Management of crop planting in the dry season 2020, an adaptation to the impact of drought for supporting the food security

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Abstract. One of the impacts of climate change is the different of seasonal rainfall characteristics from year to year, thus the conditions for planting schedules and potential planting areas will also differ from year to year. At the beginning of the Dry Season 2020, the competent authority published that 30% of the season forecast zone in Indonesia was predicted to experience Below-Normal rainfall. This paper aims to analyze areas that have the potential to experience drought and recommend crop management in paddy fields in the Dry Season 2020. The methods are to identify the rainfall condition at rice field area, overlay the rainfall condition with the cropping calendar information, recommend planting management, and balance the needs and fulfillment of rice. The results of the analysis showed that the area of rice, maize, and soybean plants in paddy fields that had the potential to experience drought were 1,087,937 hectares, 1,996,156 hectares, and 786,849 hectares. The potential area of maize and soybean to be converted into rice plants are 1,448,110 hectares, and 102,868 hectares. The potential for rice production during the period July 2020 to January 2021 is estimated at around 25.55 million tons of rice. It is predicted that the conversion of maize and soybeans to become rice plants through fulfilling their water needs will result in an increase in rice production to 33.10 million tons, and produce a supplement in the balance of rice availability to their needs during the July-December 2020 period.

1. Introduction
One of the characteristics of the climate variability and climate change in Indonesia is a shift at the beginning of the season and changes in the amount of seasonal rainfall [1]–[4]. In certain conditions, this will also have an impact on the planting schedule, harvest time, and production of food crops, as well as affect the conditions of food crop availability, where food availability is one of the pillars of food security.
Law Number 7 of 1996 and Law Number 18 of 2012 concerning Food [5], explain that Food Security is a condition for the fulfillment of food for a country to individuals, which is reflected in the availability of sufficient food, both in quantity and quality, safe, diverse, nutritious, equitable, and affordable and does not conflict with the religion, belief, and culture of the community, in order to live a healthy, active and productive life in a sustainable manner [6]. Indonesia is a country with a large population and a high growth rate, so efforts to achieve food security are a challenge that must get priority for the welfare of the nation [7], [8], [9], [10], [11].

In the discussion of food security, there are four pillars, namely the aspect of food availability, the aspect of stability of supply, the aspect of affordability or accessibility of supplies, and the aspect of food utilization or consumption. Food must be available in sufficient quantities, both during harvest and famine, evenly distributed throughout the country, affordable by the community, safe and of good quality [12], [13], [14], [15].

At the start of the Dry Season 2020, Indonesian Agency for Meteorology, Climatology and Geophysics (Badan Meteorologi, Klimatologi dan Geofisika Indonesia, BMKG) published that 103 zones or 30.1% of the seasonal forecasting zone (zona prakiraan musim, ZOM) are predicted to have Below Normal rainfall condition during in the Dry Season 2020 [16]. Below Normal rainfall condition is the condition of the average rainfall which is less than 85% of the average value for the period 1981-2010. Previously, there is the delay of the beginning of the Rainy Season 2019/2020 that caused a delay in the planting season [17], [18]. However, outside of the 103 ZOMs, there are still many area have the potential to be planted with rice during the dry season and can become areas to support increased rice production [16].

This paper aims to examine rainfall prediction information and cropping calendar information for Dry Season 2020, recommend the management of cropping patterns to anticipate drought in paddy fields, estimate the potential production of rice, maize, soybeans in paddy fields, and assess the balanced of food availability and food needs in Indonesia in the Dry Season 2020. Through the learning concept in this paper, it is hoped that policy recommendations for anticipating the dry season will be compiled through the management of cropping patterns in the following seasons.

2. Methodology
2.1. Time and place of the research
The study was conducted in the middle of the Dry Season 2020, using predictive data for February 2020. The place of the research was at Indonesia Agroclimate and Hydrology Research Institute.

2.2. Data compilation
The data used in this study are secondary data in the form of prediction information on the start of the 2020 dry season, and rainfall prediction data for the Dry Season 2020, obtained from the Climate Variability Analysis Division, Agency of Meteorology, Climatology, and Geophysics. Information on the Integrated Cropping Calendar was obtained from the Indonesian Agro-climate and Hydrology Research Institute. The data were then compiled and organized into a format used for subsequent analysis.

2.3. Rainfall Data Analysis and Interpretation.
The stages of rainfall analysis are as follows:
1. Rainfall prediction data used in the analysis are ten daily data for the week period April I to September III, 10-day I is the 1st to 10th of a month, 10-day II is the 11th to 20th of a month, 10-day III is the period from the 21st to the end of the month
2. Rainfall data is divided into 2 periods, namely April-June and July-September 2020,
3. The average rainfall value is classified according to the criteria in Table 1.
Table 1. Criteria for classifying the value of monthly rainfall for the purposes of the agricultural sector [19]–[21].

| No | Range of rainfall (mm/month) | Category     |
|----|-----------------------------|--------------|
| 1  | <60                         | Very Dry     |
| 2  | 60 - <100                   | Dry          |
| 3  | 100 - <150                  | Moderate (Drier) |
| 4  | 150 - <200                  | Moderate (Wetter) |
| 5  | 200 - <300                  | Wet          |
| 6  | >300                        | Very Wet     |

4. Overlaying the rainfall data with the distribution of the paddy fields, in order to obtain information on the area of rice fields that have the potential to experience drought, namely those experiencing dry and very dry categories.

2.4. *Analysis of national rice demand*

The analysis of national rice demand is carried out by multiplying the population by the average per capita consumption:

\[
\text{DEMAND} = \text{POP} \times \text{CONC}
\]

where DEMAND = national rice needs (tons, 1,000 kg), POP = population (people), and CONC = average rice consumption per capita (kg/kapita).

2.5. *Information on potential of planting area, analysis of potential of rice production and balance of rice availability and needs*

Analysis of Potential Rice Production is calculated using the potential planting area, multiplied by the conversion value from planting to harvest, multiplied by the average value of lowland rice productivity, multiplied by the conversion value of dry harvested production to into rice, as follows:

\[
\text{PROD}_{+4} = \text{PPA} \times k_{\text{Harvest}} \times \text{Prod}v \times k_{\text{Rice}}
\]

where PROD$_{+4}$ = Potential Rice Production at 4 months after planting (ton), PPA = potential planting area (ha), kHarvest = conversion value from planting to harvest, Prod$v$ = average value of wet land rice productivity (ton/ha), kRice = conversion value of dry harvested production to rice. This calculation will illustrate the estimated production potential in an area that is potentially experiencing drought or not.

2.6. *Anticipating potential drought areas*

In areas that have the potential to experience drought due to low rainfall conditions, modifications or efforts are made to increase the planting area of rice in paddy fields. Thus, the potential value of a modified planting area is obtained that takes into account the application of drought management efforts, particularly efforts to provide additional alternative water for rice cultivation in paddy fields. Based on this effort, it is hoped that the potential for higher rice production can be obtained and can reduce the deficit in Balanced of Rice Production against Rice Needs.

3. Results and discussion

3.1. *Rainfall conditions and potential drought area distribution in the 2020 dry season*

In the April-June 2020 period, around 38.5% of paddy area (2,872,536 hectares) experienced an average rainfall in the Very Dry category (<60 mm/month) and 11.9% of paddy area (890,834 Ha)
experienced Dry rainfall (60-100 mm/month), especially paddy area in Java and Bali-Nusa Tenggara. Based on the rain characteristic, in the period April-June 2020, the dominant rainfall characteristic is Below Normal, spreading over 4,927,917 hectares of paddy area (66.1%). Compared to the same period in 2019, conditions in the April-June 2020 period were drier than the previous year.

In the July-September 2020 period, the rainfall intensity in Indonesia is estimated to be higher than in the previous 3 months, where around 0.2% of the paddy area (12,644 Ha) experienced an average rainfall in the Dry category (60-100 mm/month) (Table 2). The Below Normal rainfall characteristic spread over 5,103 hectares of the paddy area (0.1%). Compared to the same period in 2019, the conditions for the July-September 2020 period were wetter than the previous year.

Table 2. Distribution of wet rice field area in Indonesia according to the category of rainfall intensity and characteristics in dry season 2019 and 2020.

| CORRIDOR          | WET RICE FIELD AREA | 0-60 | 60-100 | 100-150 | 150-200 | 200-300 | 300+ | UNDER NORMAL | NORMAL | ABNORMAL |
|-------------------|---------------------|------|--------|---------|---------|---------|------|--------------|--------|----------|
| APRIL-JUNE 2020   |                     |      |        |         |         |         |      |              |        |          |
| SUMATRA           | 7,459,881           | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| JAVA              | 7,459,881           | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| BALI-NUSA TENGGARA| 461,036             | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| KAUMANANTAN       | 723,948             | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| SULAWESI         | 971,854             | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| MALUKU            | 31,826              | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| PAPUA             | 45,055              | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| INDONESIA         | 7,459,881           | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| APRIL-JUNE 2019   |                     |      |        |         |         |         |      |              |        |          |
| SUMATRA           | 4,752,881           | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| JAVA              | 4,752,881           | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| BALI-NUSA TENGGARA| 461,036             | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| KAUMANANTAN       | 723,948             | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| SULAWESI         | 971,854             | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| MALUKU            | 31,826              | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| PAPUA             | 45,055              | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |
| INDONESIA         | 7,459,881           | 450  | 772    | 1,694   | 850     | 0       | 0    | 0            | 41,063 | 1,083    |

3.2. Estimation of national rice demand

To support the estimation of national rice demand per month, the following data were obtained:

1. The total population of Indonesia (POP) in Semester I 2020 based on the 2020 Population Census is 268,583,016 people [22], [23].
2. The rice consumption per capita per year is 92.9 kg of rice/capita per year [24], [25], thus the rice consumption per capita per month (KBK) is around 7.74 kg.

Thus, the national rice demand per month in Indonesia is:

\[ \text{DEMAND} = \text{POP} \times \text{CONC} \]

\[ = 268,583,016 \text{ people} \times 7.74 \text{ kg of rice/capita} \]
\[ = 2,079,280,182 \text{ kg of rice/month} \]
\[ = 2.08 \text{ million tons of rice/month} \]

3.3. Potential of Rice, Maize, and Soybean Planting Area in Dry Season 2020

Planting times are classified into 20-daily intervals. The most dominant planting time was in April II-III covering 1,212,678 hectares of paddy area (16.3%), in March III-April I covering 1,151,531 hectares of paddy area (15.4%), and in May III-June I covered 1,138,619 hectares of paddy area (15.3%). The total potential planting area for rice in paddy fields in Dry Season 2020 was 5,259,661 hectares.
hectares (Table 3). The most dominant planting time for maize is in August II-III covering 783,545 Ha of paddy area (10.5%), and for soybeans was in April II-III covering 424,620 hectares of paddy area (5.7%).

Table 3. Distribution of potential of rice, maize, and soybean planting area (Ha) in Indonesian according to planting time in the Dry Season 2020 [19].

| CORRIDOR | RICE FIELD AREA | POTENTIAL FOR PLANTING AREA IN THE DRY SEASON 2021 (Ha) |
|----------|----------------|----------------------------------------------------------|
| SUMATRA  | 1,752,308      | 199,914, 293,091, 504,017, 651,474, 110,697, 110,022, 204,181, 318,518, 39,152, 1,981,066 |
| JAVA     | 3,472,864      | 717,187, 550,179, 34,841, 384,744, 34,013, 23,542, 277,993, 230,770, 32,371, 2,285,641 |
| BALI-NUSA TENGGARA | 461,036 | 9,639, 65,010, 938, 75,632 |
| KALIMANTAN | 723,948 | 180,141, 140,033, 77,404, 42,770, 10,228, 472, 451,951 |
| SULAWESI | 972,854       | 54,085, 229,338, 52,234, 13,749, 54,985, 26,629, 13,168, 444,188 |
| MALUKU   | 31,826         | 29, 195, 11,335, 2,582, - , - , - , - |
| PAPUA    | 45,055         | 204, 11, 1,415, 3,514, 3,144, - , - , - |
| INDONESIA| 7,499,891      | 1,121,674, 1,141,092, 1,138,619, 325,129, 173,004, 495,814, 549,288, 72,506, 5,259,661 |

| CORRIDOR | POTENTIAL FOR MAIZE PLANTING AREA IN THE DRY SEASON 2021 (Ha) |
|----------|---------------------------------------------------------------|
| SUMATRA  | 1,752,308                                                    |
| JAVA     | 3,472,864                                                    |
| BALI-NUSA TENGGARA | 461,036 | 9,639, 65,010, 938, 75,632 |
| KALIMANTAN | 723,948 | 180,141, 140,033, 77,404, 42,770, 10,228, 472, 451,951 |
| SULAWESI | 972,854       | 54,085, 229,338, 52,234, 13,749, 54,985, 26,629, 13,168, 444,188 |
| MALUKU   | 31,826         | 29, 195, 11,335, 2,582, - , - , - , - |
| PAPUA    | 45,055         | 204, 11, 1,415, 3,514, 3,144, - , - , - |
| INDONESIA| 7,499,891      | 1,121,674, 1,141,092, 1,138,619, 325,129, 173,004, 495,814, 549,288, 72,506, 5,259,661 |

Table 4. The potential of rice production (tons) in paddy area for the period July 2020-January 2021.

| CORRIDOR | POTENTIAL OF RICE PRODUCTION IN JULY 2020-JANUARY 2021 (TONS) |
|----------|---------------------------------------------------------------|
| SUMATRA  | 489,039, 1,922,985, 1,857,947, 2,135,255, 1,037,763, 2,057,825, 957,777, 5,956,590 |
| JAVA     | 1,754,420, 4,446,171, 1,111,640, 1,107,587, 755,221, 1,809,004, 79,188, 11,103,310 |
| BALI-NUSA TENGGARA | 461,036 | 9,639, 65,010, 938, 75,632 |
| KALIMANTAN | 440,670 | 1,125,770, 189,350, 298,625, 51,196, 1,155, - , 2,206,765 |
| SULAWESI | 322,304       | 1,254,342, 289,191, 302,647, 162,495, 32,211, - , 2,173,189 |
| MALUKU   | 31,826         | 142, 476, 69,631, 12,630, - , - , - , - |
| PAPUA    | 45,055         | 204, 11, 1,415, 3,514, 3,144, - , - , - |
| INDONESIA| 2,816,993      | 8,749,960, 3,475,642, 4,376,040, 2,059,304, 9,900,276, 177,369, 25,555,324 |

3.4. Potential Rice Production in the Dry Season 2020

According Table 4, Potential rice production is calculated based on the potential planting area during the Dry Season 2020 using the following assumptions:

1. Calculation of production is to use the potential harvest area times the average productivity.
2. Potential harvested area is the value of the potential planted area in the previous 4 months taking into account a 5% shrinkage factor. The value of 5% is used with the assumption that a maximum tolerance value on handling protection of rice plants against flooding, drought, and pest problems. Thus, the correction factor from planting area to harvest area is 0.95.
3. The average rice productivity value used is 5.15 tonnes/ha.
3.5. Potential area of drought for rice plants

Table 5 shows that the area of rice plants that could potentially be affected by drought is 1,087,937 hectares. This area mainly occurred in Java Island covering an area of 1,001,151 hectares, in Bali-Nusa Tenggara covering an area of 74,649 hectares, and in Sulawesi covering an area of 12,136 hectares. The highest drought potential occurs in May III-Jun I, April II-III, and July III-August I, respectively, covering 326,327 hectares, 302,577 hectares, and 147,026 hectares respectively.

Table 5. Estimation of the potential drought area in paddy area according to planting time in the dry season 2020.

| CORRIDOR       | POTENTIAL FOR RICE PLANTING AREA WHICH IS PREDICTED TO BE AFFECTED BY DROUGHT IN THE DRY SEASON 2021 (HECTARES) |
|----------------|----------------------------------------------------------------------------------------------------------|
|                | MAR III-APR | APR II-III | MAY I-II | MAY III-JUN I | JUN II-III | JUL I-II | JUL III-AUG I | AUG II-III | SEP I-II | TOTAL  |
| SUMATRA        | -           | -          | -       | -             | -         | -       | -             | -         | -       | 1,001,151 |
| JAVA           | -           | 292,704    | 102,896 | 316,889       | 17,603    | -       | -             | -         | -       | 74,649   |
| BALI-NUSA TENGGARA | -     | 9,639      | 65,010  | -             | -         | -       | -             | -         | -       | 12,136   |
| KALIMANTAN     | -           | -          | -       | -             | -         | -       | -             | -         | -       | 4,093    |
| SULAWESI      | -           | 9,873      | -       | 2,263         | -         | -       | -             | -         | -       | 1,448,110 |
| MALUKU         | -           | -          | -       | -             | -         | -       | -             | -         | -       | 102,868  |
| PAPUA          | -           | -          | -       | -             | -         | -       | -             | -         | -       | 4,093    |
| INDONESIA      | 302,577     | 102,896    | 326,327 | 84,876        | 147,026   | 115,388 | 8,846         | -         | -       | 1,087,937 |

3.6. The area of maize and soybeans in paddy fields that has the potential to be modified into an area of rice

Conversion is carried out by providing water to the land according to the minimum requirement for rice plants. The recommended area for maize to become rice is an area that has an average rainfall of 100-150 mm/month. The recommended area for soybean plants to become rice is an area that has an average rainfall of 75-100 mm/month accompanied by the addition of irrigation water to the land as high as 25 mm/month according to the minimum requirement for rice plants (Table 6).

The total area of maize that can be converted into rice is 1,448,110 hectares, mainly spread over 666,700 hectares in Java, 419,230 hectares in Sulawesi, 221,749 hectares in Sumatra, 176,338 hectares in Sumatra, and 4,093 hectares in Maluku. Meanwhile, the total area of soybean crops that can be converted into rice is 102,868 hectares, spreading across the island of Java with an area of 97,998 hectares and in Sulawesi as large as 4,870 hectares.

3.7. Potential of modified rice planting area and rice production

Table 6 shows that the total area of rice plants in the dry season in 2020 will be 6,850,639 hectares, mainly spread over the Island of Java with an area of 3,050,338 hectares, Sumatra with an area of 2,157,404 hectares, Sulawesi with an area of 2,157,404 hectares, Sulawesi with an area of 868,228 hectares, and Kalimantan with an area of 672,800 hectares.

There are at least 4 water infrastructure technologies that can be applied to fulfill water requirement supporting the modification of soybeans or maize planting recommendations to become rice planting recommendations, namely: (1) Utilization of pumps; (2) Provision of trench dams; (3) Design water reservoirs around the rice fields; (4) Desain long storage.

In Table 7, High rice production occurred in August 2020 at 10.05 million tons, followed by October at 4.73 million tons, and December 2020 amounted to 7.24 million tons. From the distribution of rice production, during the July-December 2020 period, it is predicted that the need for rice consumption can be fulfilled from the rice produced during the Dry Season 2020. However, in January 2021 it is predicted that there will be lower production than the need for rice for population consumption (Table 8). To overcome this, the rice production obtained in the previous months can be used as a stock to be used as a consumption reserve in January 2021.
Table 6. Estimates of the planting area for maize and soybeans that could potentially be converted into rice by fulfilling the water requirement of rice.

| CORRIDOR       | RECOMMENDATION FOR MAIZE PLANTING AREA CONVERTED INTO RICE PLANTING AREA IN THE DRY SEASON 2021 (HECTARE) |
|----------------|------------------------------------------------------------------------------------------------------|
| SUMATRA        | 1,448 820 112,352 779 29,464 4,451 19,641 176,338                                               |
| JAVA           | 127,978 115,006 - 1,854 704 196,250 205,931 18,942 666,700                                      |
| BALI-NUSA TENGGARA | - - 1,76 14,345 306,869 100,258 - 221,745                           |
| BALI            | 70,744 5,801 3,237 5,143 7,851 228,372 37,139 157,991 415,230                                     |
| MALUKU         | - - - 4,093 - - - - - -                                                               |
| PAPUA          | - - - - - - - - - - - -                                                             |
| INDONESIA      | 129,426 185,750 14,004 115,389 14,367 23,680 560,945 347,775 96,574 1,488,110                      |

| CORRIDOR       | RECOMMENDATION FOR SOYBEAN PLANTING AREA CONVERTED INTO RICE PLANTING AREA IN THE DRY SEASON 2021 (HECTARE) |
|----------------|------------------------------------------------------------------------------------------------------|
| SUMATRA        | - - 14,378 20,847 - - - 25,574 37,198 97,998                                               |
| JAVA           | - - - - - - - - - - - -                                                             |
| BALI-NUSA TENGGARA | - - - 9,839 65,010 - - - - - 985 75,652                                |
| BALI            | - - 190,141 140,031 77,404 43,031 24,573 267,341 190,258 672,800                          |
| SULAWESI       | 972,854 54,085 300,082 58,036 69,96 63,128 34,480 241,695 42,005 57,991 868,288          |
| MALUKU         | 31,826 29 - - 195 18,228 2,582 - - - -                                                   |
| PAPUA          | 45,035 304 11 141 3,514 - - - - - -                                                   |
| INDONESIA      | 100% 17,2% 18,9% 2,4% 16,9% 4,6% 4,6% 14,9% 12,9% 2,3% 91,8%                              |

Table 7. Distribution of updated potential rice planting area after the addition of area through the fulfillment of rice water requirement.

| CORRIDOR       | WET RICE FIELD AREA | THE UPDATED RECOMMENDATIONS FOR POTENTIAL RICE PLANTING AREA IN THE DRY SEASON 2021 (Hectare) |
|----------------|---------------------|--------------------------------------------------------------------------------------------------|
| SUMATRA        | 1,702,308 203,362 283,909 62,240 763,826 110,902 213,646 322,683 58,794 2,157,404 |
| JAVA           | 5,472,864 845,165 679,564 55,688 384,744 35,866 24,247 498,852 473,899 51,313 3,050,338 |
| BALI-NUSA TENGGARA | 463,030 - - - - - - - - - - 985 75,652                                           |
| BALI            | 723,948 190,141 140,031 77,404 43,031 24,573 267,341 190,258 672,800                          |
| SULAWESI       | 972,854 54,085 300,082 58,036 69,96 63,128 34,480 241,695 42,005 57,991 868,288          |
| MALUKU         | 31,826 29 - - 195 18,228 2,582 - - - -                                                   |
| PAPUA          | 45,035 304 11 141 3,514 - - - - - -                                                   |
| INDONESIA      | 7,659,881 1,206,957 1,412,807 175,943 1,224,206 339,496 196,683 1,022,834 999,131 169,000 6,850,699 |

Table 8. Estimation of potential production and balance of fulfillment of rice for the period July 2020-January 2021.

| CORRIDOR       | POTENTIAL OF RICE PRODUCTION AND ADEQUACY FOR THE PERIOD OF JULY 2020-JANUARY 2021 (Tons) |
|----------------|------------------------------------------------------------------------------------------|
| SUMATRA        | 492,581 1,926,526 2,172,918 2,410,095 1,113,653 2,151,678 143,824 10,411,276 |
| JAVA           | 2,067,486 5,392,251 1,213,632 1,116,656 1,341,390 3,541,317 125,524 14,798,256 |
| BALI-NUSA TENGGARA | 440,670 1,125,770 189,350 399,978 382,808 753,097 - 3,291,672                         |
| BALI            | 440,670 1,125,770 189,350 399,978 382,808 753,097 - 3,291,672                         |
| SULAWESI       | 132,304 1,600,458 325,493 350,406 759,449 796,267 141,861 4,106,238                     |
| MALUKU         | - 142 476 89,657 12,630 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - |
| PAPUA          | 500 552 3,460 20,654 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - |
| INDONESIA      | 3,133,541 10,045,690 9,328,908 4,729,088 3,609,930 7,242,359 413,613 33,103,137        |
| NEEDS          | 2,079,280 2,079,280 2,079,280 2,079,280 2,079,280 2,079,280 2,079,280 14,554,960 |
| DIFFERENCE     | 1,054,261 7,964,418 8,496,628 2,649,808 1,530,650 5,163,079 (1,665,667) 18,548,177     |
| ADEQUACY STATUS| Adequate Adequate Adequate Adequate Adequate Adequate Deficient Adequate                     |

4. Conclusions
In the April-June 2020 period, wetland rice fields were dominated by rainfall in the Very Dry (<60 mm/month) and Dry (60-100 mm/month) categories, with Lower Normal rainfall characteristics, especially in Java and Bali-Nusa Tenggara. The next sub-season, in the period July-September 2020, rice fields are dominated by Wet (200-300 mm/month) and Very Wet (>300 mm/month) rainfall, with Upper Normal rainfall characteristics, especially in Sumatra, Java, Kalimantan, Sulawesi, Maluku, and Papua. The potential for rice planting in paddy fields in Dry Season 2020 is 5,259,661
hectares of rice fields (70.5%), of which 1,087,937 hectares are potentially affected by drought. The potential for maize and soybean planting in paddy fields is 1,996,156 Ha (26.8%) and 786,849 Ha (10.5%), respectively.

Potential planting area for maize and soybeans can be recommended to be converted to become rice plant area, in such a way that the potential for rice planting area in Dry Season 2020 can be increased to 6,850,639 hectares, after receiving additional conversion from a corn area of 1,448,110 hectares and a soybean area of 102,868 Ha. With this area, in the period July 2020 to January 2021, there is a potential for rice production of 33.10 million tons, and it will produce a supplement in the balance of rice availability to its needs during the July-December 2020 period. In January 2021 there is a negative balance of rice availability to consumption needs for the Indonesian population. This deficiency can be covered by using the stock in the previous months.

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