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Analysis of Rainwater Availability and Water Requirements in the Amarasi District Area Kupang Regency

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ABSTRACT: The hydrological conditions of the Amarasi District, Kupang Regency have 3-4 wet months and 8-9 dry months according to Oldeman's classification. Annual rainfall in the last ten years shows the lowest rainfall was 1,461mm and the highest was 2,688mm, the average annual rainfall was 1,859mm. The Amarasi region is included in zones D and E of the Oldeman climate classification. The practice of utilizing limited water resources by planting fodder crops in the form of legumes and grasses as well as food crops in integrated dry land agriculture has been carried out by the Amarasi community. This research examines the availability and demand for domestic, agricultural and livestock water and will produce an availability index as the carrying capacity of regional water availability. The method used to calculate the availability of water originating from rain is runoff analysis based on weighted coefficients for each land use, then analyzed in a monthly series and compared with the level of water demand for each use. Domestic water needs, livestock drinking and irrigation follow SNI 19-6728.1.2002. Then the analysis results are interpreted with tables and time series graphs. The research results show the following time series of water availability: January: 44,626,635.13m3; February: 31,210,646.01m3; March : 20,050,098.53m3; April: 11,726,074.47m3; May : 3,023,180.66m3; June: 1,747,689.52m3; July : 973,284.18m3; August : 168,880.36m3; September: 1,026,614.82m3. October 2,846,522.91m3; November 10,713,903.37m3; and December: 26,871,976.23m3. The amount of water demand in the time series is as follows: January: 1,929,491.70m3; February: 1,391,817.98m3; March: 1,697,543.42m3; April: 781,567.95m3; May : 883,736.22m3; June: 755,911.95m3; July : 284,777.42m3; August : 384,569.42m3; September: 387,871.95m3. October 355,448.02m3; November 3,242,283.15m3; and December: 2,631,159.26m3. Water availability index: January: 4.32 (good), February: 4.46 (good), March: 8.47 (good), April: 6.67 (good), May: 29.23 (slight critical), June: 43.25 (mild critical), July: 29.26 (mild critical), August: 227.27 (bad/severe critical), September: 37.78 (mild critical), October 12.49 (good), November: 30.26 (mild critical) and December 9.79 (good).

KEYWORDS: Amarasi, rainwater, time series, water availability, water requirement

INTRODUCTION

The astronomical location of Amarasi District is between 123^0 47'18.88" to 123^0 59'0.9" East Longitude and 10^0 15'57.89" to 10^0 9'34.73" South Latitude. The area of Amarasi District is 155.09Km2. Located at an altitude between 236 masl to 536 masl, with gentle topography (<150) 86.04% of the area and moderate topography (150 - 250) 13.96% of the area [1]. Rainfall in Amarasi District is known to be 1,977mm in 2022, with 106 rainy days and 3 wet months, 5 wet months and 4 dry months.

Most of the region is characterized by a savanna biome, having very limited surface water potential. These hydrological and climatological conditions shape the pattern of dry land farming activities in semi-arid areas which only rely on rainfall as a source of irrigation water, which can have an impact on crop failure, harvest failure, low availability of food and feed ingredients.

The total population in Amarasi District is 19,538 people, consisting of 9,790 men and 9,748 women, with 4,538 families, of which 73.94% of the workforce works in the agricultural sector (farming, animal husbandry and plantations). Cultivation of dry land which depends on annual rainfall for field farming, covering an area of 7,208.9 hectares (46.48%) and cultivation of ruminant livestock in the form of 11,933 cows, 8,950 goats, 266 buffalo and horses, 14,893 pigs and chickens 56,426 wild animals [1]. The area of land that has not been utilized optimally is quite large, covering an area of 50.54%, or an area of 7,837.9 Ha [1].

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Efforts to optimize land for farming can only be successful if supported by the availability of water for irrigation. For this reason, information about water availability is needed. The availability of water in an area is related to the physical conditions of the environment, including the area, morphology and rainfall as well as natural processes in the water cycle that occur in a river basin.

Water availability is defined as the amount of water (discharge) that is estimated to exist continuously in rivers and rainwater that falls directly in a certain amount in a certain period. Water availability is influenced by rainfall, climate, watershed area, soil type, vegetation conditions, watershed hydrological conditions [2];[3]; [4] and [5]. In summary, the factors that influence water availability and production are classified as: 1). Meteorological factors and 2). Watershed factors.

Metrological factors include rain and evapotranspiration which is an accumulation of several climate factors, namely air temperature, solar intensity, air humidity and wind speed [6].

Water availability can be calculated using the runoff coefficient method modified from the rational method with equation [6]:

$$C = \sum Ci \times Ai)/ \sum Ai$$

$$R = \sum Ri / m$$

$$SA = 10 \times R \times C \times A$$

Where :

SA = Water availability (m3/month)
C = Weighted runoff coefficient
Ci = Land use runoff coefficient
Ai = Land use area (ha)
R = Algebraic average of monthly rainfall.
Ri = Rain of the i-th rain station
m = number of rain stations
A = Area
10 = Conversion factor from mm x ha to m^3

Water needs in an area are very dependent on land use patterns [7]. When used for paddy fields, water requirements are greater than when used for other crops on dry land.

The concept of water requirements is based on the formulation of Indonesian Water Resources Law no. 17 of 2019, Article 28, is all water needs used to support all human activities, including domestic and non-domestic clean water (industrial, tourism and social), irrigation water for both agriculture in the broadest sense and fisheries, and water for city flushing. .

Water needs in rural areas are primarily aimed at domestic and agricultural clean water needs. Domestic water needs are largely determined by population and per capita consumption. Population trends and population history are used as a basis for calculating domestic water needs. Rural domestic needs according to SNI [8] are 60 liters/person/day, so domestic needs = population x 60 liters/day. The need for cattle/buffalo/horses per day = 40 ltr x number of livestock. The need for goats / pigs per day = 5 ltr x number of livestock. Water requirements for irrigation = 86,400 liters/day x rice field area (ha). The need for seasonal and perennial food crops = daily ETp x planting area.

Various field conditions related to water requirements for agriculture vary over time and space [9], as expressed in the factors: 1) Types and varieties of crops grown by farmers, 2) Variation in crop coefficients, depending on the type and stage of plant growth, 3) When will the preparation of group land processing begin? 4) The planting schedule used by farmers, including water supply in connection with land preparation, seeding and fertilization, 5) Status of the irrigation system and irrigation efficiency, 6) Soil type and agro-climatological factors

Availability index (IA) is a term used to show the ratio between water demand (KA) and water availability (AT) expressed in percentage (%). Index value below 25%, good condition, 25% to. 50% = mild critical, 50% - 100% = critical and above 100% = severe critical (bad condition) [10].

This research discusses the amount of water availability originating from rainfall in the Amarasi District area according to monthly time series, determines the amount of water demand according to the monthly time series for various use applications and obtains a monthly time series availability index in the Amarasi District area, as the carrying capacity of water resources in Amarasi District.

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METHODS

This research was conducted in the Amarasi District area using a village and sub-district approach, namely Nonbes Village, Oesena Village, Ponain, Tesbatan, Tesbatan 2, Apren, Kotabes, Oenoni and Oenoni Village 2. This research took place for 4 months, namely from July to December 2023.

RESEARCH MATERIALS AND EQUIPMENT

The research material is rain data for 10 years (2013 to 2022) obtained from BMKG Lasiana for 4 rain stations. Climate data (wind speed, temperature, exposure time and humidity) was obtained from the BMKG online database, demographic data, land use, data on the type and number of livestock, land use area data and administrative maps for Amarasi District were obtained from BPS Kupang Regency.

The equipment used is a laptop equipped with the cropwat Ver.8.0 program, to calculate potential evapotraspiration, an Excel program for numerical analysis of the Google Earth Pro application, Google Earth Engine, to calibrate land use areas.

RESEARCH STEPS AND METHODS

1. Rain data is tested for consistency using the RAPS (Rescaled adjusted partial sums) method [11].
2. Net rainfall is obtained by subtracting the amount of monthly rainfall from the probability of interception occurring.
3. Regional rainfall is calculated using the arithmetic average method.
4. Evapotranspiration is obtained from analysis of climate factors data
5. Determining the amount of water availability is based on the runoff water coefficient value. Availability is the difference in excess of water that becomes runoff water. The amount of runoff water is calculated using the equation V = A x ∑ Ci, where V = volumetric runoff water, A = total land use area, Ci, weighted runoff water coefficient.
6. Determination of water needs is based on calculating domestic water needs, drinking needs, large livestock (cattle, buffalo and horses), medium livestock (goats, sheep and pigs), and cultivated plants, based on water needs according to SNI [8].
7. From the results of the analysis of water availability and demand, the water availability index in the Amarasi District area was determined.

RESULTS AND DISCUSSION

Availability of Water in the Amarasi District Area.

Rainfall in the Amarasi District area is obtained from 4 stations, namely from BMKG Lasinana Station, Eltari Meteorological Station, Naibonat Station, and Oekabiti Rainfall observation Post. Rainfall data for each station was tested for consistency, the results of the consistency test are presented in Table 1, as follows:

Table 1. Results of rainfall data consistency tests for 4 Rain Stations.

Station	Max. monthly rainfall amount	10 Year Average	**Q/n^0.5**	**R/n^0,5**	**Q/n^0.5 Tabel**	**R/n^0,5 Tabel**
Lasiana	5193	519.3	0.39716	0.53987	1.11	1.28
El Tari	4836	483.6	0.37475	0.56841	1.11	1.28
Naibonat	6538	653.8	0.41153	0.60880	1.11	1.28
Oekabiti	5891	589.1	0.33633	0.58072	1.11	1.28

Information : - If Q/n^0.5 < Q/n^0.5 Tabel = Data Konsisten
- If R/n^0.5 < R/n^0.5 Tabel = Data Riabel

From the RAPS test results it is known that the rainfall data for St. Lasiana has a value of Q/n^0.5 = 0.3972, St El Tari = 0.3748, St. Naibonat = 0.4115 and St. Oekabiti = 0.3363, where these values are smaller than (Q/n^0.5 Table = 1.1100 which shows that the data test results are consistent.

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Reliability test by testing the R/n^0.5 value for each rain station/post is known: St. Lasiana has a value of R/n^0.5 = 0.53987, St El Tari = 0.56841, St. Naibonat = 0.60880 and St. Oekabiti = 0.58072, where the test value is lower than the R/n^05 table of 1.2800, which means the data is reliable for use in rain data analysis. Consistent data will produce reliability, efficiency and accuracy in its use.

The results of the consistency test show that rain data can be analyzed for various purposes. Rain data from 4 rain stations is used to determine regional rainfall. Average regional rainfall data, as presented in the graphic image:

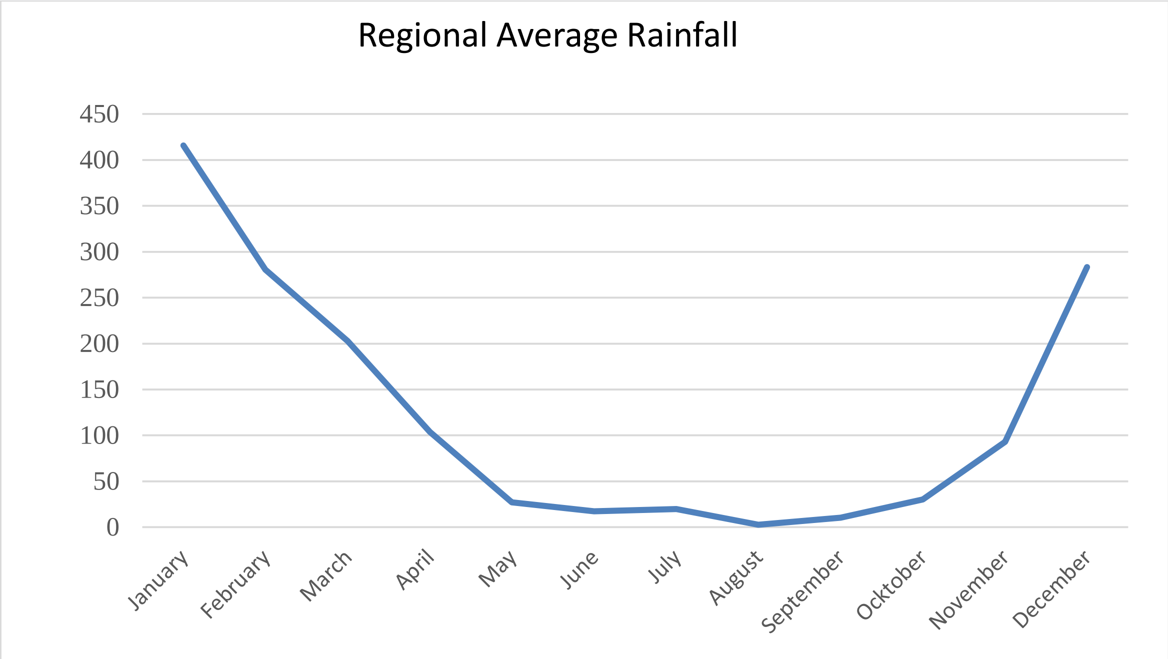

Figure 1. Rainfall graph for the Amarsi region, average monthly time series (m^3)

From Figure 1, it is known that the highest average monthly rainfall was in January at 401.66mm, followed by February at 280.91mm, December at 241.86mm. These three months are wet months according to the Oldeman climate classification where monthly rainfall is < 200mm. The amount of rainfall of 200 mm per month is considered sufficient to cultivate lowland rice, while for secondary crops the minimum amount of rainfall required is 100 mm per month [12].

The amount of rainfall > 100mm is found in March and April, so these months are suitable for cultivating short-lived secondary crops such as hybrid corn, radishes, peas and green beans.

The amount of rainfall < 100 mm is found in May, June, July, August and September, where these months are dry months according to the Oldeman climate classification. According to the Schmidt-Ferguson classification, the dry month category is a month with rainfall < 60 mm, a humid month is a month with rainfall 60 – 100 mm, and a wet month is a month with rainfall > 100 mm. Thus, the Amarasi District Area has 5 wet months, namely January, February, March, April and December, one humid month, namely November and 6 dry months.

Climate classification based on the Schmidt-Ferguson classification [13], shows the Q value (comparison of dry months and wet months) for the Amarasi District area of 120, so that the Amarasi District region falls into the climate type category E (slightly dry) and tends to D (moderate).

The size of the land use area and the runoff coefficient value according to the United States Forest Service (USFS), are presented in Table 2. Below:

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Table 2. Runoff coefficient based on land use in the Amarasi Region.

Land Use Management	Utilization Area (Ha)	Coef. C	C Weighted (Ci)
Field/bush	4,092.90	0.3	1,227.87
Yard	1,089.50	0.4	435.80
Agricultural land	3,062.60	0.3	918.78
Plantation land	3,647.00	0.25	911.75
Forest	3,617.00	0.25	904.25
Runoff result			4,398.45
δS (Storage)			11,110,55

Source: Processed USFS land use and runoff coefficient data

Based on the analysis of the coefficient and delta storage values and the amount of net rain, water availability according to the monthly time series is obtained as in the following graph:

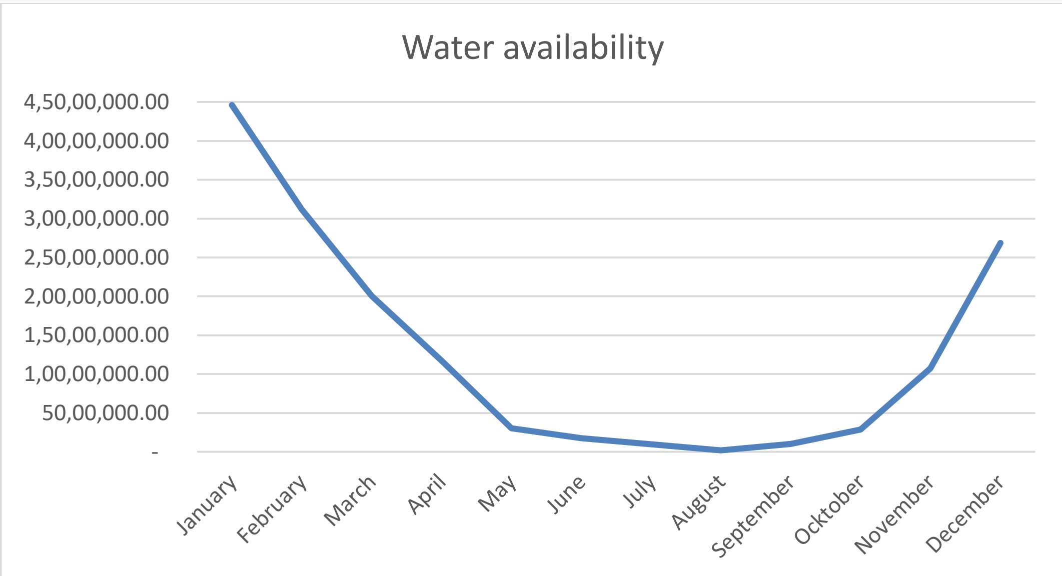

Figure 2. Graph of monthly water availability in the Amarasi region (m^3).

From Figure 2, the water availability graph for the Amarasi region, it is known that the highest amount of water availability is in January each year, with a volumetric average of: 44,626,635.13m3, followed by February: 31,210,646.01m3, March 20,050,098.53m3, April: 11,726,074.47m3, and decreased sharply in May amounting to 3,023,180.66 m3. Since May, water availability has gradually decreased to the lowest availability in August amounting to 168,880.36m3. In September there were several rain events which caused water availability to gradually increase to 1,026,614.82m3, in October: 2,846,522.91m3, in November it rose to 10,713,903.37 m3, and continued to rise in December to 26,871,976.23 m3.

Water availability is high in months with rainfall above 200mm/month, namely January, February and December, where these months are suitable for cultivating lowland rice crops in December. Water availability, in March and April, is only suitable for cultivating horticultural crops which have a harvest age of 8 to 10 weeks. Meanwhile, May to October are dry months, which are not recommended for cultivating seasonal crops, unless supported by the availability of surface water such as river flow. and artificial lakes and displays.

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Amarasi Region Water Requirements

Water requirement is a term used to describe the volume of water needed for domestic needs (bathing, washing and toileting), irrigation needs and drinking needs for livestock, as well as industrial needs and other needs in an area within a certain period of time.

Analysis of the community's domestic water needs, drinking needs of large livestock (cattle, buffalo and horses), and medium livestock needs (goats, sheep and pigs) can be seen in Figure 3, graph of domestic water needs, large livestock and medium livestock.

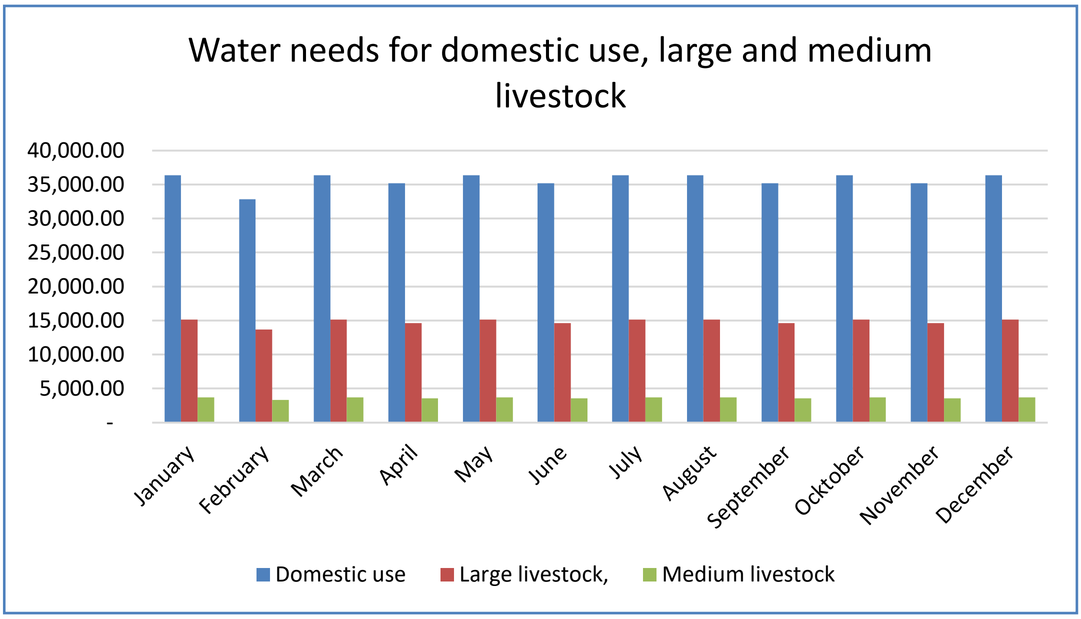

Figure 3. Graph of domestic demand, large livestock and medium livestock (m3).

Domestic water needs are calculated based on water needs according to SNI [8], amounting to 60 liters/person/day. From the graphic image, it is known that domestic water needs for households, drinking needs for large livestock (cattle, buffalo and horses) and medium livestock (goats, sheep, pigs) are relatively constant in volumetric amounts, differences in monthly volumetric amounts are caused by different numbers of days. for every month.

In months with 31 days, the water requirement for domestic needs for the people in Amarasi is 36,340.68m3, in months with 30 days, the need is 35,168.40m3 and specifically for the month of February with 28 days the water requirement is 35,168.40m3. 32,823.84m3.

In the practice of water use, of course there are variations between families, because it is influenced by the number of family members, lifestyle patterns and styles, types of activities around the house as well as other external factors such as cultivating vegetables in the yard and raising livestock. This is in line with the results of research conducted [14], which states that water use patterns are a very complex process that is influenced by many factors, including seasonal variability and water availability, limited water supply, household characteristics, and attitudes and views regarding conservation. water.

Water requirements for drinking large livestock, cows, buffalo and horses are based on a total of 12,199 livestock, consisting of 11,933 cows, 18 buffalo and 248 horses and the standard requirement according to SNI [8], is 40 liters/head/day .

From Figure 3, the monthly volumetric graph of water requirements for large livestock (cattle, buffalo and horses) is relatively constant. The difference in monthly volumetric numbers is caused by the different number of days for each month. In months with 31 days, the water requirement for all villages in Amarasi for livestock drinking per month is 15,126.76m3, in months with 30 days, the requirement is 14,638.80m3, and specifically for the month of February the livestock's drinking requirement is 13,662.88.

In real terms, livestock's drinking needs can be different, influenced by the type of animal, age and type of feed. In terms of the Amarasi population's habit of feeding banana stems with a high water content (±90%), the livestock's need to drink after being fed banana stems also decreased. This is in line with the opinion of [14], which states that the water requirements of beef cattle depend on the stage of production, lactation and environmental temperature. Water requirements in beef cattle increase with increasing

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animal weight, during pregnancy and lactation, and at high temperatures. And it is also influenced by the humidity/water content of the feed ingredients.

The water requirement for drinking for medium livestock, goats, sheep and pigs is based on the number of livestock of 23,845 heads, and the standard drinking requirement for medium livestock according to SNI [8], is 5 liters/head/day.

From Figure 3, the graph of the monthly volumetric drinking requirements of medium livestock (goats, sheep and pigs) is relatively constant in terms of volumetric amounts, differences in monthly volumetric amounts are caused by the different number of days in each month. In months with 31 days, the water requirement for all villages in Amarasi for drinking livestock is 3,695.98m3 per month, in months with 30 days, the need is 3,576.75m3, while specifically for February the water need is 3,576.75m3. 3,338.30 m3. The real drinking needs of medium livestock are also influenced by the type of animal, age and type of feed. Although goats and sheep can meet their water needs from the feed they consume, these livestock also need water because water is needed to help with the processes of digestion, metabolism, excretion, lubricating joints, and homeostasis [15].

Sheep and goats are types of livestock that only consume good quality water, meaning it is not cloudy and does not smell [16]. The drinking needs of goats, sheep and pigs are influenced by environmental temperature factors, growth age and type of food, in pigs with feed containing high salt and protein increases the water requirements of these animals [17]. It was further stated that during the breastfeeding phase, for goats, sheep and pigs, the need for drinking water was also greater than the average need for adult livestock.

Water requirements for irrigation, both lowland rice, upland rice, corn, cassava, nuts and horticultural crops, can be seen in Figure 4, Graph of irrigation water requirements for rice fields and plants grown on dry land.

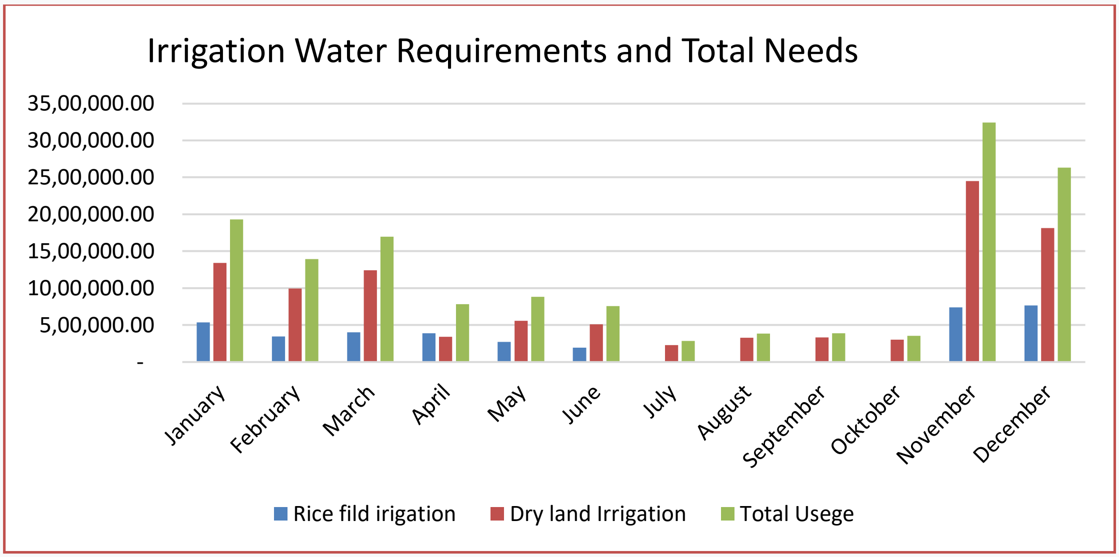

Figure 4. Graph of irrigation water requirements and total water requirements (m^3).

Water requirements for cultivating lowland rice plants in the first and second planting seasons (MT-1 and MT-2), which fall from November to July can be seen in Figure 4. Calculation of water requirements is based on a flow rate of 1 liter/second/ha . In MT-1 the rice planting area is 285 ha and in MT-2 it is 150 ha. It is known that the water requirement for lowland rice crops is highest in MT 1 in December at 763,611.84m3 and the lowest in MT 2 in June, 129,600.00m3. In MT-1 and MT2, there is a decrease in water demand in the third and fourth months.

The water requirements of rice plants vary according to planting age, from the vegetative phase to the beginning of the generative phase of 60-90 days they require 1 liter/second/ha of water [8]. In the final generative phase to the ripening phase, 50% of the requirements can be used.

Water requirements for field rice, corn, cassava and other horticultural crops are calculated based on the potential evapotranspiration rate. From analysis of climate element data with the Cropwat Ver.8.0 program. It is known that the area of field rice/gorah crops is 100 ha, corn 896 ha, peanuts 8 ha, green beans 6 ha, vegetable crops 154 ha. The planting area becomes the basis for calculations by calculating the daily evapotranspiration rate.

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The results of the analysis are presented in Figure 4, Graph of irrigation water requirements. It is known that the water requirement for field crops (rice, corn, cassava and other crops) planted in the rainy season, the largest water requirement in November is 2,449,920.00m3, and the lowest in July was 229,641.00m3.

Fluctuations and variations in different water requirements are caused by several factors, the most important of which are monthly evapotranspiration, type, age and growth phase of plants, and planting area.

Water needs are an accumulation of domestic (household) need variables, livestock drinking needs, food crop cultivation and horticulture. Analysis of water needs in Amarasi District.

The total water requirements for various needs for households, large and medium livestock cultivation, lowland rice cultivation and other seasonal crops, are presented in Figure 4, graphic image of total water requirements. The highest total water demand occurred in November at 3,242,283.15 m3, the second highest in December at 2,631,159.26 m3, followed by January at 1,929,491.7m3, followed by February at 1,391,817.98m3 and March at 1,697,543.42 m3. m3. Meanwhile, the lowest was in July at 284,777.42m3. Fluctuations and variations in different water requirements are caused by several factors, namely plant growth period, type of plant, planting area and the amount of monthly evapotranspiration. From the total need for water for various purposes, it appears that in the rainy season or in months with available rainy days, the need is quite high, but from June to October the need for water tends to fall, because the need for various activities stops, for example for irrigation of annual crops and Irrigation of field rice as well as paddy fields. The needs that are relatively constant are domestic needs and livestock cultivation.

With the large Amarasi population growth rate, 2.53%, the growth rate of the large and medium livestock population which also tends to increase by 1.9% per year, the water demand between July and October will exceed natural water availability, the impact is there is a deficit in the balance of monthly water needs.

Water Availability Index

The water availability index is the ratio between water availability and demand for various purposes. From the results of the analysis of total water demand and total available water, it is presented in Figure 5. Graphic of the relationship between water availability and demand in Amarasi District. From the graphic image, it can be seen that there is a curved pattern with high availability in January, low in August and again high in December.

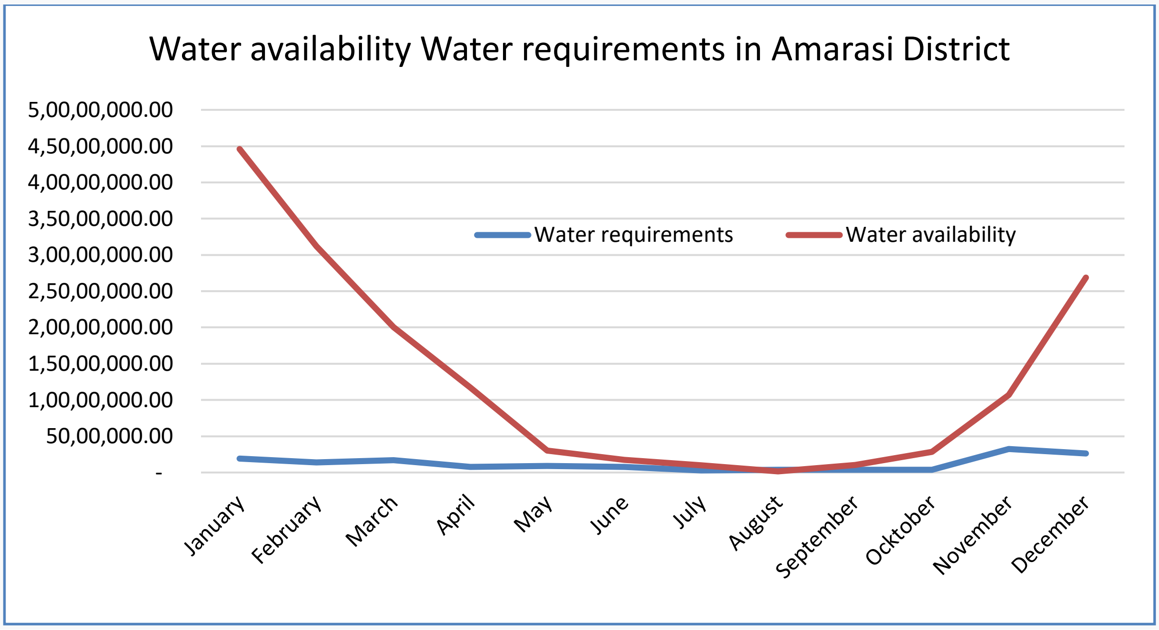

Figure 5. Graph of the relationship between water availability and demand in Amarasi District.

The pattern of demand fluctuates, however, it is high in November because it is the beginning of MT 1 planting, and decreases again in December, January and February. In March it tends to increase, because it is the start of planting at MT 2 for lowland rice crops.

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The availability index, which shows the comparison between the availability and demand for water for all purposes, is a comparison between the volumetric volume of water demand and the volumetric volume of water availability.
The water availability index values and hydrological statistics for the Amarasi District area are shown in Table 3 as follows:

Table 3. Water Availability Index

Month	Index Value	Status	Month	Index Value	Status
Januari	4,32	Good	Juli	29,26	Light critical
Februari	4,46	Good	Agustus	227,72	Severe critical/bad
Maret	8,47	Good	September	37,78	Light critical
April	6,67	Good	Oktober	12,49	Good
Mei	29,23	Light critical	November	30,26	Light critical
Juni	43,25	Light critical	Desember	9,79	Good

Source: Analysis of total water needs and monthly water availability.

From Table 3, it is known that in January, the availability index was: 4.32, respectively February: 4.46, March: 8.47 and April: 6.67, indicating that the condition of the availability ratio exceeds requirements (good), while the index value in May: 29.25, June 43.25, July 29.26 shows the availability ratio is in a mild critical condition. Meanwhile, for the month of August, the index value was 227.72, indicating a severe/bad critical condition. In September it returned to mild critical condition with an index value of 37.78 and in October the condition was good, however it returned to mild critical condition in November with an index value of 30.26. In December, hydrological conditions returned to good with an index value of 9.79.
In November, although there has been rain, November is the start of planting for all seasonal crop commodities, paddy and field rice, corn, cassava and other seasonal secondary crops, which contribute to high water needs. This is in line with the opinion of [9], which states that various field conditions are related to water needs, including: 1) Types and varieties of plants planted by farmers, 2) Variations in plant coefficients, depending on the type and stage of plant growth, 3) When it starts land preparation preparation) 4) Planting schedule used by farmers, including water supply in connection with land preparation, seeding and fertilization, 5) Status of the irrigation system and irrigation efficiency, 6) Soil type and agroclimatological factors.

CONCLUSIONS AND SUGGESTIONS

Based on the results of research on "Analysis of the availability and need for rainwater in the Amarasi District, Kupang Regency", it can be concluded:

1. The amount of water availability in the monthly time series is as follows: January: 44,626,635.13m3; February: 31,210,646.01m3; March : 20,050,098.53m3; April: 11,726,074.47m3; May : 3,023,180.66m3; June: 1,747,689.52m3; July : 973,284.18m3; August : 168,880.36m3; September: 1,026,614.82m3. October 2,846,522.91m3; November 10,713,903.37m3; and December: 26,871,976.23m3.
2. The amount of time series water requirements for domestic use, cultivation of large livestock (cattle, buffalo, horses), medium livestock (goats, sheep and pigs), lowland rice cultivation, lowland rice cultivation, cultivation of seasonal food crops (corn, cassava, green beans and peanuts), as follows: January: 1,929,491.70m3; February: 1,391,817.98m3; March: 1,697,543.42m3; April: 781,567.95m3; May : 883,736.22m3; June: 755,911.95m3; July : 284,777.42m3; August : 384,569.42m3; September: 387,871.95m3. October 355,448.02m3; November 3,242,283.15m3; and December: 2,631,159.26m3.
3. The water availability index is as follows: January: 4.32 (good), February: 4.46 (good), March: 8.47 (good), April: 6.67 (good), May: 29.23 (mild critical), June: 43.25 (mild critical), July: 29.26 (mild critical), August: 227.27 (bad/severe critical), September: 37.78 (mild critical), October 12.49 (good), November: 30.26 (mild critical) and December 9.79 (good).

From the research results it can be suggested:

1. Because the Amarasi District area has 1 month of severe critical condition and 4 months of mild critical condition, it can still maximize the use of water resources which have not been utilized so far.

2. Surplus water storage technology is needed in surplus months to increase the usability of water that can be used in months with mild and severe critical conditions.
3. Further studies are needed on the response of human resources to water availability

REFERENCES

1. Amarasi Dalam Angka. Biro Pusat Statistik Kabupaten Kupang-2023.
2. Gupta R.S., 1989. Hidrology and Hydraulic Systems. Prentice Hall, Englewood Cliffs-New Jersey.
3. Viessman W.Jr, Knapp J.W Lewis G.L. and Harbaugh T.E, 1977. Introduction to Hydrology. Harper and Row- New York.
4. Linsley R. K, Kohler M.A dan Pulhus J.L.H, 1989. Hidrologi Untuk Insinyur. Erlangga-Jakarta.
5. Asdak Chay, 2010. Hidrologi dan Pengelolaan Daerah Aliran Sungai. Gadjah Mada University Perss. Jogyakarta.
6. Tunas I G., 2007. Optimasi Parameter Model Mock Untuk Menghitung Debit Andalan Sungai Miu. Smartek-Jural Vol 5. No. 1, Univ, Tadulako.
7. Zarkasih M.R, Rohmat D dan Nur D.M., 2018 . Evaluasi Ketersediaan Dan Tingkat Pemenuhan Kebutuhan Air Di Sub Das Cikeruh. Gea. Jurnal Pendidikan Geografi, Volume 18, Nomor 1, April 2018.
8. Badan Standardisasi Nasional. 2002. Penyusunan neraca sumber daya Bagian 1: Sumber daya air spasial .Standar Nasional Indonesia, SNI 19-6728.1-2002.
9. Triatmodjo B, 2014. Hidrologi Terapan, Beta Offset, Yogyakarta.
10. Hatmoko W, Radhika, Amirwandi S dan Fauzi M, 2012. Neraca Ketersediaan Air Wilayah Sungai di Indonesia. Pusat Litbang Sumberdaya Air Bandung. Indonesia.
11. Harto S.Br, 1993. Analisis Hidrologi. Gramedia Pustaka Utama. Jakarta.
12. Bayong H.K. Tj, 2004. Klimatologi ITB Press-Bandung Indonesia.
13. Rahmanto, dkk 2022, Rahmanto E., Rahmabudhi S., dan Kustia T. 2022. Kajian Analisis Spasial Penentuan Tipe Iklim Menurut Klasifikasi Schmidt–Ferguson Menggunakan Metode Thiessen–Polygon di Provinsi Riau. Bulettin GAW Bariri. Vol. 3 No. 1. Hal. 35–42. doi: 10.31172/bgb.v3i1.66
14. Fan L., Liu G., Wang F., Geissen V dan Ritsema C.J., 2013. Faktor Yang Mempengaruhi Konsumsi Air Domestik di Rumah Tangga Pedesaan Akibat Akses Peningkatan Pasokan Air. Tinjauan Pada Daerah Aliran Sungai Wei-Tingkok . Plos One Vol.8. No. 8. E71977, 2013. https://doi.org/10.1371/journal pone 0071977
15. Hasan, dkk.,2022) Hasan M.R, Yani A dan Rahayu S, 2022. Model Evaluasi Penerapan Aspek Pakan dan Air Minum dalam Good Farming Practice Peternakan Domba di UP3J Bogor. Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan Vol. 10 No. 3 Oktober 2022, Hlm: 119-125. DOI: https://doi.org/10.29244/jipthp.10.2.119-125
16. Yamin, M., S. Rahayu, M. Baihaqi, & M. Duljaman. 2014. Teknologi Produksi Ternak Domba dan Kambing. IPB Press, Bogor
17. Meehan M.A, Stoka G dan Mostrom M, 2021. Kebutuhan Air Ternak. North Dakota State Universty. https://www.ndsu.edu/agriculture/ag-home/directory/miranda-meehan

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