The analysis of selection of upland rice variety in East Aceh District

B A Bakar\textsuperscript{1*}, A Azis\textsuperscript{1}, Y Yusriani\textsuperscript{1}, Idawanni\textsuperscript{1}, R Andriani\textsuperscript{1}, Y G Bubu\textsuperscript{2}, E Rosa\textsuperscript{3} and Fachruddin\textsuperscript{4}

\textsuperscript{1} The Assessment Institute of Agriculture Technology of Aceh Banda Aceh, 23111, Indonesia
\textsuperscript{2} The Assessment Institute of Agriculture Technology of Nusa Tenggara Barat Nusa Tenggara Barat, 84211, Indonesia
\textsuperscript{3} Department of Agrotechnology, Universitas Abulyatama, Banda Aceh, 23111, Indonesia
\textsuperscript{4} Department of Agricultural Engineering, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia

*Corresponding author’s e-mail: baskarolin2000@gmail.com

Abstract. The aim of this research was to determine important parameters based on farmers' perceptions and the selection of the best alternative varieties for the development of upland rice in East Aceh. Data collected includes secondary data and primary data. Primary data collection is done by using questionnaire data in gathering information on farmers' perceptions. Whereas the alternative selection combines elements of farmers' perceptions and field observations of several varieties. The analytical method was carried out using observations in the field and processing data descriptively. The varieties used in the field study were \textit{Inpago 8}, \textit{Inpago 9}, \textit{Inpago 10}, \textit{Inpago 11} and \textit{Situ Patenggang}. The results of the study address important parameters in the cultivation of upland rice based on the results of the questionnaire with farmers are the age of fast harvesting plants and the average production with a very important category, then the weight of 1000 seeds in grams and the potential yield with important categories, then the productive tillers of each stem, the amount grain of each panicle (seeds) and tall plants in the Medium category. The choice of the best alternative varieties in East Aceh Regency based on the results of farmers' perceptions and field studies were found in \textit{Inpago 9} varieties.

1. Introduction

Agricultural development is influenced by the dynamics of global and strategic environment in the country. Changes in the global strategic environment that leads to the growing strength of trade liberalization and globalization will bring a variety of consequences for the competitiveness of Indonesian agricultural commodities in the global market. Economic globalization and free trading is affecting all of life aspects in the world, including agriculture sector which is the mainstay for most developing countries.

To support the national development direction globalization era, the development of the agricultural sector geared to the development of agribusiness formidable and potentials area with an
agribusiness approach. Agribusiness approach giving attention to efficiency improving and sustainability of agricultural resources carrying capacity. The increasing of rice production which is conducted by the government is more focused on the paddy field, mainly through intensification program. The efforts were able to increasing productivity and production, but it has not solved the problem of providing sufficient food national requirements. Director of Strategic Studies of Government Policy of Bogor Agricultural University (KSKP IPB) Dodik Ridho Nurrochmat said, currently the area of agricultural land is very limited, while consumption increases with population growth [1].

The advantages of upland rice cultivation can be planted on dry land without water accumulation. Besides, it produces yields and quality of aroma grains and colors that are very good [2]. Aspects that need to be considered include increasing national rice productivity, including through increasing the use of plantation land and forestry for the development of upland rice [3] Therefore, well management practices, application adequate plant nutrition and water, weeds, diseases, and insect pests. This is consistent with Hafif's research [4] The use of superior varieties, as well as assistance to the application of land management technologies such as the use of soil enhancers, jajar legowo planting systems, and fertilizing, increased upland rice production to 3 to 5 tons/hectare.

Upland rice received less attention because of low productivity. Data Badan Pusat Statistik Provinsi Aceh [5] states that the average productivity of upland rice was 2.56 tons per hectare, this result is far below the average rice production of Indonesia reached 4.78 tons per hectare. In the year 2005 was estimated at 30.79 million tons of rice production but national rice requirement as much as 35 million tons, resulting in deficit that reached 4.21 million tons. In addition to strengths, there are also deficiencies in the cultivation of upland rice farmers, Mariam et al. reported [6] that report on upland rice has been done but is still largely ignored by farmers, Because the grain yield is low and unstable, even though it is widely planted in the interior. The average yield of upland rice ranged from 0.46 up to 1.1 tons / ha. Low yields caused by poor management by farmers during the cultivation period, where the land is left unattended after sowing without controlling plant nutrients, weeds, diseases, and insect pests.

Worldwide, approximately 27 million ha of rice are grown in upland rather than paddy fields, and is subject to drought stress [7]. Upland rice, produced by smallholder farmers, is the lowest-yielding rice production system. Drought stress is the most severe abiotic constraint in upland rice. Improving productivity of rice in the upland ecosystem is essential to meet rice food security needs of impoverished upland communities [8]. [9] explains that most strains of rice that has the ability to grow and develop relatively well during drought is to maintain leaf water potential remains high. Plants can maintain the water potential remains high by improving the water uptake and store it in plant tissue, and reduces water loss. The dry conditions of crops will survive by turgor cell maintenance through the addition of root depth, root system efficiency and reduce water loss.

Various problems and issues of agricultural development policy requires studies to prepare materials quickly and accurately whether anticipatory or those that can answer the growing problems. The aim of this research was to determine important parameters based on farmers' perceptions and the selection of the best alternative varieties for the development of upland rice in East Aceh.

2. Materials and Methods
2.1 Time and Place
The activities started in March to December 2015, was placed on the area of rice production centers in East Aceh district. Study topics was the problems of dryland development of upland rice. The policy analysis done quickly in order to obtain results of the study that still relevant for policy formulation. Nevertheless, this research method will still consider the theoretical basis and maintain the objectivity.

This research is expected to result in, among other things: (i) the relevant information in the form of policy formulation, and (ii) policy recommendations. The presentation formare: (i) memo or policy brief on sensitive issues, (ii) materials for Rakorbang in Aceh Province, and (iii) working paper for a matter of discretion that is not sensitive. As for the results of this study are very limited, among other
things: (i) the Governor of Aceh Province (ii) the scope of the Agriculture Department, (iii) Head of Economic Bureau, Bappeda, and (iv) a number of second-tier scope of Aceh Province. The research was undertaken in coordination with relevant agencies in the area.

The data collected includes secondary data and primary data. Primary data collection is done by using questionnaire data in gathering information on farmers' perceptions. Whereas the alternative selection combines elements of farmers' perceptions and field observations of several varieties. The analytical method is carried out using observations in the field and processing data descriptively. The varieties used in the field study are Inpago 8, Inpago 9, Inpago 10, Inpago 11 and Situ Patenggang.

All varieties were treated by applying the same technology to dry land. Use of the upland rice technology package as shown in Table 1. Application teknologi dan fertilizer recommendations refer to the guidelines for fertilizer and technology recommendations following minister of agriculture regulations [10].

**Table 1. Super Largo Technology Package on Dry Land in Aceh Province**

| Cultivation Components | Alternatif of technology components |
|------------------------|-------------------------------------|
| Varieties              | - *Inpago* 8                        |
|                        | - *Inpago* 9                        |
|                        | - *Inpago* 10                       |
|                        | - *Inpago 11 Agritan*               |
|                        | - *Situ Patenggang*                |
| Tillage                | - Twice, at the start of the rainy season and just before planting |
| Quality seeds          | - Blue labeled, germination test    |
| Total seeds            | - 30 – 40 kg/ha                    |
| Amount seed/hole       | - 3-5 seeds (The seeds that are ready to be planted are mixed with biological fertilizer) |
| How to plant           | - Legowo line (20 cm between the row and 40 cm legowo, in the 10 cm row) |
| Water management       | - Drainage management in the rainy season |
| Fertilization:         | - Urea: 150 kg/ha (1/3 doze for age 10 DAP, 1/3 doze for age 30 DAP, and 1/3 doze for age 45 DAP) |
|                        | - KCl: 30 kg/ha (100% given when planting) |
|                        | - SP-36: 50 Kg/ha                   |
|                        | - Dolomit/ lime: Depending on the Dry Soil Test Kit (PUTK) |
| Organic matter         | - Agrimeth Biofertilizer (for seed treatment only 1 time given when planting) |
|                        | - Biodekomposer (when tillage)      |
|                        | - Organic fertilizer (Manure 1-2 tons / ha is given when the second tillage) |
| Pest control           | - monitoring of pests population    |
|                        | - biological pesticides if needed (Bio Protector and Bio Decomposer) |
| Harvesting             | - With Combine Harvester             |
2.2. The Best Alternative Choice Method

The method for determining alternative decisions using questionnaires. This method was a tool for individuals in making a decision by quantifying farmers on a certain scale. The steps in using this questionnaire comparison method. Farmers choose alternatives from seven parameters including plant age, number of productive tillers per family, number of panicles / grains per family, plant height, weight of one thousand seeds, yield potential and dry grain harvest, with the following selection criteria presented in Table 2.

| No. | Farmer's Perception | Preference Like        | Scale |
|-----|---------------------|------------------------|-------|
| 1   | Very unimportant    | Dislike moderately     | 1     |
| 2   | Unimportant         | Dislike slightly       | 2     |
| 3   | Neutral             | Neither like nor dislike | 3    |
| 4   | Important           | Like slightly          | 4     |
| 5   | Very important      | Like moderately        | 5     |

Conducted the value calculation for each alternative decision using the formula:

\[
Total\ value\ \sum_{i=1}^{M}(TN_i) = \sum(RK_{i})^{TKK_{i}}
\]

Explanation:

- \(TN_i\) = total alternative value number-i
- \(RK_{i}\) = degree of importance of relative criteria number-j in decision choice number-I
- \(TKK_{i}\) = degree of importance of decision criteria number-j
- \(n\) = number of decision choices
- \(m\) = number of decision criteria

Ranking of the best alternative decisions according to the high total alternative from preference perception in various varieties and Observations in the Field.

3. Results and Discussions

3.1. General Description of The Location

East Aceh district is a district located in the eastern side of the province. This district also includes oil-rich districts besides North Aceh and Aceh Tamiang. Geographically, East Aceh regency located at position 04 ° 09 '21.08" - 05 ° 06' 02.16" north latitude and 97 ° 15' 22.07" - 97 ° 34' 47.22" East to the limits as follows: "Northern Regency bordering with North Aceh and Malacca Strait", Southern Regency bordering with Gayo Lues", Easternbordering with Malacca Strait, Kota Langsa, and Aceh Tamiang", westembordering with Aceh Tengah and Bener Meriah. This region has an area of 6040.60 km², administratively East Aceh District consists of 24 Districts, 512 Village/Gampong.

The choice of survey location conducted by BPTP Aceh appropriate with statistical data of Aceh Province about planting area, production and productivity of upland rice. Upland rice planting area in East Aceh in 2015 reached 678 hectares, with 3.5 tonnes / ha of productivity. According to the Agriculture and Horticulture Department, East Aceh district welcomed the BPTP activities undertaken in East Aceh District. This is in line with the Vision and Mission of the East Aceh Government, for agriculture sector that is contained in the Vision and Mission of agricultural development.
The vision: to be the professionals driving agribusiness and welfare of farmers with sustainable agribusiness system. While the mission: Improve Human Resource Development, Food Crops and Horticulture development; Developing Enterprises Food Crops and Horticulture with rural-based agribusiness system; Increase the production of food crops and horticulture through the application of agricultural technology and post-harvest handling.

According Kadistan of East Aceh, the fundamental problem for the development of upland rice in East Aceh is the use of upland rice varieties. VUB government assistance of Situ Begendit upland rice were distributed to farmers not planted, by reason of bad taste, the smell not good and easily fall. Farmers still use local varieties such as Arias kuning that have been adaptive and site-specific. Arias flavor rice fluffier rice and fragrant.

Agriculture and Horticulture Department in East Aceh states that local varieties of upland rice such as ariases were planted by farmers in Peneron and Serbajadi have the good quality, the price is much higher than the average of HPP Rp 4,500 / Kg MPD. Traders buy rice from the field directly to localized at low prices, and then after processing / milled with modern machines, sold back to Aceh with a high price, this is also a problem.

The farmers habits in East Aceh, began to cultivate the soil to upland rice planting in May and June. If we grow beyond the month, our results declined, in that month the rainfall suitable for paddy fields. While pests and diseases are not exist.

3.2. Variety Choices in Increasing Productivity

In general, the results of questionnaires and field observations on several varieties of upland rice in East Aceh Regency are presented in Table 3. The difference in seed varieties based on the results of upland rice research in dryland turned out to affect 7 important parameters including plant age, number of productive tillers per family, number of panicles / grains per family, plant height, weight of one thousand seeds, yield potential and dry grain harvest, yield of questionnaire distribution to the farmers the most important parameter choices are the age of fast harvesting plants and average

Figure 1. Map of Land Slope in East Aceh Regency
production with very important categories, then the weight of 1000 seeds in grams and the potential yields with important categories, then the productive tillers per stem, the number of grains per panicle (grains) and height plants with medium category. This result is also consistent with Ruskandar's research [11] which states that the adoption rate of hybrid rice by farmers is one of the parameters determined by productivity.

| Descriptions                              | Inpago 8 | Inpago 9 | Inpago 10 | Inpari 11 | Situ Patenggang | Score Farmer's Perception | Farmer's Perception |
|-------------------------------------------|----------|----------|-----------|-----------|------------------|---------------------------|---------------------|
| Age Plant (day after planting)            | 32       | 3125     | 243       | 1024      | 243              | 5                         | Very Important      |
| Productive tillers                        | 125      | 125      | 64        | 64        | 125              | 3                         | Neutral             |
| Amount of grain/ panicles                 | 64       | 125      | 1         | 8         | 27               | 3                         | Neutral             |
| Plant height                              | 64       | 27       | 125       | 1         | 8                | 3                         | Neutral             |
| Weight of 1000 seed                       | 3125     | 243      | 1         | 32        | 1024             | 3                         | Neutral             |
| Yield potential                           | 256      | 625      | 81        | 1         | 16               | 4                         | Important            |
| Average production                        | 1024     | 3125     | 243       | 1         | 32               | 5                         | Very Important      |
| Total                                     | 4690     | 7395     | 758       | 1131      | 1475             |                           |                     |
| The Best Decision                         | 2        | 1        | 5         | 4         | 3                |                           |                     |

The results of the study were narrowed down to the 2 most important parameters according to farmers from 7 main parameters so that the best choice for rice cultivation in dry land in East Aceh District was based on the variety approach at the research location namely the plant age and average production parameters. Based on the age of the fastest plants for successive harvests according to varieties include Inpago 9 (109 days), Inpari 11 (111 days), Inpago 10 and Situ Patenggang (115 days) and Inpago 8 (119 days). Whereas if observed the highest average production (tons / ha) of MPD in succession included Inpago 9 (5.3 tons / ha), Inpago 8 (5.2 tons / ha), Situ Patenggang (4.3 tons / ha), Inpari 11 (4.1 tons / ha) and Inpari 10 (4.0 tons / ha). Thus the best alternative choice is based on the consideration of farmers' parameter questionnaire results and observations in the field are found invariety of Inpago 9 (1st choice), Inpago 8 (2nd choice), Situ Patenggang (3rd choice) and Inpari 11 (4th choice) and Inpari 10 (5th choice). Based on this analysis, it was highly recommended to develop the Inpago 9 of Upland Rice over the other existing varieties.

The influence of the use of varieties on the productivity of upland rice in East Aceh Regency is also almost close to the research of Nurhati et al. [12] which found that there was a role for new superior varieties in increasing rice production in West Java. However, the results of this study, in contrast to the study of Mulsanti et al. [13] which states differences in seed classes do not make a difference to productivity, agronomic traits, and yield components. Differences in agronomic performance, yield and yield components, between varieties are more determined by the genetic traits carried by the variety itself.

4. Conclusions
Important parameters in upland rice (padi gogo) cultivation based on farmer's assessment are age of fast crop harvest and average production with very important categories, then weight of 1000 seeds in grams and potential yields with important categories, subsequently productive tillers per stem. number of grains per panicle (seeds) and tall plants with Medium category. Varieties of Upland Rice (Padi Gogo) that have the highest acceptance values were the variety of Inpago 9 (1st choice), Inpago 8 (2nd choice), Situ Patenggang (3rd choice) and Inpari 11 (4th choice) and Inpari 10 (5th choice). Based on
this analysis, it was highly recommended to develop the Inpago 9 of Upland Rice over the other existing varieties.

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