Farmers’ Perceptions to the Maize Integrated Crop Management in Dryland Agro-Ecosystem of Timor Island

B. Murdolelono¹, Helena Da Silva¹, and E. Budisantoso²

¹ East Nusa Tenggara Assessment Institute for Agricultural Technology
² Australia Indonesia Partnership for Decentralization
Jl. Timor Raya Km.32 Naibonat-Kupang-East Nusa Tenggara
Email: bambang_murdolelono@yahoo.com

ABSTRACT. Maize is the staple food crop grown on higher than 85% of smallholder land in Timor Island, but maize yield only 2.55 t/ha, while potential yield higher than 5 t/ha. To increase farmer’s productivity use maize integrated crop management (ICM) approach. Demonstration plot of maize ICM is a strategy for disseminate new technology of maize, which demonstration was conducted in 70 sites of dry land agro-ecosystem in Timor Tengah Utara (TTU) district, East Nusa Tenggara (ENT) province during November 2011-April 2012. The study aims to evaluated farmer’s perceptions of maize ICM technologies and probability their adoption. Data gathered through structured survey involved 600 farmers that distributed into 60 villages of plot demonstration sites. The research showed that farmers have optimistic view to the ICM of maize due to: (a) farmers aware that maize farming with good management showed higher yield than existing practices, (b) Farmers prefers to use organic fertilizers than an-organic fertilizers, (c) farmers strongly believes that high seed quality will increase yield, (d) farmers keep the seed from introduced varieties to be planted in the next season, (e) 73% of farmers is ready to buy seed if there is no longer government or NGOs’ support, (f) farmers believe that new cropping pattern (new varieties, space planting and fertilizing) can increase maize yield, (g) Even without extension workers’ assistance, farmers will continue to applied ICM of maize, and (h) the possible technology components to be adopted are planting space, new varieties and organic fertilizer; while farmers still reluctant to spend money to buy an-organic fertilizers.

Keywords: maize, farmers’ response, dry-land, Timor

Introduction

On the Timor Tengah Utara (TTU) Regency that their agricultural was dominated by dry land agricultural as much as 56,007 ha or 86.75%, maize is one commodity that potential to develop not only for food security but also economic oriented. Maize area in TTU District is 20,124 ha, while paddy and cassava only 8,395 ha and 5,540 ha. One problem of maize in TTU district is low productivity that was 2.58 t/ha (TTU In Figure 2007). It’s caused farmer’s maize technology cultivation very simple and using production inputs such as fertilizer and pesticide by farmers was very limited. Opportunity to increase maize productivity still possible because maize productivity achievement of many research in the same location was 4.4 to 6.7 t/ha for OPV’s maize and 7.2 – 9.4 t/ha for hybrid maize (BPTP NTT 2010).

TTU Regency got maize seed assistance from Agricultural Ministry of Indonesia as much as of 198 ton of OPV’s maize and 51 ton of hybrid maize on the late 2011. OPV’s maize seed were distributed for 7,950 ha on 16 sub-districts, 112 villages, 475 farmers groups, while hybrid maize were distributed for 3,400 ha on 8 sub-districts, 52 villages, 282 farmers groups.

Besides of maize seed assistance, it was done improving of technology cultivation, which together with many stakeholders such as AusAID, East Nusa Tenggara AIAT, TTU Regency Dinas of Agricultural, Agricultural Extension Institution, five local NGO’s, local government, and farmers groups built up 70 field demonstration as wide as one hectare per farmers group. This field demonstration aims to disseminate new technology. The kind of new technology were new OPV’s, space planting cultivation, seed use per hole, fertilizing, strip cropping system planting and harvesting. Sustainability of the new technology must be known to adoption possibility, so farmer’s perceptions of the new technology need to record.

Aims

This research objective to: (a) analyzed of farmer’s response to the new technology, and (b) evaluated farmer’s willingness to pay of new varieties and fertilizer.
Methodology

The research was done on 70 field demonstration that spread on 24 sub-districts in TTU Regency, which it’s done on October 2011–Maret 2012.

Maize field demonstration was done by 70 farmers groups that were accompanied by NGO’s and extension services. Kind of maize technology demonstrations are: (1) Field demonstration is a farmer’s learning by doing. Maize field demonstration was one hectare for farmers group. One field demonstration does four kind of technology that were: (a) maize monoculture use compost or organic manure 10 t/ha, (b) maize monoculture use un organic fertilizer 200 kg urea/ha + 200 kg Ponska/ha, (c) strip cropping maize and peanut use un organic fertilizer 200 kg urea/ha + 200 kg Ponska/ha, and (d) strip cropping maize and peanut use compost or organic manure 10 ton/ha, (2) The OPV’s seed was used Surya, (3) for monoculture planting system, seed were planted with space 40 cm x 75 cm, 2-3 seed/hole. For strip cropping, maize were planted use “ajar legowo” planted system with space (100-50) x 40 cm, which alley of maize as wide as 100 cm was planted peanut, (4) application of un organic fertilizer: first application on 7-10 DAP with 50 kg/ha urea + 150 kg/ha Ponska. Second application on 35 DAP with 150 kg/ha urea + 50 kg/ha Ponska, and (5) Harvesting was done if “black-layer” of seed was visible.

This technology demonstration was evaluated by farmers and they determined the kind of technology that would be adopted.

For known of sustainability of new technology, it was done information collected of famers response, willingness to accept and willingness to pay to the new technology. Data collected by observation and structured interview with 600 farmers who involved on field demonstration. The data analysis use descriptive analysis.

Result and Discussion

Existing of Maize Technology Cultivation on TTU Regency

Maize varieties commonly used by farmers are local varieties. Nevertheless many farmers use superior varieties from government assistance, but generally the farmers said that the new varieties susceptible to pest storage (Sitophilus zeamais) so they retain their local maize. Maze was planted with irregular spaced about 85-125 cm (estimated population 11,000 per hectare with 3-4 plants per hill).

The farmers do not use organic and un organic fertilizers, although manure potential to used because at some farmer’s yard have found cow manure.

Farmers Characteristic

Age

A farmer in a farm implement is strongly influenced by his physical abilities. The increasing their age will increase their productivity until it reaches a certain age, and then will decrease accompanied by declining productivity. The results of the survey respondents indicated that farmer’s age range of 22-75 years, and the average age is 43.28 years. It’s indicated that work ability of the farmers is strongly enough.

Long education

The level of formal education is an important factor to determine the level of human resources. The higher the level of formal education of farmers will be higher reasoning power and the ability to adapt and accept change. Education is a learning tool to improve knowledge, which in turn will instill a sense of attitude and affect the ability of farmers to be able to act in a more rational so that the higher the acceptance of an innovation. With higher levels of education will possibility to change attitudes and behavior to improve the quality of life independently.

The education level of farmers between 0-15 years old with an average of 7.16 years of formal training, which it were 63% level of primary school, 23% junior school, and 10% of high school (Figure 1).

Farmers Labor

Amount of family members is a burden on families in the provision of all the necessities of life, but on the other side is a source of labor for carrying out farming activities. Results of the interviews in the study area showed that the average farm family dependent is 3.79 people/HH. While the availability of productive labor (15-55 years) of 2.24 people/HH (Table 1).
Land and Livestock Ownership

Land is one of the most important production factors for farmers. In general, farmers have many dry land farming fields and yards. The results showed that farmer’s land ownership ranged from 1-5 parcels with an average of 1.86 parcels/household, which 50% of the farmers have one land parcel only. The land cultivation ranges from 1-3 parcels with an average of 1.43 parcels/KK, which 63% of the farmers cultivated only one land parcel (Figure 2).

Wide range of farmers land ownership ranged from 0.25 to 9.98 ha with an average of 1.52 ha/household. However, wide range of land cultivated ranged 0.05 to 4.0 ha only with an average of 0.78 ha/household. Ratio between cultivated land and productive workforce (aged 15-55 years) was 0.35 ha/labor. It means that each person labor burden of work field was 0.35 ha/labor.

Livestock is an important component for maize farming sustainability, especially in terms of the integration of crop-livestock. It will be produced the flow of energy, namely: biomass crops are used for animal feed Ð produced manure as a source of soil nutrients (Subandi 2002). The kind of potential livestock for crop-livestock system were cattle and goats. The results of the interview showed that ownership of cattle ranged from 0-15 tail/HH with an average of 1.57 tail/HH, while ownership of goats ranges from 0-15 tail/HH with an average of 0.87 tail/HH. Judging from the equity livestock ownership showed 38% of the farmers have not cattle, and 66% of the farmers have not a goat (Figure 3).

Without additional un organic matter, amount of cattle in this location is very limited and is not sufficient for support organic agricultural system. Subandi et al. (1995) stated that in each ton of dry manure contained 21.6 to 25.7 kg N, 4.8 to 6.8 kg P and 14.5 to 16.2 K. Observations Subandi et al. (1995) that one cattle produced 3.69 kg dry manure/tail/day, while Alit et al. (1997) states that one cattle produced 15 kg wet manure/tail/day. If one cattle produced dry manure 3.69 kg/tail/day, while the ownership of cattle averaged only 1.57 tail/HH so that one HH produce dry manure 1.57 tail/HH x 3.69 kg/tail/day x 365 days = 2114 kg/ year. In 2114 kg of dry manure contained 45.7 to 54.3 kg N, 10.1 to 14.4 kg P, and 30.7 to 34.2 K, and 2,114 kg of dry manure.
manure for fertilize the maize area of 0.78 ha so that calculated in a hectare is 58.5 to 69.7 kg N/ha, 13.0 to 18.4 kg P2O5/ha, and 39.3 to 43.9 kg K2O/ha. This manure not enough for fertilize maize field because maize plants absorb N, P and K respectively about 198 kg, 33 kg, and 205 kg/ha (Arnon 1975).

The new superior variety (NSV) is one major component on Integrated Crop Management (Indonesian Agricultural Department 2008). Potential yield of the Surya OPV’s is higher than local varieties. Adnan et al. (2010) stated that Surya OPV’s was released by Indonesian Agricultural Department on 1986, which have some superiority that are resistance to downy mildew and rust diseases, cob of corn close properly, and potential yield 6.9 t/ha.

The good seed is obtained from seed nursery, labelled seed, and high seed germination higher than 90%. On this activity, use good seed varieties, which this seed was produced through Indonesian Standard Operational Procedures for seed, so seed producer guaranteed seed quality.

Some reasons that encourage the farmer to adopt new varieties are: (a) have high potential yield, (b) have some excellence such as shorter plant (± 150 cm) compared > 180 cm on local varieties, shorter age (± 90 – 110 days compared ± 95 – 110 days on local varieties.

Willingness to accept of space planting

Application of the optimal space planting is one key success to increase maize productivity. Usually the farmers use space planting ± 100 cm x 100 cm (population around 10,000 holes/ha). The farmer’s space planting is considered too long because a lot of field do not covered with leaves canopy. In this activity, it’s recommended use 75 cm x 40 cm (population around 33,000 holes/ha).

The interview showed that (1) 93.8% of farmers believe that the new space planting will increased maize yield, while 6.2% did not believe, and (2) 87.3% of farmers said that they will applied the new space planting although do not guidance by extension services, while 12.5% doubtful and 0.2% said no.

Strip cropping maize with legumes such as peanuts is recommended to increase the nitrogen content in the soil. Legume plants incorporated into farming systems because: 1). capable of binding free legume N from the air thereby increasing soil fertility, 2). Farmers are not generally used to make fertilizer, so these commodities will decrease land degradation of soil fertility, 3). Relatively easy to do, 4). Marketable, 5). High nutrient content, especially high protein, and 5). Legumes biomass potential to use for livestock feed.
Willingness to accept of fertilizing

The interview showed that (1) 83.3% of farmers believed that fertilizing will increased maize yield, while 14.4% doubtful and 2.3% said no, (2) 75.1% of farmers believed that un organic fertilizer (phonska + urea) will increased maize yield, 16.7% doubtful and 8.2% said no, and (3) 88.4% of farmers will applied organic fertilizer (manure) although do not guidance by extension services, while 7.4% doubtful and 4.2% said no.

The addition of un organic fertilizers is one characteristic of modern agricultural practices, particularly in the manufacture of nutrient composition in hydroponic cultivation. However, some people refuse un organic fertilizer on the grounds that commercial fertilizers containing toxic chemicals that are harmful to humans, animals and the environment and prefer the addition of nutrients derived from organic materials or natural course. Regardless of polemic, maize crops require sufficient nutrients to support growth. Nutrients can come from organic fertilizer or un organic. The wisest choice is to choose organic fertilizers advance in ways as described above, if still less then added un organic fertilizer.

The type and dosage of fertilizer vary depending on the location. Therefore maize fertilization technology should be determined based on site-specific needs. If no data, it can use the general recommendation that were urea 200-300 kg/ha + SP36 75-100 kg/ha + KCl 50-100 kg/ha. For dry land recommended fertilizer twice. The first application dose is half of urea fertilizer + all doses of KCl, which were applied 7-14 DAP. And the second application dose is half of urea (Murdolelono et al. 2010).

Willingness to pay

The interview showed that (1) 73.1% of farmers spend IDR 250,000 to buy the new seed varieties, while 19.9% doubtful and 7% said no, (2) 50.4% of farmers ready to spend their money to buy un organic fertilizer, while 30.1% doubtful and 19.5% said no.

Farmers in dry land EN province occupied subsistent facultative and semi commercial level (Subandi et al. 1997). They were difficult to applied agribusiness because their orientation for food security (Sumamo and Bamualim 1999). So technology information and new innovation must be adapted in this condition. It’s needed institutional building for sustainability technology introduction.

Farmer’s maize technology very simple and using production inputs such as fertilizer and pesticide by farmers was very limited. Energy cycles for sustainability natural resources were limited and land fertility were gradually decrease because energy get out from land (BPTP NTT 2006). It’s not advantage for sustainability agricultural development in this area.

Technology choice

The interview showed organic fertilizer more interested than un organic fertilizer, while and then maize monoculture more interested than strip cropping maize/peanut (Figure 4). Manure and other organic sources are used to improve soil fertility and organic matter content of the soil and provide micro-nutrients and other growth factors that are not normally provided by chemical fertilizers (inorganic). The use of these materials can also enhance microbial growth and turnover of nutrients in the soil.

Conclusions

Farmers have realized that good practices maize increased their maize yield. Some technology to adopt are new OPV’s maize, space planting, use organic fertilizer, monoculture cropping system, than intercropping maize-legumes.

Farmers strongly believe that the use of quality seeds to increase maize yields. If no money, they will keep the new varieties of maize seed for planting on next season, but some farmers are willing to spend money to buy the labeled seed.

Acknowledgements

The authors express their sincere appreciation for AusAID, Head of East Nusa Tenggara AIAT, TTU Regency
Dinas of Agricultural, Agricultural Extension Institution, five local NGO’s (YMTM, YABIKU, YAFA, YBS and YTM), local government, and my farmers groups.

References


BPTP NTT. 2010. Pendampingan 315 unit SLPTT jagung untuk meningkatkan produktivitas dari 2 T/Ha Non SLPTT menjadi > 5 T/Ha serta menghasilkan benih jagung hibrida 0.5 ton.


Sumarno and A.Bamualim. 1997. Farming system development and technology needed. In: regional seminar proceeding of application indigenous technology and new technology for support agricultural in Nusa Tenggara. Indonesian agricultural research development.
