# Public-Private Partnership on Maize Technology Development and Delivery: PT BISI International Experience and Overview

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**ABSTRACT.** Maize is an important food crop in Indonesia as indicated by the increasing demand for feed mills, food industries, and human consumption in the past 15 years. PT BISI International Tbk. was established in Indonesia in 1983, is currently the largest producer of hybrid seeds of maize, rice and horticulture, as well as a major Indonesian producer of pesticides and a distributor of fertilizer. This paper presents an overview of maize production in Indonesia and experiences of PT. BISI International on seed maize business.

Key words:

## Introduction

Maize is an important food crop in Indonesia as indicated by the steady and continuously increase in demand of this commodity. Maize is not only used for food but also for feed. Currently, the national maize production has not sufficiently to met the domestic demand, hence maize import still has to be done. Efforts have been done by the Indonesian government to improve maize production in the country to reach self-sufficiency and to enhance export.

PT BISI International Tbk (BISI/The Company), established in Indonesia in 1983, is currently the largest producer of hybrid seeds for maize, rice and horticulture, as well as a major Indonesian producer of pesticides and a distributor of fertilizer. The company has three subsidiaries, namely PT Multi Sarana Indotani (MSI) that manufactures pesticides, PT Tanindo Subur Prima (TSP) that distributes and markets imported horticulture seeds, and PT Tanindo Intertraco (Tinco) that distributes and markets products of MSI Company. BISI and its subsidiaries focus their operations in the following business activities: (1) Production of primary field crop hybrid seeds which includes hybrid maize and rice seeds that provide farmers with seed, of high yielding varieties; (2) Production of horticulture seeds which includes vegetable and fruit seeds such as: chili, cucumber, eggplant, tomato, pumpkin, cabbage, Chinese cabbage, long bean, spinach, honeydew, watermelon and others, and (3) Production of pesticides as well as sales of specialty fertilizers.

BISI's leadership in the Indonesian seed market has been driven by strong R&D initiatives that have produced high quality hybrid seeds trusted by Indonesian farmers for more than two decades. Research and development is conducted across 12 research farms strategically distributed in main farming regions of Indonesia with a total area of 231 hectares. Currently, 9 BISI's hybrid maize varieties has been released to the markets, namely F1 Sweet Boy, F1 Bisi Sweet, F1 - Sweet Glory, Super Sweet Maize, F1 - BISI 2, BISI-12, BISI-16, Arjuna-BISI, and Surya. In addition to being a hybrid seed breeder, BISI is also engaged in other upstream agricultural activities which include agro-chemicals and fertilizer distribution. These products offer crop protection during the farming cycle and help maximize the potential of the seed for farmers. BISI's strength in research and development, production, distribution marketing and sales best positions us to capitalize on the abundant opportunities in the Indonesian seed industry.

The company is actively involved in crop research researches and productions. The activities were conducted through both international and domestic partnerships. The domestic partnerships were including with the government institutions, local governments, and farmers groups. The company built research and production facilities at various places in the country including two seed factories at Kediri, one pesticide factory at Mojokerto. The research facilities are distributed over 9 cities or regions representing 7 provincies of Indonesia, namely Kediri and Malang (East Java), Subang, Bogor, and Bandung (West Java), Magelang (Central Java), East Lampung (Lampung), Karo (North Sumatera), West Lombok (West Nusa Tenggara), and Buleleng (Bali).

This paper presents an overview of maize production in Indonesia and experiences of PT. BISI International on maize business.

## Maize Production and Productivity in Indonesia

National maize production in Indonesia increased significantly in the past decade. Within the period of 1995 to 2011 maize planting area in the country did not changed much, in the range of 3.5 - 4.1 million ha. However, the average of maize productivity had been increasing steadily from 2.26 MT/ha in 1995 to reach 4.57 MT/ha in 2011. In that period, the national maize production had continued to increase from about 8.1 million MT in 1995 to reach 18.3 million MT in 2011 (Table 1). This has been quite encouraging, although the amount has not met national needs, so that the government still has to import maize.

Table 1. Indonesian maize production areas and maize productivities in 1995-2011.

| Year | Estimated area (ha) | Productivity (t/ha) | Estimated production (tons) |
|---|---|---|---|
| 1995 | 3,595,700 | 2.26 | 8,142,863 |
| 2000 | 3,500,318 | 2.77 | 9,676,899 |
| 2005 | 3,625,987 | 3.45 | 12,523,894 |
| 2006 | 3,345,805 | 3.47 | 11,609,463 |
| 2007 | 3,360,324 | 3.66 | 13,287,527 |
| 2008 | 4,001,724 | 4.08 | 16,317,252 |
| 2009 | 4,160,659 | 4.24 | 17,629,748 |
| 2010 | 4,131,676 | 4.44 | 18,327,636 |
| 2011 | 3,864,692 | 4.57 | 17,643,250 |

## Indonesian Maize Supply and Demand

Although the national maize production is quite high, but it had not met the national demand and the shortage must be imported. Since 2005, the government had continuously imported maize at a fluctuating amount. Data on national maize production and maize imports in the period 2005-2011 are presented in Table 2, while the trend of maize imports in this period is presented in Figure 1.

Maize grains are used to meet the needs for feed mills, food industry, and human consumption. The amount of maize needed for each use is estimated to continuously increasing, but the complete data is not available. The needs of maize for feed mills are increasing since 2007 from 3.9 million MT to 5.6 million MT in 2011 (Table 3).

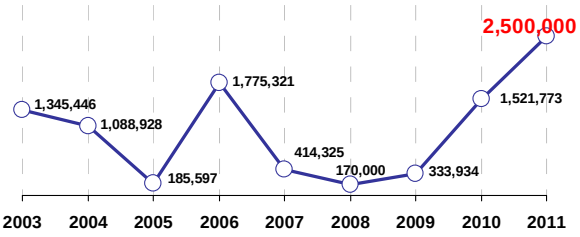


Figure 1. Trends of distribution of maize imports (tons) in Indonesia from 2003 to 2011.

Table 2. Indonesian maize supplies from national production and import in the period of 2005-2011.

| Maize supply | Year: (ton) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| National production | 12,523,894 | 11,609,463 | 13,287,527 | 16,317,252 | 17,629,748 | 18,327,636 | 17,643,250 |
| Import | 185,597 | 1,775,321 | 414,325 | 170,000 | 333,934 | 1,521,773 | 2,500,000 |
| Total | 12,709,491 | 13,384,784 | 13,701,852 | 16,487,252 | 17,963,682 | 19,849,409 | 20,143,250 |

Table 3. Maize supply and usage in Indonesia from 2005 to 2011.

| Maize supply | Year: (ton) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Supply: | | | | | | | |
| National production | 12,523,894 | 11,609,463 | 13,287,527 | 16,317,252 | 17,629,748 | 18,327,636 | 17,643,250 |
| Import | 185,597 | 1,775,321 | 414,325 | 170,000 | 333,934 | 1,521,773 | 2,500,000 |
| Usage: | | | | | | | |
| Feed mill | - | - | 3,906,000 | 4,179,000 | 4,420,000 | 4,780,000 | 5,600,000 |
| Food industry | ? | ? | ? | ? | ? | ? | ? |
| Human consumption | ? | ? | ? | ? | ? | ? | ? |

## Strategies for Self-sufficiency and Export of Maize

There are two strategic approaches to achieve the national maize self-sufficiency and to enhance maize exports, namely by increasing average yield of maize to more than 7 MT/Ha and expansion of new maize planting areas by more than 500,000 hectares. An illustration of the needs of maize planting areas to overcome shortages of maize supplies in the period of 2005-2011 is presented in Table 4. For examples, to overcome the 2,500,000 MT maize import in 2011, an additional 547,046 Ha of new planting area is needed when the maize productivity is 4.57 MT/Ha, and an area of 357,143 Ha is needed when the maize productivity is 7 MT/Ha.

## Challenges in Maize Production

There are a number of challenge on maize production in Indonesia. Some of the major challenges and their alternative efforts to overcome the challenges are presented in Table 5. Some of the biotic challenges in maize production are losses due to pest and diseases. Some of the major diseases of maize are downy mildew, rust, leaf spot, fusarial disease (Figure 2).

Table 4. An illustration of the needs of expansion for new planting areas to overcome maize imports in 2005-2011.

| Maize supply | Year | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Maize import (tons) | 185,597 | 1,775,321 | 414,325 | 170,000 | 333.934 | 1,521,773 | 2,500,000 |
| Additional area (ha) (Maize productivity 4,57 tons/ha) | 40,612 | 388,473 | 90,662 | 37,199 | 73,071 | 332,992 | 547,046 |
| Additional area (ha) (Maize productivity 7 tons/ha) | 26,514 | 253,617 | 59,189 | 24,286 | 47,705 | 217,396 | 357, 143 |

Table 5. Challenges of maize production and alternatives approaches to overcome.

| No. | Challenges | Alternative to Overcome |
|---|---|---|
| 1 | 49% of planting area is dry land (rainy season planting), where average yield is 20% lower than dry season planting | R & D : Breeding |
| 2 | Big differences in yield between favorable (7-8 MT/Ha) and unfavorable planting area (3-4 MT/Ha) | • R & D : Breeding<br>• Technology: Agronomy<br>• Innovative: Loan, input subsidy |
| 3 | More biotic stress due to high humidity in the tropics | R & D: Breeding |
| 4 | High cost of production due to less support of useful new technology, less support of infrastructure | • Better technology: Agronomy, mechanization<br>• Better infrastructure: Road, irrigation |
| 5 | Introduction of maize farming into new growing area (less infrastructure, far from market, competition with other crops) | • Better infrastructure<br>• Technology and information dissemination<br>• Opening new 'maize estate' areas |
| 6 | Competition between crops (maize, sugarcane, palm oil, rubber, horticulture, cassava) | Unknown (???) |
| 7 | High pressures of biotic and abiotic factors: diseases, weeds, water lodging, drought, low soil fertility | • Intensify breeding program<br>• Collaboration with government, NGO, community in reforestation, construction and maintenance of irrigation system,<br>• Alternate cropping system (maize-soybean) |
| 8 | Limited wide diversity and advance germplasm | • Germplasm exchange or licensing<br>• Intensify progress on germplasm improvement |
| 9 | Focus of research: Private focus: to overcome constraints in big market; public focus unknown (???) | Joint research in the field that is not become a focus |
| 10 | Mostly happen in new growing areas:<br>• Less knowledge and technology<br>• Less support of infrastructure<br>• Far from market | • Collaboration with local government officials on knowledge and technology dissemination<br>• Provision of better infrastructures by local government<br>• Provision of incentive for 'maize estate' areas |

Figure 2. Some of the major diseases of maize in Indonesia.

## Prospects for Expansion of New Maize Growing Areas

There are chances to expand new maize production areas in the country, such as:

1) in swampy land areas of South Sumatera;
2) in peat soil areas of Sumatera, Kalimantan, and West Papua;
3) in the dry land area of East Nusa Tenggara and Sulawesi;
4) maize intercroping with oil palm in Mukomuko, Bengkulu, and
5) maize intercroping with rubber in rubber plantations of the government owned company.

## Opportunities for Partnerships to Address the Challenges

There are two partnership opportunities to address the challenges in maize production, namely: (1) Public-private partnership, and (2) Private-private partnership. Objectives of the partnerships are:

1) to enable pooling of resources and minimize risks in R&D investments for mutual benefit;
2) to improve access to new research expertises and infrastructures;
3) to improve access to new technology and tools;
4) to share investment costs, leading to lower product costs;
5) to improve access to new product markets and costumer;
6) to improve access to private equity and funding, and
7) to build strengths on both public and private sectors.

## Opportunities of Partnership Activities

There are four opportunities and partnership activities, namely: (1) varieties development, (2) betterment of technology, (3) infrastructure development, and (4) open new 'maize estate' growing areas. Activities and details of the partnerships are presented in Table 6.

## BISI's Partnership Experiences

PT BISI International experiences on partnership activities with domestic and international institutions are listed in Table 7. There were four partnership activities which had been conducted by the company, namely capacity building, germplasm distribution, germplasm licensing, and variety extension. Domestic partnerships are done with research institution, universities, local governments, and farmers' groups. International partnerships are conducted with international institutions, namely IRRI, Philippines; ICRISAT, India; and CIMMYT, Mexico. The crops involved in the partnerships were rice, maize, and sorghum.

Table 6. Opportunities of partnership activities to overcome challenges in maize production.

| Activity | Partnership |
|---|---|
| Varieties development: R&D, production, and extension | Resource mobilization:<br>1. Capacity building<br>2. Germplasm distribution, exchange and licensing<br>3. Commercial variety licensing<br>4. Parental and commercial seed production<br>5. Knowledge and technology dissemination (demo plot, sample seed distribution, farmer field school/SLPTT) |
| Better technology | Agronomy research:<br>1. Agronomic options to increase yield<br>2. Agronomic options to increase labor efficiency<br>3. Agronomic options to increase input (pesticide, fertilizer) efficiency<br>Mechanization:<br>1. Capacity building for R & D and testing<br>2. Technocal assistance for appropriate machinery development<br>3. Group training on mechanization<br>4. Experts to support formulation of mechanization strategy<br>5. Technical assistance to make a custom hiring business model<br>6. Training of extension officers as mechanization propoters |
| Infrastructure | - Road and port constructions<br>- Irrigation system:<br>1) Enhance water use efficiency<br>2) Financing for construction, improvement, and rehabilization |
| Open new 'maize estate' growing areas | ???? |

Table 7. PT. BISI experience on partnership activities with domestic and international institutions.

| Partnership | Partner | Crops |
|---|---|---|
| Capacity building | BB Padi, Sukamandi, West Java;<br>Balitsereal, Maros, South Sulawesi;<br>Gajah Mada Univ., Yogyakarta<br>Bogor Agriculture Univ., Bogor | Rice<br>Maize |
| Germplasm distribution | BB Padi, Sukamandi, West Java;<br>Balitsereal, Maros, South Sulawesi;<br>IRRI, Philippines;ICRISAT, India;<br>CIMMYT, Maxico | Rice: IR64, Ciherang, IR ..<br>Maize: Arjuna, Suwan, Nei 9008, Nei 9202,<br>AMATLCOHS 63-2-5-E-3-1-2;<br>AMATLCOHS 170-2-3-2-1-1-B-3 |
| Germplasm license | IRRI, Philippines;<br>ICRISAT, India | Rice<br>Sorghum |
| Variety extension | Local governments<br>Farmers' groups | Maize: Support government program on BLBU, CBN, Seed subsidy through provision of good seeds at affordable prices |