Potency of maize production by the application of NPK (15-10-20) fertilizer and organic fertilizer on irrigated field dry season 1

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Abstract. Fertilization is one of efforts to increase maize production, and among the commercial fertilizers is compound fertilizer, which contains NPK. Due to varied contents of NPK in such fertilizers, the research was conducted to study effectiveness of fertilizers that contain NPK (15-10-20) against growth and production of maize. The research was conducted at irrigated field MK1 (dry season 1) from May to August 2017 at Sidorejo Village, Umbulsari Subdistrict, Jember Regency. The research used hybrid maize of var. P 31, organic fertilizer 2 t/ha, Randomized Block Design (RBD) with 3 replications. There were 8 treatments of combined fertilization, so that there were 24 experimental plots. The treatments included Urea: 250 kg and 350 kg, NPK (15-10-20): 250 kg, 350 kg, 450 kg, and 550 kg. The standards of comparisons were without fertilizer and recommended fertilizer. Size of the experimental plot is 6 m x 6 m. Results of the research showed that the application of 250 kg urea + 250 kg NPK 15-10-20/ha produced the highest production of grains, 10.08 t/ha. It could increase the production for about 1.61 % in comparison with the recommended dose (350 kg urea + 450 kg phonska/ha) and increase 9.20 % in comparison with fertilization that used to be applied by the farmer (400 kg urea + 500 kg Phonska/ha). The highest RAE (Relative Agronomic Effectiveness) above 100 can be achieved by the application of 250 kg Urea + 250 kg NPK (15-10-20)/ha for about 102 %. The application of 250 kg urea + 250 kg NPK 15-10-20/ha has made profit Rp. 24,247,000 or using B/C ratio 1.724 is higher than fertilization using the recommended dose (350 kg/ha urea + 450 kg/ha NPK Phonska), which made profit Rp. 23,811,000 or using B/C ratio 1.714. Based on yield of grains and farming calculation, it is suggested to apply 250 kg urea + 250 kg NPK (15-10-20)

1. Introduction

In order to promote growth and production of the maize (Zea mays) optimally, sufficient nutrients are required during its growth. Maize is one of agricultural commodities, which gain specific attention in Indonesia after rice [1]. Therefore, fertilization is one of the main determinant factors of maize breeding success in addition to superior varieties. Fertilizer application is basically intended to fulfill nutrients, which are required by the plant, whereas nutrients in the soil are not sufficient. Fertilization is very important because it provides nutrients, which are required by the plant [2].

The needs of both macro-and-micronutrients are not completely provided by the soil, so that it requires additional nutrients in the form of fertilizer. However, the applied nutrients in the form of fertilizers are not completely absorbed by the plant. According to Patrick and Reddy [3], it is only 55-60% nitrogen and 20% P that can be absorbed by the maize crop [4], K ranges 50-70% [5], while S is
around 33% [6], and Tabri [7] reported that low yield of maize was caused by no application of N fertilizer, and lack of potassium may cause low production of maize [8].

The plant’s response to the applied fertilizer is depended on type of fertilizer and fertility status of the soil. N, P, and K are highly required to grow and reproduce, in which each yielded seeds may requires 27.4 kg N, 4.8 kg P, and 18.4 kg K [9]. Based on the targeted production in order to produce 7.5 ton/ha maize, It requires 197.3 kg/ha N, 104.3 kg/ha P2O5 and 268.5 ton/ha K2O [10].

The need of N and K is high for maize, and the farmers have applied N in high dose, but it is not counter balanced with the application of K because they presume that K fertilizer is expensive. However, N, P, and K are macronutrients, which are essential for the plant growth. The nutritive source of N, P and K may be derived from decomposition of soil mineral, organic matters, irrigation water, and fertilization. N in flooding area, soil solution, as well as leached from compound NPK, is lesser than from urea [12].

Results of the research on application of combined-organic and inorganic fertilizers showed significant yields. Sarno [13] suggested that combined application between NPK and manure has produced higher yield than just applied 100% NPK or manure. Prasetyo et al. [14] suggested that the application of cattle droppings as manure for about 10-20 t/ha and single inorganic fertilizer for about 50% as recommended, did not show any significant difference with the application of inorganic fertilizer of 100% as recommended.

Based on the description above, the research was conducted to study effectiveness of NPK (15-10-20) on maize using organic fertilizer 2 t/ha. It is expected that the plant will get sufficient nutrients for its growth, so that its growth and productivity will be optimal. Objective of the research was to study effectiveness of NPK (15-10-20) on growth and yield of maize.

2. Methods

The research was conducted at Sidorejo Village, Umbulsari Subdistrict, Jember Regency, on Inceptisol soil, in which the research was done during the first dry season/ MK1, started from May 2017 to August 2017 and soil analysis is presented in (Table 1).

Table 1. Soil Analysis on Location of the Research at Sidorejo Village, Umbulsari Subdistrict, Jember Regency

| No | Testing Parameter | Yield | Unit | Criteria | Method |
|----|-------------------|-------|------|----------|--------|
| 1  | pH                |       |      |          |        |
|    | - H2O             | 6,4   | -    | Less acid| (1:5), Electrometry; pH Meter |
|    | - KCl             | 5,1   | -    |          | (1:5), Electrometry; pH Meter |
| 2  | C-Organic(*)      | 1,29  | %    | Moderate | Walkley & Black; Spectrophotometry |
| 3  | N-total(*)        | 0,16  | %    | Low      | Kjeldahl; Titrimetry |
| 4  | P<sub>2</sub>O<sub>5</sub> (*) | 116 | Ppm | Very High | Bray I; Spectrophotometry |
| 5  | Cation Exchange Value(*) | | | | |
|    | - K-dd (exchangeable) | 0,43 | me.100g<sup>-1</sup> | Moderate | Percolation NH<sub>4</sub>-Acetate 1 M, pH 7; AAS |
|    | - Cation Exchange capacity (KTK) | 37,79 | me.100g<sup>-1</sup> | High | Percolation NH<sub>4</sub>-Acetate 1 M, pH 7 + NaCl 10%; Titrimetry |
| 6  | Texture(*)        |       |      |          |        |
|    | - Sandy           | 22    | %    |          | Hydrometer |
|    | - Dusty           | 28    | %    |          | Hydrometer |
|    | - Clayey          | 50    | %    |          | Hydrometer |
The research applied P-31 variety and fertilizers, such as organic fertilizer, Urea, Phonska, NPK (15-10-20), as well as other supporting materials that include pesticide, rope, plastic bag, tape measure, and bamboo. Based on the analysis results on nutrients level contain in NPK (15-10-20), as presented in Table 2, N and P are higher.

### Table 2. Results of analysis on Nutrient Level of NPK (15-10-20)

| Parameter | Unit  | Yield | Conducted in Accordance with |
|-----------|-------|-------|-------------------------------|
| N         | %     | 17.98 | SNI 2803 : 2012 (point 6.2)  |
| P₂O₅      | %     | 11.93 | SNI 2803 : 2012 (point 6.3)  |
| K₂O       | %     | 20.65 | SNI 2803 : 2012 (point 6.4.1)|
| Moisture  | %     | 1.12  | SNI 2803 : 2012 (point 6.5.1)|
| Pb        | ppm   | 39.80 | SNI 2803 : 2012 (point 6.6.3)|
| Cd        | ppm   | 0.50  | SNI 2803 : 2012 (point 6.6.2)|
| Ar        | ppm   | 2.61  | SNI 2803 : 2012 (point 6.7)  |
| Hg        | ppm   | 0.45  | SNI 2803 : 2012 (point 6.6.1)|

The experimental design used Randomized Block Design with 3 (three) replications. The treatments consisted of 8 combinations of fertilization including the control. The treatment is combination between NPK (15-10-20) and Urea in accordance with dose of the treatment, in which one of them is without applying any fertilizer to count RAE, and the other one is the recommended fertilizer as standard of comparison (Table 3).

### Table 3. Fertilizer application on effectiveness test against NPK (15-10-20) at Sidorejo Village, Umbulsari Subdistrict, Jember Regency 2017

| No | Treatment | Urea (kg/ha) | Phonska (kg/ha) | NPK (15-10-20) (kg/ha) |
|----|-----------|--------------|-----------------|------------------------|
| 1  | A         | 0            | 0               | 0                      |
| 2  | B         | 350          | 450             | 0                      |
| 3  | C         | 250          | 0               | 250                    |
| 4  | D         | 300          | 0               | 300                    |
| 5  | E         | 350          | 0               | 350                    |
| 6  | F         | 400          | 0               | 400                    |
| 7  | G         | 450          | 0               | 450                    |
| 8  | H         | 400          | 500             | 0                      |

Size of each testing plot is 6 m x 6 m with 5 samples of plants in each testing plot on variables of plant height, length of ear, diameter of ear, and weight of 100 grains, while conversion for weight of dry grains in ton per hectare uses yield of each testing plot on all replications (3 replications).

First of all, the testing field was cultivated using tractor and hoe, and then removed the weeds, after that applied organic fertilizer by dose 2 ton/ha. After labeling the land, ridging (seedbeds) is made as testing plot unit. Seed planting is done using dibble. The spacing is 20 cm x 70 cm and it is filled with 1-2 seeds per dibble. And then, it is followed with watering to accelerate germination and to promote the plant growth uniformly.

Fertilizer is applied twice (2x) at 15 and 30 days after planting (dap). It should be applied gradually in accordance with the plant growth. It is applied for about 5-10 cm from the stem base by listing.
(making row or line). The fertilizer is put into the list (row or line), and then covers it with soil. Watering is applied in accordance with plant and land condition.

Weed control may be done by weeding and concomitant with heaping up the soil manually using sickle at 25 and 45 dap. Pest control is overcome using pesticide in accordance with the recommended dose.

Harvesting is done when husk of the maize ear has dried. Maize is harvested when it has matured physiologically in accordance with agro ecology of the local area. The maize is allowed to completely dry on its stem, and when the husk is completely dried and turn into brown and the corn hair turns into black and dried, maize is ready to be harvested.

Observation or soil analysis was conducted before the test. Taking soil sample was done through composite, in which soil sample was taken diagonally from 5 points and in 0-20 cm depth. And then, the soil sample was analyzed at the Soil Laboratory of BPTP East Java. The tested components include: water content, pH H2O and pH KCl, C-organic, N total, P2O5, K-dd (exchangeable), Cation Exchange Capacity, and soil texture for % dusty, clayey, and sandy soils.

Agronomic observation on maize is conducted over the growth and harvested yield components. The observed-growth variables include: (1) plant height at 50 dap and approaching the harvest time, (2) Number of leaf at 50 dap and approaching the harvest time. While the observed variables for the harvested yields include: (1) ear length, (2) diameter of ear, (3) weight of dry grains ton/ha, which is conversed from yield of dry grains per testing plot.

Data analysis for results of observation on growth and yield components was analyzed using F-test and followed by significant comparative test of DMRT at level 5%. In order to study effectiveness of the tested fertilizer technically/agronomically, Relative Agronomic Effectiveness (RAE) value is calculated using formulation 1:

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    RAE = \frac{\text{Yield of tested fertilizer} - \text{control}}{\text{Yield of standard fertilizer} - \text{control}} \times 100
\]

Moreover, in order to find out the profit economically, input-output analysis of the farm is applied using B/C ratio analysis approach or profit/cost.

3. Results and Discussion
In accordance with the analysis result on soil at the experimental location, it showed that pH soil is rather acid, moderate C-organic content, and low N but high P and K, which is exchangeable in moderate condition, as well as high Cation Exchange Capacity (CEC). Such condition is ideal for planting maize that requires high P and K. However, in order to increase the yield, maize highly depends on the application of nutrients in the soil, not only Nitrogen (N), Phosphor (P), and Sulfur (S), but also Potassium (K).

3.1. Growth of Maize
Observation on plant growth includes plant height and stem diameter at 30 and 60 dap. Results for analysis of variance showed significant effect on plant height at 30 and 60 dap, and then followed by difference test among treatments using DMRT at level 5% (Table 4).

When approaching the harvest time, the application of 250 kg Urea + 550 kg NPK (15-10-20) and 350 kg Urea + 450 kg NPK (15-10-20) produce higher plant height and significant difference than without using fertilizer (Table 4).

| Table 4. Observation on plant height at 30 and 60 dap in diverse treatments of fertilizer |
|----------------------------------|-------------------------------|-------------------|-------------------|
| Treatment | Dose and Type of Fertilizer | Plant height at 30 dap (cm) | Plant height at 60 dap (cm) |
|-----------|-----------------------------|-----------------------------|-----------------------------|
| A         | Urea (kg/ha) 0 | Phonska (kg/ha) 0 | NPK (15-10-20) (kg/ha) 0 | 47.3 b | 174.6 c |
| B         | 350 | 450 | 0 | 61.8 a | 232.8 ab |
During observation on stem diameter at 30 dap, it showed that treatment C (250 kg Urea + 250 kg NPK 15-10-20/ha) has produced the greater diameter, 1.84 cm, even though it showed no significant difference with other treatments, but it showed significant difference in comparison with treatment A without fertilizer and E.

Table 5. Observation on Plant Diameter at 30 and 60 dap in diverse treatments of fertilizer

| Treatment | Dose and Type of Fertilizer | Diameter of plant at 30 dap (cm) | Diameter of plant 60 dap (cm) |
|-----------|-----------------------------|----------------------------------|------------------------------|
| A         | 0 Urea (kg/ha) 0 Phonska (kg/ha) 0 NPK (15-10-20/kg/ha) | 1.46 b | 2.22 c |
| B         | 350 Urea (kg/ha) 450 Phonska (kg/ha) 0 NPK (15-10-20/kg/ha) | 1.70 ab | 2.68 ab |
| C         | 250 Urea (kg/ha) 450 Phonska (kg/ha) 250 NPK (15-10-20/kg/ha) | 1.84 a | 2.50 bc |
| D         | 300 Urea (kg/ha) 350 Phonska (kg/ha) 300 NPK (15-10-20/kg/ha) | 1.75 a | 2.57 bc |
| E         | 350 Urea (kg/ha) 0 Phonska (kg/ha) 350 NPK (15-10-20/kg/ha) | 1.49 b | 2.49 bc |
| F         | 400 Urea (kg/ha) 400 Phonska (kg/ha) 400 NPK (15-10-20/kg/ha) | 1.55 ab | 2.69 ab |
| G         | 450 Urea (kg/ha) 450 Phonska (kg/ha) 450 NPK (15-10-20/kg/ha) | 1.66 ab | 3.01 a |
| H         | 400 Urea (kg/ha) 500 Phonska (kg/ha) 450 NPK (15-10-20/kg/ha) | 1.65 ab | 2.56 bc |
| KK (%)    | 10.85 | 14.16 |

Based on vegetative growth, both plant height and stem diameter show that higher N application will increase plant height and stem diameter (treatment G), in which higher N will produce higher yield in comparison with other treatments.

3.2. Maize Production

Based on results of observation, parameters of production include diameter of ear length, diameter of ear, weight per ear and weight of grains per hectare. Results of observation on ear length showed that treatment (250 kg Urea + 250 kg NPK 15-10-20/ha) has produced the longest ear length, 20.3 cm, and showed significant difference in comparison with the treatment without fertilizer, but it showed no significant difference with the treatment using fertilizer.

Diameter of ear by treatment F (400 kg Urea + 400 kg NPK 15-10-20/ha) showed the greatest diameter, 4.35 cm, even though it had no significant difference with treatment G (450 kg Urea + 450 kg NPK 15-10-20/ha) and H (400 kg Urea + 500 kg Phonska/ha), but it showed significant difference with other treatments (Table 6). Moreover, observation on weight per ear by treatment F (400 kg Urea + 400 kg NPK 15-10-20/ha) showed the heaviest weight of ear, 217.4 gram and it showed significant difference in comparison with other treatments.
Table 6. Observation on ear length, diameter of ear, weight per ear and yield of dry grains with different fertilizer treatment

| Treatment | Dose and Type of Fertilizer | Ear Length (cm) | Diameter of Ear (cm) | Weight per Ear (gram) | Yield of Dry Grains (ton/ha) |
|-----------|-----------------------------|-----------------|----------------------|-----------------------|-----------------------------|
| A         | 0 0 0                       | 12.3 b          | 3.79 c               | 102.9 c               | 4.44 b                      |
| B         | 350 450 0                   | 16.6 ab         | 4.13 b               | 168.2 b               | 9.92 a                      |
| C         | 250 0 250                   | 20.3 a          | 4.10 b               | 156.2 b               | 10.08 a                     |
| D         | 300 0 300                   | 16.5 ab         | 4.16 b               | 167.9 b               | 9.21 a                      |
| E         | 350 0 350                   | 15.9 ab         | 4.12 b               | 157.8 b               | 9.18 a                      |
| F         | 400 0 400                   | 16.8 ab         | 4.35 a               | 217.4 a               | 9.79 a                      |
| G         | 450 0 450                   | 16.7 ab         | 4.26 ab              | 180.3 b               | 9.65 a                      |
| H         | 400 500 0                   | 16.3 ab         | 4.23 ab              | 173.9 b               | 9.23 a                      |

**Note:** The same letter in the same column shows that the treatment has no significant difference with Duncan’s test at level 5%.

Based on result of the plotting (ubinan), it showed that the heaviest weight of grains per hectare was produced by treatment C (250 kg Urea + 250 kg NPK 15-10-20/ha), 10.08 ton/ha, even though it showed no significant difference in comparison with the treatment using the recommended dose (350 kg Urea + 450 kg Phonska/ha) and treatments that applied by the farmers, H (400 kg Urea + 500 kg Phonska/ha) and treatment using NPK 15-10-20 with different dose. But, it showed significant difference without fertilizer application (Table 6). Production of dry grains increase by treatment C (250 kg Urea + 250 kg NPK 15-10-20/ha) in comparison with the recommended dose and the ways used to be applied by the farmer, 1.61% and 9.20%, respectively.

Table 7. RAE Value for effectiveness test of NPK (15-10-20) on maize at Sidorejo Village, Umbulsari Subdistrict, Jember Regency

| Treatment | Dose and Type of Fertilizer | Yield of Dry Grains (t/ha) | RAE (%) |
|-----------|-----------------------------|-----------------------------|---------|
| A         | 0 0 0                       | 4.44                        | -       |
| B         | 350 450 0                   | 9.92                        | 100     |
| C         | 250 0 250                   | 10.08                       | 102     |
| D         | 300 0 300                   | 9.21                        | 87      |
| E         | 350 0 350                   | 9.18                        | 74      |
| F         | 400 0 400                   | 9.79                        | 97      |
| G         | 450 0 450                   | 9.65                        | 95      |
| H         | 400 500 0                   | 9.23                        | 87      |

**Note:**
Table 8. Analysis on maize farm per hectare by treatment 250 kg Urea + 250 kg NPK (15-10-20)/ha and recommended treatment of 350 kg urea + 450 kg Phonska/ha

| Description          | (250 kg Urea + 250 kg NPK (15-10-20)/ha) | 350 kg Urea + 450 kg Phonska/ha |
|----------------------|------------------------------------------|---------------------------------|
|                      | Physical Value (Rp/ha) | Phys  | Physical Value (Rp/ha) |
| Means of Production  | Physical Value (Rp/ha) | Physical Value (Rp/ha) |
| Seeds (kg)           | 20 pack 1.200.000        | 20 pack 1.200.000        |
| Stable manure (ton)  | 2 1.200.000              | 10 1.200.000              |
| Fertilizer (kg)      |                           |                               |
| Urea                 | 250 450.000              | 350 630.000                 |
| Phonska              | 0 1.447.500              | 0 1.125.000                 |
| NPK 15-10-20         | 500 0                   | 6 0                         |
| Pesticide (unit)     | 10 200.000              | 6 200.000                  |
| Number               | 4.527.500               | 4.355.000                  |
| Workforce (HOK/ha)   | Contract 1.350.000       | Contract 1.350.000         |
| Land preparation     | t work 1.500.000         | work 1.500.000             |
| (tractor)            | 30 1.400.000            | 30 1.400.000               |
| Planting (HKW)       | 20 700.000              | 20 700.000                 |
| Weeding I (HKP)      | 10 1.260.000            | 10 1.260.000               |
| Weeding II (HKP)     | 18 420.000              | 18 420.000                 |
| Fertilization (HKP)  | 6 1.400.000             | 6 1.400.000                |
| Pest Control (HKP)   | 20 1.500.000            | 20 1.500.000               |
| Irrigation (HKP)     | 30 1.500.000            | 30 1.500.000               |
| Harvest time         | 9.530.000               | 9.530.000                  |
| Total cost of production (t/ha) | 10,08 14.057.500  | 9,92 13.885.000           |
| Selling Price (Rp/kg) | 3.800                   | 3.800                       |
| Gross Income (Rp/ha) | 38.304.000              | 37.696.000                 |
| Net Income (Rp/ha)   | 24.247.000              | 23.811.000                 |
| B/C ratio            | 1.724                   | 1.714                       |

Relative Agronomic Effectiveness (RAE) is applied to find out the effectiveness value of fertilizer against the recommended fertilizer. The recommended fertilizer uses the recommended dose, which is used as base in constructing RDKK or Detail Plan of the Group’s Need, 450 kg Phonska + 350 kg Urea. RAE is ratio between the increase yield following the application of specific fertilizer and the increase yield following the application of the recommended fertilizer, and multiplied by 100%. Table 7 presents the highest RAE, which is obtained by applying 250 kg Urea + 250 kg NPK (15-10-20)/ha, 102%.

In order to grow and produce maize optimally, it requires sufficient dose of fertilizer, particularly Nitrogen (N) and Potassium (K). Rahmi [17] reported that application of NPK as the most required macronutrient to promote both vegetative and generative growth. More application of N fertilizer will
promote height of the plant. However, the application of 350 kg Urea + 550 kg NPK (15-10-20) that contains higher N will be followed by the increasing height of the plant.

Based on the growth of stem diameter at 30 dap, it showed that the application of urea, phonska, and NPK (15-10-20) has not affected to diameter growth of the plant. Furthermore, during observation at 60 dap, fertilizer application started to show its effect, in which treatment G (450 kg Urea + 450 kg NPK 15-10-20/ha) showed the greatest stem diameter, 3.01 cm, even though it did not have significant difference with treatments B and F, but it showed significant difference with other treatments. Based on results of the research by Solomon et al. (2012), showed that the application of NPK could promote the growth of length and diameter of the stem. Murni and Arief, R.W [13] reported that higher NPK will significantly increase plant height and productivity (yield of grain).

Based on the fertilization research, yield of maize productivity is higher, particularly by the treatment C, which produces 10.08 ton/ha. The yield is much higher in comparison with the national productivity in 2015, which produced 4.1 ton/ha [1] and maize productivity in East Java reaches 6.76 ton/ha [3].

High productivity in this research is enabled by adding more NPK, which is derived from the application of Phonska and NPK 15-10-20, as well as manure 2 t/ha. Based on review from BPTP of East Java, to produce the targeted production, 7.5 ton/ha maize requires 197.3 kg/ha N, 104.3 kg/ha P2O5, and 268.5 kg/ha K2O [4]. Bukhsh et al. [5] stated that the application of potassium (K) may increase plant height, numbers of grain per ear, length of ear, weight of 1000 grains, and quality of seeds. Shilpashree et al. [21] suggested that the application of N and manure have significantly increased growth and weight of seeds. Law-Ogbono [10] suggested that NPK compound fertilizer has significantly increased plant height and yield of seeds. Sathish et al. [19] reported that the application of NPK on sandy soil at the Station of Agricultural Research has significantly increased yield of maize, and nutrient absorption of N, P, and K.

Along with fertilization recommendation from IFA and FAO (2000), the need of fertilizer for hybrid maize in Indonesia is 120-280 kg/ha N, 45-60 kg/ha P2O5, and 30-60 kg/ha K2O. While for local variety is 45-90 kg/ha N, 30-45 kg/ha P2O5 and higher than 30 kg/ha K2O. Titiloye [25] reported that the appropriate method to increase maize yield is by combining organic and inorganic fertilizers. Kang and Balasubramanian [9], Ayoola and Makinde [2] showed higher yield of maize and sustainable the maize is fertilized using balanced NPK, which is combined with organic fertilizer/organic substance in the soil.

RAE value above 100, 102 %, for maize by applying fertilizer 250 kg Urea + 250 kg NPK (15-10-20)/ha is more effective agronomically than applying the recommended fertilizer. However, NPK fertilizer has not fulfilled the need for N, so that additional N is required, which is derived from Urea. Results of analysis showed that net income following the application of 250 kg Urea + 250 kg NPK 15-10-20/ha (treatment C) has made profit Rp. 24,247,000 or using B/C ratio 1.724. This yield is much higher than the applied dose as recommended by BPTP or the Assessment Institute for Agricultural Technology of East Java on the treatment B (350 kg/ha urea + 450 kg/ha NPK Phonska) that has made profit Rp. 23,811,00 or by B/C ratio 1.714. Syafruddin and Zubachtirodin [22], maize yield that applied NPK 20-10-10 by dose 400 kg/ha + 200 kg urea/ha on Inceptisol soil in Gowa, South Sulawesi, has produced more than 10 t/ha. In order to optimize maize production, it requires the application of organic fertilizer and NPK (15-10-20) on Inceptisol soil of the irrigated field MK1.

4. Conclusion
The application of inorganic fertilizer 2t/ha and Urea 250 kg + 250 kg NPK 15-10-20/ha will produce the highest grains for about 10.08 ton/ha. In which, the “Relative Agronomic Effectiveness” (RAE) value is above 100, 102 %. It increases production 1.61 % in comparison with the recommended dose (350 kg urea + 450 kg phonska/ha) and increases 9.20% in comparison with fertilization, which is usually applied by the farmer (400 kg urea + 500 kg Phonska/ha).

The application of C 250 kg urea + 250 kg NPK 15-10-20/ha showed profits for about Rp. 24,247,000 or using B/C ratio 1.724, which was higher than applying the recommended dose (350 kg/ha urea + 450 kg/ha NPK Phonska) that showed profits Rp. 23,811,000 or using B/C ratio 1.714.
Therefore, it is suggested to apply NPK 15-10-20 + Urea for fertilizing maize and as an alternative of fertilizer substitution on maize, which usually use Phonska and Urea.

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