated that the outdated techniques reduce the farmers' revenues because off-takers reject poor quality maize that does not meet standards (Interviewee 7, Personal Interview, May 1, 2018). Therefore, Good Agricultural Practices (GAP) have to be applied from cultivation to post-harvest processes and are vital to farmers' interests in having higher-yielding quality maize.

The government provides assistance to farmers throughout the UPSUS program. However, although the farmers (FGD 2, Personal Communication, May 2, 2018) emphasize that they are willing to join and participate in these activities, they argue the frequency of the provided trainings is not sufficient. They stated that the government's field instructors are only presents during the distribution of the UPSUS seeds or that they receive no government assistance at all throughout the year.

According to an official of the agricultural department in Sumenep district government, there is a shortage of agricultural field instructors (Interviewee 8, Personal Interview, May 4, 2018).

“A representative of a private seed producer...claimed the private sector will provide more field instructors to assist the farmers if sales increase, either directly from farmers or from government programs. It allows them to expand their sales activities and market share while it frees up human and financial resources of the local governments”

Ideally, one government field instructor should assist one village; however, in the Sumenep district there are 126 instructors to assist 330 villages. According to the Agricultural Extension and Human Resource Development Agency of the national government, in 2016 there were 68,623 agricultural field instructors across Indonesia (BPPSDMP, 2016). If they were ideally distributed assuming each instructor handles one village, there remains a shortage of nearly 12,625 field instructors to assist the farmers in Indonesia's 80,888 villages in 2016.

Additionally, government field instructors do not necessarily have the capacity to provide effective assistance to maize farmers, as they mostly focus on paddy and administrative tasks (Stuart Higgins Consulting Company, 2017a). They may also not comprehend the latest developments in agriculture, such as the use of new types of herbicides and pesticides and cannot help farmers properly cultivating hybrid maize seed.

Alternatively, farmers also receive training and support from private sector field instructors, who are employed by private seed producers. They provide demo plots and organize farm field days⁶ that are very effective in transferring knowledge and skills to farmers. A representative of a private seed producer (Interviewee 7, Personal Interview, May 1, 2018) claimed the private sector will provide more field instructors to assist the farmers if sales increase, either directly from farmers or from government programs. It allows them to expand their sales activities and market share while it frees up human and financial resources of the local governments.

4. Classification of Maize Markets

A market is defined by networks of buyers, sellers and other actors that come together to trade in given products or services. In this study, the strength of maize markets is being classified by three main components: (1) the core market which consists of buyers and sellers, (2) the implementation of Good Agricultural Practices (GAP) during cultivation and post-harvest processes, and (3) other support factors such as infrastructure, irrigation, and finance.

- Buyers and sellers are maize farmers and private sector actors that engage in the local maize value chain. Private sector actors comprise of private seed producers, off-takers, small retailers, and traders. Maize farmers are either commercial or subsistence farmers⁷ and plant either traditional or hybrid maize varieties.
- Good Agricultural Practices (GAP) consist of codes, standards and regulations that serve as guidelines to support optimal productivity in order to ensure food quality and safety. According to the FAO they are “practices that address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural products”

⁶ “The traditional role of farm field days is to introduce growers and agricultural professionals to new technologies and techniques so that the audience could see how these technologies or techniques could be practically used and applied.” Fountas S, Blackmore S, E.D, Hawkins S, Blumhoff G, Lowenberg Heiniger RW, Havlin JL, Crouse DA, Kvien C, Knowles T (2002). “Seeing is believing: The role of field days and tours in precision agriculture education. Precision Agric., 3: 309-318.

⁷ Subsistence farmers consumes most of what they produce and sell very little in cash markets (Clifton, 1968) while commercial farmers produce mainly for markets (Stat SA Agricultural Survey, 1996).

(FAO, 2003). In accordance with FAO, the MOA states that the GAP includes technological implementation that environmental friendly, concern of health care and improvement of workers' welfare, prevention of plant pest infestation (OPT) and establishing the principle of traceability⁸ (MOA 48/2006). GAP need to be implemented by maize farmers during the cultivation and post-harvest processes to ensure high-quality maize production.

- Health care and improvement of workers' welfare, prevention of plant pest infestation (OPT) and establishing the principle of traceability
- Other support factors, such as infrastructure, finance and irrigation, matter in the supply chain of maize markets. Infrastructure is vital as it provides market access. Irrigation supplies water access, and finance allows farmers to finance their agricultural operations.

The strength of maize markets is classified into three levels, namely strong, semi-strong, and thin maize markets. The stronger the maize markets in an area, the more sustainable the value chain will be. Strength levels of maize markets are explained below. It needs to be reiterated that this paper only covers maize markets, and therefore, the classification below only applies to the existing maize production and not to all agricultural markets. It is also important to note that an administrative district (kabupaten) can have more than just one market type. 3 out of 8 sub-districts (kecamatan) in Dompu are considered strong maize markets (Mangalewa, Kilo, Kempo) and the rest are semi-strong maize markets (Dompu, Pajo, Pekat, Woja, Hu'u). In Sumenep district, 8 out of 24 sub-districts are considered semi-strong maize markets (Progoon, Guluk-guluk, Pasongsongan, Ganding, Rubaru, Leteng, Bluto, Saronggi), and the rest are thin maize markets (e.g. Batang-Batang, Gayam, and Kalianget).

a. Strong maize markets

In this type of market, all farmers are categorized as commercial farmers, which suggests that the region already has a focus commodity for a particular industry. Strong markets embrace competition by a wide number of market actors, including at least 5 private seed producers, 10 small retailers and 3 large-scale off-takers. To maintain the quality of their maize, most farmers apply GAP, pay attention to land preparation, planting distance and number of seeds per hole, proper weed and pest/disease control, and proper post-harvest handling. Moreover, most of the farming land is dedicated to hybrid maize farming, and most of the farmers use Loans for Farm Enterprises (*Kredit Usaha Tani* – KUT) by the Indonesian government to operate their farm.

b. Semi-strong maize markets

In semi-strong maize markets, the majority of farmers still plant traditional maize and less than half have experienced planting hybrid maize. There are subsistence farmers and commercial farmers. A value chain exists but the market system is less competitive due to a limited number of two to four private seed producers and one or two large-scale off-takers. Moreover, since most of the farmers in the area are beginners in planting hybrid maize, most of the cultivation techniques are influenced by conventional methods, which can be seen from the number of seeds they plant in one hole, the type of weed and pest control, and the way they handle the post-harvest process.⁹ Most of the lands in this area are dry lands and suitable for maize farming, yet

⁸ Principle of traceability is a concept where a product can be traced to its source.

⁹ In the conventional method, the farmers tend to put more than two seed in one hole. Most often they will not put the seeds in the hole, but instead sow them to the land. In the post-harvest handling, the farmers will be checking the water level of the maize by biting it instead of using tools, checking the dryness of the maize from the stickiness of the maize, peel of the maize seed by hand instead of machine.

only half are used for hybrid maize farming. Only a few farmers use loan facilities from the bank to finance their farm, most of them prefer to use their own capital.

c. Thin Maize Markets

In thin maize markets only a few farmers plant maize. All maize farmers are categorized as subsistence farmers and they only cultivate traditional, not hybrid maize seed. There are hardly any maize market players present and if so, they deal mostly with traditional seeds. Even when maize is being traded, it happens on a micro level and is only meant for household consumption. The maize farmers apply only traditional cultivation techniques. Most of the land is dedicated to other commodities such as fruits and soybean, and farmers use their personal capital to finance their farms.

Table 4: Classification & Characteristic of Maize Markets

	Strong Maize Markets	Semi Strong Maize Markets	Thin Maize Markets
Buyers/ Sellers	<p>Farmers:</p> <ul style="list-style-type: none"> 100% of the maize farmers in the district plant hybrid maize. At least 80% of the farmers use hybrid maize seeds with a minimum potential yield of 9 t/ha. They bought them from private seed producers. The farmers follow the commercial objective of selling their maize. There are farmer groups that consist only of maize farmers. Potential farmers' income from maize +/- 30 million IDR per ha per harvest¹⁰ <p>Private sector:</p> <ul style="list-style-type: none"> Minimum 5 private seed companies operate in the district. Minimum 10 small retailers on a Retail 1 level¹¹ Minimum 3 large-scale off takers There is competition between market actors 	<p>Farmers:</p> <ul style="list-style-type: none"> Minimum 20% of the total maize farmers in the district plant hybrid maize and 80% of the farmers still plant traditional maize. 90% of the farmers use hybrid seeds with a potential yield of up to 5 t/ha. They were bought by the farmers and obtained through UPSUS. The purpose of planting maize is for private consumption and for sale Farmer groups have members who grow various crops, not only maize. Potential farmers' income from maize +/- 10 million IDR per ha per harvest¹² <p>Private sector:</p> <ul style="list-style-type: none"> Between 2 and 4 private seed companies operate in the district. Between 4 and 9 small retailers on a Retail 1 level 1 or 2 large-scale off takers 80% of the maize production sold to local traders The maize market is less competitive 	<p>Farmers:</p> <ul style="list-style-type: none"> Less than 10% of the farmers in the district plant maize. The farmers only plant traditional maize seeds. The purpose of planting maize is for consumption only. <p>Private sector:</p> <ul style="list-style-type: none"> No private seed company operationalized in the area No maize off-takers in the area Kiosk sellers only sell seed for other commodities.

¹⁰ Dompu is an area with semi-strong and strong maize markets where the potential yield reaches an average of 10 ton/ha, and the price of maize in the district is IDR 3.150/kg. Potential total farmers income from maize is 10 tons x IDR 3,150 = IDR 31,250,000.

¹¹ Retail 1 or R1 is the first seed-kiosk seller that received the first goods supply from the seed distributor.

¹² Sumenep is an area with semi-strong and thin maize markets where the potential yield reaches only an average of 3 tons/ha and the price of maize in the area is IDR 3.500/kg. Potential total farmers income from maize is 3 tons x IDR 3,500 = IDR 10,500,000.

	Strong Maize Markets	Semi Strong Maize Markets	Thin Maize Markets
Good Agricultural Practices	<p>Cultivation process:</p> <ul style="list-style-type: none"> At least 80% of the farmers apply the plant spacing technique in the cultivation process. At least 80% of the farmers apply fertilizer twice. At least 80% of the farmers plant 1 seed per hole <p>Post-harvest:</p> <ul style="list-style-type: none"> At least 80% of maize farmers use threshing machines to separate the corn from the cobs. At least 80% of the farmers sell all their maize after it has been dried in order to maintain the quality At least 90% of the farmers use tools to measure the maize moisture 	<p>Cultivation process:</p> <ul style="list-style-type: none"> Between 50 and less than 80% of the farmers apply the plant spacing technique in the cultivation process. Between 50 and less than 80% of the maize farmers apply fertilizer twice Between 50 and less than 80% of the maize farmers plant 1 seed per hole <p>Post-harvest:</p> <ul style="list-style-type: none"> Between 50 and less than 80% of the maize farmers use threshing machines to separate the corn from the cobs. Between 50 and less than 80% of the maize farmers sell all their maize after it has been dried Between 50 and less than 90% of the farmers use tools to measure the maize moisture 	<p>Cultivation process:</p> <ul style="list-style-type: none"> Less than 50% of the farmers apply the plant spacing technique in the cultivation process. Less than 50% of the maize farmers apply fertilizer twice Less than 50% of the maize farmers plant 1 seed per hole <p>Post-Harvest:</p> <ul style="list-style-type: none"> Less than 50% of the maize farmers use threshing machines to separate the corn from the cobs. Less than 50% of the farmers sell all their maize after it has been dried Less than 50% of the farmers use tools to measure the maize moisture
Supporting Factors: • Infrastructure • Irrigation • Finance	<ul style="list-style-type: none"> At least 80% of the maize land is dryland At least 80% of the dryland are dedicated for maize At least 80% of the farmers use government Loans for Farm Enterprises (KUT - Kredit Usaha Tani) 	<ul style="list-style-type: none"> Between 50 and less than 80% of the maize land is dryland Between 50 and less than 80% of the dryland are dedicated for maize Between 50 and less than 80% of the farmers use government Loans for Farm Enterprises (KUR- Kredit Usaha Rakyat) 	<ul style="list-style-type: none"> Less than 50% of the land is dryland Less than 50% of the dryland are dedicated for maize Less than 50% of the farmers use government Loans for Farms Enterprises (KUR-Kredit Usaha Rakyat)

Sources are collated through personal interviews with head of food crops departments in Sumenep District & Dompu District, private seed producer representatives, farmers group, and seed-kiosk sellers

Impact of the UPSUS program in each type of maize market

1. UPSUS in strong maize markets

Strong markets for hybrid maize are considered to be playing fields for all types of market actors in the maize industry, which means there is intense competition. The farmers compete to deliver large amounts of high-quality maize. For that, they prefer using premium hybrid seeds bought from private seed producers. Since the farmers already have a good understanding of hybrid maize and the technology in maize cultivation, they are reluctant to use hybrid maize seeds from the UPSUS program – considered to yield lower production levels (see Table 2). Moreover, farmers stated they are financially capable and willing to buy hybrid maize seeds as long as the quality is in accordance with their expectations (FGD 1, Personal Communication, April 25, 2018; FGD 2, Personal Communication, May 2, 2018). Therefore, although these farmers are eligible to get free seeds from the UPSUS program, they still prefer premium seeds from the private sector, which guarantee higher yields compared to those from the UPSUS program.

This suggests that farmers in strong markets do not optimally absorb the UPSUS seeds, which creates a distortion when farmers sell the free-of-charge seeds to the black market and buy the premium quality seeds in return. UPSUS seeds are sold to other maize farmers, who needed more than the allocated quota, at the relatively low price of IDR 25-40 thousand per kg. This is not in line with the UPSUS hybrid seed program and it also does not support the other UPSUS objective of expanding the existing maize planting area nor an increased cropping intensity (Stuart Higgins Consulting Company, 2017b).

In general, the UPSUS program is not suitable to be implemented in strong markets as it fails to achieve its intended objectives. Moreover, besides black-market activities it also has other adverse consequences. According to the representative of a private seed producer (Interviewee 7, Personal Interview, May 1 2018) involved in the UPSUS program, one of the reasons why the company has joined the program is because of the apparent demand from the government and profit opportunities for the company. However, the program also required the company to adjust their production and marketing strategies. Consequently, when they had shifted their focus and resources to produce seeds for the subsidy program, they often encountered delays in the distribution of their commercial seeds, which then negatively impacted their profits.

2. UPSUS in semi-strong maize markets

In semi-strong markets where farmers mostly plant hybrid maize for the first time, the free seed distribution encourages them to try hybrid seeds. In these markets, the UPSUS program has worked effectively in stimulating maize farmers to shift from regular seeds to hybrid seeds, which can deliver higher yields compared to regular seeds. Since there is an emerging market for hybrid maize in these areas, input distributors and retailers from the private sector also become available selling hybrid seeds and other farming inputs such as fertilizers & pesticides. Farmers who succeed in achieving significantly higher productivity by using hybrid seeds from UPSUS program in their first try are, therefore, able to buy other hybrid seeds from the private sector for the next planting season.

“The UPSUS program has worked effectively in stimulating maize farmers to shift from regular seeds to hybrid seeds, which can deliver higher yields compared to regular seeds.”

According to the representative of a private seed producer (Interviewee 7, Personal Interview, May 1, 2018) his company joined the UPSUS program because it expanded their market outreach. The UPSUS program has become the company's vehicle for promoting their seeds but the prolonged existence of this program can also create two unintended consequences. First, when the maize farmers in the area gain more experience and knowledge in planting hybrid maize, they prefer switching to high-quality seeds from private seed producers outside the UPSUS program. Similar to the strong markets, when the farmers keep receiving the subsidy they will turn to black markets sell it to buy higher-quality seeds, which renders the UPSUS program ineffective.

Second, the UPSUS program can make farmers dependent on government seed subsidies and discourage private seed producers from entering the market. Even if farmers are financially able to purchase higher quality hybrid seeds at market prices, the presence of free seeds from the government can make them unwilling to do so. The UPSUS program also puts farming input retailers at a disadvantage as they cannot compete with UPSUS distributors who give the seed for free to the farmers. They are losing sales due to competitors with free seeds. Consequently, private market actors reduce their stock, commercial seeds become less and less available, and the reliance on the government program increases (Stuart Higgins Consulting Company, 2017b).

In general, the UPSUS program can help achieving higher maize production levels in semi-strong markets. However, if the program is being applied with no time-limits and continues over several crop cycles, it can negatively affect the farmers and also hinder the development of sustainable maize markets.

3. UPSUS in Thin Maize markets

Thin Maize markets for hybrid maize may still have land suitable for planting hybrid maize. It is the intention of the Indonesian government that, by providing free seeds to farmers through the UPSUS program, the farmers will expand the maize production.

Nevertheless, farmers in thin maize markets are largely unfamiliar with new techniques and skills necessary in the cultivation and post-harvest processes of hybrid maize (Interviewee 9, Personal Interview, May 2, 2018). They may also deem maize to be less profitable compared to more familiar crops, such as fruits and vegetables (Interviewee 9, Personal Interview, May 2, 2018). As mentioned above, the government is not able to supply a sufficient amount of properly trained agricultural field instructors in order to transfer the skills to the farmers.

Private market actors will not find it attractive to meet that demand. Since the maize market in these areas are weak, it does not bring any incentive for market actors and buyers to operate in the area. The number of buyers and private seed producers is severely limited, which makes farmers feel unmotivated to plant hybrid maize even when they are being provided with free seeds. Eventually, since the UPSUS seeds are not being sufficiently sought after in the area, it encourages the creation black markets and renders the implementation of UPSUS program in thin maize markets ineffective.

Recommendations

The UPSUS hybrid seed program can increase the production levels of maize but several reforms are required to ensure the subsidy is being applied most effectively and has no negative consequences. We propose three reforms to improve the operations of the UPSUS program.

1. Revision of MOA 03/2015 section III

The current mechanism of the UPSUS program regulated in MOA 03/2015 section III does not take the strength of the local maize markets into account. It is not sufficient to just assess potential individual recipients of the UPSUS program in order to ensure that farmers will effectively use the UPSUS seeds to accomplish higher production levels of maize. The regulation needs to add a section that classifies the local districts into strong maize markets, semi-strong maize markets, and thin maize markets as defined in the Classification Matrix (Table 4). Based on this classification, local governments need to assess their maize markets and identify which area is suitable to be included in the program. Once the strength of the maize market in the area has been identified, the next step is to apply different UPSUS mechanisms suitable for each specific market.

“local governments need to assess their maize markets and identify which area is suitable to be included in the program.

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UPSUS hybrid seeds in areas with semi-strong maize markets

MOA 03/2015 section III (B) needs to include periodic assessments to determine if the local markets have become strong enough to end the UPSUS seed program. Once the assessment concludes the local maize market fulfills the criteria of a strong market, the UPSUS program in this area should be phased out.

Such assessments have been successfully conducted in the Sumenep district and the UPSUS seed program has been implemented for a limited duration of time. During the first year the private seed producers provided free samples of hybrid seeds for some of the farmers who then reached positive yield increases. After witnessing this, more farmers became interested in planting hybrid maize in the second year. In the third year all the farmers in the area began planting hybrid maize seeds, which they bought from small retailers.

Secondly, the UPSUS program should seek capacity-building programs in collaboration with private seeds producers. The private sector will only be interested in this collaboration if there is a potential for them to market their seeds. The perspective that the UPSUS seed program will be phased out in strong markets offers space for the private sector to expand their business.

Collaboration between government and private seed producers can improve Good Agricultural Practices of farmers in planting hybrid maize. It can also help addressing the shortage of public agricultural field instructors. Currently, the collaboration with private field staff is still informal. By having a formalized cooperation, the assistance from private seed producers can be intensified.

Once the UPSUS program is over, there needs to be a mechanism that ensures the farmers' access to markets in order to sustain the maize industry in the area. Experience in Dompu shows that local government plays an important role in building the strength of maize market. From 2011 to 2012, Dompu's head of district and his staff conducted regular visits to the private agri-business sector to convince them of conducting business in Dompu. Later on, they introduced private businesses to farmers' groups and tried to create good relationships between both sides. The local government also invited local farmers to join comparative maize studies in other area to show the potential of planting maize. This effort stimulated the interest of the farmers to plant maize in Dompu and led to continuous business transaction between input producers, off takers and maize farmers.

UPSUS hybrid seeds in areas with thin maize markets

MOA 03/2015 section III (B) needs to be revised and provide an option to discontinue the UPSUS hybrid seed program in areas with thin maize markets. Prior to the implementation of the UPSUS hybrid seed in these areas, local governments should conduct a competitiveness analysis to determine if maize has the potential to grow in their area, or if other commodities are more viable. If these areas have stronger markets for other commodities and the farmers are more interested to plant other crops they perceive more profitable, then, the local government should refrain from implementing the UPSUS seed program. It should, instead, support those commodities preferred by the farmers.

UPSUS hybrid seeds in areas with strong maize markets

MOA 03/2015 section III (B) should discontinue the UPSUS hybrid seed program in areas with strong maize markets. Farmers in these areas are financially capable to purchase higher-quality seeds produced by the private sector. Providing subsidy programs in strong maize markets is unlikely to be effective in delivering the Indonesian government's goal of increasing maize production. It can even limit farmers and private sector growth and prevent longer-term agricultural development and sustainability. Distortions can appear if UPSUS seeds are traded illegally in the black market. The withdrawal of subsidies from these areas means that the private sector can develop commercial markets, the value chain will be strengthened, and sustainable agriculture can be achieved.

“there needs to be a mechanism that ensures the farmers' access to markets in order to sustain the maize industry in the area”

“MOA 03/2015 section III (B) should discontinue the UPSUS hybrid seed program in areas with strong maize markets”

2. Revision of the Technical Implementation Guideline of Maize Cultivation, Section IV

The limited quality of seeds is one of the main problems of the UPSUS program. The quota of 65% for Balitbangtan and licensed domestic producers needs to be abolished. Discontinuing the UPSUS hybrid seed program in several thin maize markets and all strong maize markets frees up stocks of higher-quality seeds for semi-strong markets and increases the chance that farmers can actually receive the seeds of their choice. The seed distribution through the Kartu Tani program and targeting farmers through the Universal Poverty Database may be future options once these mechanisms have been fully introduced in rural areas. Meanwhile, national and local government agencies need to focus on strengthening local maize markets so that farmers can sustainably switch to hybrid maize. If farmers in semi-strong markets receive the seeds they wanted, it reduces waste and UPSUS targets can be achieved.

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