Community-Based Maize Seed Production: A Case Study of South Sulawesi and West Nusa Tenggara, Indonesia

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Abstract: Maize productivity in Indonesia has increased directly with the adoption of high yielding varieties by farmers. In 1987, 26.66% of farmers grew high-yielding varieties with an average yield at the national level of 1.46 t/ha. By 2002, 75% of farmers grew high-yielding varieties with a national average yield of 3.09 t/ha. However, in many villages, especially in the remote areas, farmers do not have access to good quality seed mainly due to high seed prices. Therefore, farmers mostly grow recycled seed from hybrids which has a lower seed price but also a lower yield potential. The solution is to increase farmer access to the high quality seed. The objective of this research was to accelerate the distribution of the new, high-yielding varieties through the establishment of an efficient community-based seed production system at the village level that could produce and provide high seed quality at an acceptable price to farmers. The research was conducted in two provinces, South Sulawesi from 2002 to 2004, and in West Nusa Tenggara from 2003 to 2004. The new high-yielding variety (cv. Lamuru) was increased at the community level by progressive farmers and distributed. The results indicated that local seed growers can produce certified seed which was distributed both locally and to neighbouring provinces. The seed that has been sold from seed growers in South Sulawesi was 57 tons in 2003 and increased to 92.5 tons in 2004, while from West Nusa Tenggara, the sold seed was 20 tons in 2004 and 3.0 ton in early 2005. Through the establishment of community-based seed production systems, the distribution of new, high-yielding varieties can be accelerated.

Key words: Technology dissemination, Community-based seed production, Open-pollinated variety

Introduction

The presence of improved varieties, either open-pollinated (OPV) or hybrid, has significantly increased maize yields. However, the adoption of improved varieties in Indonesia has been quite slow; as a result, the share of improved varieties was 26.66% in the period of 1986 to 1987 (Subandi *et al.*, 1988), and in 1997 the share of improved variety reached 44% (CIMMYT, 1994). Lately, the share of improved varieties used by farmers has increased to 80% (consisting of 24% hybrids and 56% OPVs) throughout the country. Similar data were reported by Nugraha and Subandi (2002) for 19 provinces in which the share of improved varieties reached 75%, consisting of 48% improved OPVs and 27% hybrids, while the remaining 25% was local varieties. However, Kasryno (2002) estimated that the use of real hybrids (F_1) by farmers was only 10%, because some farmers planted F_2 or F_3 generation seed due to high price of F_1 hybrids. The improved OPVs planted by farmers were mostly regenerated seed, resulting in low yield.

Results and Discussion

Maize Growing Area and Production Constraints

The maize production area has been classified into three major regions, i. e. dryland (65% ~ 70%), rainfed lowland (20% ~ 30%), and irrigated lowland 10% ~ 15% (Kasryno, 2002). The large dryland area contributes to low average maize productivity. The major constraints to enhancing maize growing area in the drylands are soil acidity and drought. The use of drought tolerant and early maturing varieties is one option to solve the limited water availability to the crops.

Most of the maize area (57% ~ 60%) in Indonesia is on the main island of Java, which contributes about 61% of the national maize production. Based on land availability, the potential areas for expansion of maize production are outside of Java, due to decreasing agricultural areas in Java because of continuing land conversion to non-agricultural purposes. Therefore, in the future, Java's farmers may shift to grow horticultural crops instead of food crops. However, there are several constraints that occur in the outer Java islands, such as marginal lands (soil acidity, drought, low N), limited seed availability of newly released varieties, limited labor, and poor infrastructure.

National maize productivity in 2002 was relatively low, with an average of 3.09 t/ha, although in East Java maize productivity was 3.54 t/ha (Table 1). The higher productivity in this area was attributed to higher adoption of better production technology by farmers, such as improved varieties, cropping systems and the availability of good quality seeds of high-yielding varieties.

Table 1 **Harvested area, production, and average yield in five maize growing provinces in Indonesia in 2002**

Province	Harvested area (ha)	Production (t)	Yield average (t/ha)
East Java	1 043 285	3 692 145	3.54
Central Java	495 224	1 505 706	3.04
Lampung	320 057	989 323	3.09
South Sulawesi	205 909	661 005	3.10
North Sumatera	198 670	640 593	3.22
Remaining provinces	863 688	2 165 332	2.51
Indonesia	3 126 833	9 654 104	3.09

Source: CBS and Ditjen of Food Crops Production (2003)

Distribution of Breeder Seed (BS)

Maize hybrids developed by AARD are not yet widely grown by farmers due to limitations in seed multiplication and distribution by small seed companies, despite the fact that the genetic ability of the maize hybrids recently developed by AARD is comparable to that of hybrids developed by multinational private seed companies such as BISI, Pioneer, and Monsanto. In 2000, the ICERI sent maize BS to more than 22 provinces in Indonesia. The demand for maize BS increases each year. These seeds were distributed to the Agriculture Department through the Centre of Seed Multiplication in 22 Provinces around the country, private seed growers, groups of farmers, students, and researchers. The amount of distributed maize BS increased over the years: 1 440 kg in 2000, 765 kg in 2001, 1 315 kg in 2002, 1 672 kg in 2003, and declined to 530 kg in 2004.

The dominant seed distributed in 2000 was Bisma (820 kg), followed by Lagaligo (520 kg/ha) and Lamuru (330 kg/ha). In 2002 and 2003, the dominant seeds distributed were Lamuru followed by Bisma. Lamuru was dominant in uplands with uncertain rainfall or short duration of rainfall distribution, i. e. in west Nusa Tenggara (NTB), and the southern part of South Sulawesi, especially in lowlands and uplands. On the other hand, Bisma was preferred by farmers with adequate water supply, and was not only produced as grain but also for fodder (used for silage) due its highest biomass production among the OPVs that ICERI has released so far.

In 2004, the most seed distributed by ICERI were for Sukmaraga, followed by Lamuru. These seeds were mainly distributed to the Seed Centres at provincial level. However, in some cases, this system of seed distribution did not work as expected, because the Seed Centres are mostly located in the capital cities of each province, whereas the seed growers are mostly in villages that are quite far from the capitals. As a consequence, in some maize growing areas many farmers faced problems in accessing seeds as required. To overcome these problems, they used recycled seed of either hybrid or OPV, especially in uplands with inadequate

rainfall and limited access to transportation. The farmers realise that the yield obtained from recycled seeds will be much lower than the yield obtained from F_1 seeds, but they have no alternatives. Most farmers in marginal areas were not able to buy hybrid seed because of high prices.

Community-Based Seed Production

To accelerate the dissemination of new high-yielding varieties, either OPV or hybrid, ICERI conducted varietal field demonstrations followed by field days several times, i. e. Lamuru in Blora, central Java (2003); in Takalar South Sulawesi (2002); in East Lombok (2003); in Gorontalo (2003); and Sukmaraga in Tanah Laut, South Kalimantan (2004). Each field day was conducted at a farmer's field, with the about 5 hectares of the variety grown in the demonstration for the field day. The field days were attended by more than 100 farmers, stake holders, private sectors, NGOs, extension workers, the Quality Control and Seed Certification in each province, the Assessment Institute of Agriculture Technology (AIAT) at provincial level and several researchers from ICERI. In South Kalimantan the field day was attended by the Minister of Agriculture; in Gorontalo it was attended by the chairman of the national parliament and in several sites field days were attended by Bupati (mayor); while in NTB the field day was attended by the Governor, besides others participants. The field days played a significant role in the dissemination of new varieties, but the question remained as to how to disseminate the seed at acceptable price, in the proper quantity and quality, and in the proper time at the village level prior planting. In dry land areas, one key to success for growing maize was to provide good quality seeds that had been chosen by farmers, i. e. a drought-tolerant variety. The seeds required should be on-hand, awaiting adequate rainfall that will support seed germination.

Because of the difficulty of farmers to access seeds of improved varieties, community-based seed production projects have been developed by ICERI in two provinces, i. e. in Bajeng village, Takalar district of South Sulawesi province, and Sambelia village, Lombok Timur district of West Nusa Tenggara (NTB) province. These activities (in South Sulawesi and NTB) started with identification of the constraints to maize production in both provinces through Participatory Rural Appraisal (PRA), followed by an action crop (demonstration) established to show the performance of several high-yielding varieties of good quality seeds, and followed by field days. Recording of the farmers' preferences for the new varieties were synthesized to make the proper conclusion of the farmers preference, i. e. (1) in drylands, farmers prefer to have an early maturing variety besides high productivity to solve the risk of crop failure against short distribution of rainfall; (2) the shelling ratio should be as high as Bisi-2 hybrid to get a good price; (3) grain colour should be deep yellow (orange); (4) it should be easy to harvest the ears; (5) it can be consumed as green corn, and (6) plant height should not too high compared to Bisi-2 hybrid to avoid lodging. The middlemen, who collect the harvest at the village level, played a big role influencing farmers' preferences for a certain variety. After having identified farmers' preferences during field days, finally farmers have their own decision making, i. e. they preferred to have Lamuru to be disseminated as soon as possible to ensure access by farmers to good quality seeds of high-yielding varieties at village level in both sites (in South Sulawesi and West Nusa Tenggara).

The results showed that the seed growers have been able to produce high quality seed. The seed growers in Sambelia NTB were able to produce 8 837kg of high quality seeds of ES, and all of the seed produced was sold to other villages, sub-districts, and other districts such as Dompu, Sumbawa, Central Lombok, West Lombok and in East Lombok. Also, four retailers were formed in different villages.

In South Sulawesi, the seed growers in Bajeng Takalar district were able to market the ES to other provinces (East Nusa Tenggara, NTT, Gorontalo and South Sulawesi). The amount of seed sold was 57 tons of Lamuru in 2003, which increased to 92. 5 tons in 2004, when seed was also sent to other provinces, such as Gorontalo, South Kalimantan and South Sulawesi.

Due to the appropriate moisture management (10.5% to 11% seed moisture), seeds produced by these growers in NTB can be kept up to ten months with only a small reduction in vability. In South Sulawesi, because they handled a large quantity of seeds, these can kept for up to 8 months, due to lesser ability to reduced the moisture content down to 11% ~ 12%. The cost of seed processing, along with the price of ears was much cheaper in South Sulawesi, i.e., Rp 2 224/kg, while in NTB it reached Rp 2 500/kg. Therefore, the farm gate price of extension seed (ES) in South Sulawesi was Rp 3 000/kg, much lower compared to the price in NTB, i.e. Rp 4 500/kg.

Linkages among ICERI, Seed Centers and Other Stakeholders

To support the success of new varieties released to farmers, in 2004 the ICERI staff gave a practical training on seed production to several provinces, i.e. in Central Java, West Nusa Tenggara, Lampung, South Kalimantan, and South Sulawesi. ICERI also supplied them with foundation seed (FS) of maize OPVs, to enhance the steady supply of source seed (SS) to community-based seed growers at village level. These activities forged linkages among Seed Centres at provincial level, AIAT and seed growers in the provinces. These linkages will facilitate the continuing seed source to be multiplied at Seed Centres for collaborative projects with the existing seed growers at village levels. Using this system of seed distribution will accelerate seed distribution of new varieties.

Two locations (West Nusa Tenggara and Lampung provinces) out of five were successful in seed distribution. In West Nusa Tenggara province, the seeds were produced by the farmer group "Daya Makmur" at the irrigated lowland village of Labuan Pandan, Sub-district Sambelia, district East Lombok, in collaboration with Seed Centre at the district level (BBU). All seeds produced (10.55 t) from 3.26 ha of the OPV Lamuru were sold out. In Lampung, the seeds were produced by the farmer group "Sama Maju" at the rainfed lowland village of Punggur, Sub-district Asto Mulyo, district Central Lampung. All seeds produced (3.33 t Lamuru and 4.50 t Sukmaraga) from 3.26 ha were sold out.

Seed distribution was conducted by ICERI partners in the province, such as the Agriculture Extention Services (called DIPERTA), and the Assessment Institute of Agriculture Technology (called BPTP). The seeds were marketed at East Lombok Timur and another island called Sumbawa, and sold at Rp 6 000 ~ Rp 7 000/kg.

References

CBS and Ditjen of Food Crops Production. 2003. www.deptan.go.id

CIMMYT. 1994. World maize facts and trands. Maize seed industries. Emerging roles of the public and privates sectors

Kasryno, F. 2002. Perkembangan Produksi dan Konsumsi Jagung Dunia Selama Empat Dekade Yang Lalu dan Implikasinya Bagi Indonesia. (The Progress of World Maize Production and Consumption for the Last Four Decades, and Its Implication to Indonesia). Paper presented at One Day Seminar on Maize Agribusiness, in Bogor, 24 June 2002. AARD

Nugraha, U. S and Subandi. 2002. Perkembangan teknologi budidaya dan industri benih. Diskusi Nasional Agribisnis Jagung. Badan Penelitian dan Pengembangan Pertanian, Bogor, 24 July 2002

Subandi, Ibraim, M. and A. Blumenschein. 1988. National Coordinated Research

Program on Corn. Central Research Institute for Food Crops. Agency for Agricultural Research and Development