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EVALUATION OF WATER AVAILABILITY AND NEEDS OF CORN (ZEA MAYS L)

(*Evaluasi Ketersediaan dan Kebutuhan Air Tanaman Jagung (Zea mays L)*)

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Abstract

Water is one of the natural resources and an important element to support the sustainability of life on earth. The existence of air that is on earth can only be used less than 1% of the existing fresh air or 0.01% of the total air on earth. The average water in the world is used 70% for agricultural needs, 8% for domestic needs and 22% for industrial needs. The objectives of this study are as follows: 1) To see the physical condition of the soil to be planted with maize in Savana Jaya Village. 2) To see the condition of the cropping pattern in the village of Savana Jaya agriculture. 3) To see the analysis of corn irrigation water needs from planting to harvesting with the Cropwat 8.0 program in Savana Jaya Village. 4) To see the analysis of relative yields of maize with Cropwat 8.0. The research was conducted in Savana Jaya Village, Waeapo District, Buru Regency, Maluku Province. Selection of location on the area of land planted with maize. Data collection and research were carried out for 3 months, namely December 2019 - February 2020. The results showed that 1. Soil type Black clay Soil or black clay in the village of Savana Jaya with a total available moisture of 200 mm. m-1, the maximum infiltration rate is 30 mm. day-1, and the maximum depth that can penetrate the ground as deep as 900 cm. Pores containing 50% air, the maximum depth of air is 100 mm.meter-1. 2. The planting time for maize in Savana Jaya village is 4 times, namely January - March, April - June, July - September and October - December. 3. Corn commodities grown with a growing time of 60 days (variety BBA 228), with a crop coefficient of 0.30 - 1.20, with 30 days of tillage and planting, 20 days of vegetative phase, and 10 days of generative phase. 4. Rain efficiency during my MT is 62.1% and schedule efficiency -% with a time limit of 0.0% shows that this planting schedule is right for good plant growth. Although the efficiency of irrigant patients is invaluable because the rain that falls directly can meet the water needs of maize plants during MT I.

Keywords: *Evaluation, Water Availability. Buru Island*

Abstrak

Air merupakan salah satu sumber daya alam dan elemen penting untuk menunjang keberlangsungan kehidupan di bumi. Keberadaan udara yang ada di bumi hanya dapat dimanfaatkan kurang dari 1% dari udara segar yang ada atau 0,01% dari total udara di bumi. Rata-rata air di dunia digunakan 70% untuk kebutuhan pertanian, 8% untuk kebutuhan rumah tangga dan 22% untuk kebutuhan industri. Tujuan dari penelitian ini adalah sebagai berikut: 1) Untuk melihat kondisi fisik tanah yang akan ditanami jagung di Desa Savana Jaya. 2) Untuk melihat kondisi pola tanam pertanian di Desa Savana Jaya. 3) Untuk melihat analisis kebutuhan air irigasi jagung mulai dari penanaman hingga panen dengan program Cropwat 8.0 di Desa Savana Jaya. 4) Untuk melihat analisis hasil relatif jagung dengan Cropwat 8.0. Penelitian dilakukan di Desa Savana Jaya, Kecamatan Waeapo, Kabupaten Buru, Provinsi Maluku. Pemilihan lokasi pada areal lahan yang ditanami jagung. Pengumpulan data dan penelitian dilakukan selama 3 bulan yaitu bulan Desember 2019 - Februari 2020. Hasil penelitian menunjukkan bahwa 1. Jenis tanah Tanah lempung hitam atau lempung hitam di Desa Savana Jaya dengan total kelembaban tersedia 200 mm. m-1, laju infiltrasi maksimum adalah 30 mm. hari ke-1, dan kedalaman maksimal yang mampu menembus tanah sedalam 900 cm. Pori-pori mengandung 50% udara,

kedalaman maksimum udara adalah 100 mm. Meter-1. 2. Waktu tanam jagung di Desa Savana Jaya adalah 4 kali, yaitu Januari - Maret, April - Juni, Juli - September dan Oktober - Desember. 3. Komoditas jagung ditanam dengan masa tanam 60 hari (varietas BBA 228), dengan koefisien tanam 0,30 - 1,20, dengan umur olah dan tanam 30 hari, fase vegetatif 20 hari, dan fase generatif 10 hari. 4. Efisiensi hujan selama MT saya adalah 62,1% dan efisiensi jadwal -% dengan batas waktu 0,0% menunjukkan bahwa jadwal tanam ini tepat untuk pertumbuhan tanaman yang baik. Padahal efisiensi pasien irigasi tidak ternilai harganya karena hujan yang turun secara langsung dapat memenuhi kebutuhan air tanaman jagung selama MT I.
***Kata Kunci**. Evaluasi, Ketersediaan Air. Pulau Buru*

INTRODUCTION

Water is one of the natural resources and an important element to support the sustainability of life on earth. The existence of water found on earth can only be used less than 1% of the existing fresh water or 0.01% of the total water on earth. The average water in the world is used 70% for agricultural needs, 8% for domestic needs and 22% for industrial needs (Walhi, 2008).

Water that can be used for agricultural purposes, among others, can be known through the balance of water availability (runoff) and demand. Sugiura et al. (2009) in Heryani N., 2017 developed a runoff analysis model that is effective and efficient for predicting flooding, in developing countries where the availability of water resource recording data is very limited. Efforts to increase domestic maize production can be pursued through expanding the planted area and increasing productivity. The expansion of the area can be directed at potential lands such as irrigated rice fields, rainfed lowlands and dry land which have not been used for agriculture. Efforts to increase productivity can be carried out by providing sufficient amounts of water and managing it properly to meet the needs of plant growth in production. Based on the fact that nearly 79% of the maize area in Indonesia is cultivated on dry land, the remaining 11% on irrigated rice fields and 10% on rainfed lowlands (Mink et al. 1987). The model developed uses input data not only from field data but also in combination with data from satellites based on Geographical Information Systems (GIS). The most felt impact due to changes in global climatic conditions has an effect on precipitation patterns and

evaporation. This has an effect on changes in everything related to the use of water resources (Watts, 1997 in Rahayu, et al.

2010). An important finding obtained from his research, that verification of the results of flood predictions that can illustrate the availability of water in an area, shows results that are very similar to conditions in the field. To clarify the problem and make it easier to analyze, a problem boundary is created. The limitation of the problem in this study is "Calculation of water needs for maize plants using the Cropwat 8.0 program with the Penman-Monteith method." in related agencies in Buru Regency.

RESEARCH METHOD

Data collection is divided into two, namely primary data and secondary data. Primary data that is carried out is by field testing on maize fields which includes the determination of the soil water content in the field capacity (field capacity). Meanwhile, secondary data obtained from BMKG Namlea in the form of climate data for 10 years with an observation period of 2009 s.d. 2019. The observed parameters calculated in this study are, 1) Rainfall as an input component of groundwater balance, rainfall is tabulated in monthly intervals, then the data is analyzed by the Tiered Sequential Method. 2) Evapotranspiration is the amount of water loss from an area which includes evaporation and transpiration through soil surfaces, tree leaf surfaces, free water

surfaces and others. In calculating the evapotranspiration of this calculation module, the Penmann method is used. 3) Determination of the planting period on the monthly mean rainfall value and the 50% chance of rainfall is carried out using the Reddy (1983) method, which is based on the 3-month average CH / ETP movement. The data analysis in this research includes several parameters that influence the need for irrigation water, namely evapotranspiration of reference plants, effective rain, tillage, soil and plant data. These parameters are needed to determine the amount of water for rice irrigation based on the CROPWAT 8 method from the soil tillage stage.

DISCUSSION

Administratively, the village of Savana Jaya is located in Waeapo District, Buru Regency, Maluku Province. Geographically, the location of the study area of Waeapo Subdistrict is as follows, in the north it is bordered by Namlea District, in the south it is bordered by Waelata District, in the west it is bordered by Lolongguba District, in the east it is bordered by Kaiely District.

While astronomically the study area of Waeapo District is located between 3045 '- 3083' latitude and 98015 '- 98000' east longitude which covers an area of 14,000 ha consisting of 7 villages namely Wanareja Village, Waenetat Village, Waekasar Village, Waekerta Village, Waetele Village, Village Gogrea, and one of them is Savana Jaya Village.

Geographically, the village of Savana Jaya is as follows, the north is bordered by the Wai Bini River and Jiku Merasa Village, the south is bordered by Gogorea District, the west is bordered by Sanleko Village, the east is bordered by Namlea Bay.

Meanwhile, astronomically, the study area covers an area of 4.58 km2, which is 11.15% of the area of Waeapo District. With a height of about 66.60 meters above sea level (asl). And the distance from Savana Jaya Village to the capital of Waeapo District is around 20 km (2019 statistical data) and Savana Jaya Village flows a river, namely the Wai Bini river.

Savana Jaya Village has 1 hamlet, 2 Rukun Warga (RW) and 7 Rukun Tetangga (RT). The number of farmers using water in the village of Savana Jaya is approximately 251 people, out of a total of 865 people. Data on workers / farmers can be in the form of 11 farmer groups, 117 heads of farmer families, and 251 farmers with the following descriptions 1) 15 people graduated from academic / high school, 2) 15 people graduated from high school, 3) 100 people graduated from junior high school, 4) 100 elementary school graduates, and 5) 21 people do not go to school. Buru Regency is surrounded by the Seram Sea in the north and the Banda Sea in the south which causes high waves in the west and east monsoons, with very strong ocean currents from July to October. The average air temperature in Buru Regency in 2015 ranged from 25oC to 28.5oC. The average humidity varies between 80-90%.

Buru Island has a tropical climate and a monsoon climate which is influenced by monsoons and is closely related to the surrounding oceans. The general characteristic of Central-North Buru (Savana Jaya village) of the average annual rainfall is from 1800-2000 mm. year-1.

According to Koppen, the climate of Buru Island in the north (Namlea) is included in the Awa classification category, and is included in the class D category in Schmidt and Ferguson with an average of 6.1 wet months and 4.2 dry months. The climate of the Buru Island area, in the middle and south, is included in the Afa classification category according to Koppen, is included in the category B class in Schmidt and Ferguson with an average of 8.4 wet months and 2.6 dry months, and Waeapo especially Savana Jaya village including the Aw climate type where in the

dry months, the rainfall cannot compensate for the lack of rainwater in the area.

The highest rainfall recorded at the Namlea Meteorological and Geophysical Agency station is an average of 174.8 mm with 188 rainy days per year occurring in 2018, the temperature ranges from 22,300 Celsius to 32,300 Celsius. The maximum temperature is in November (33,400 Celsius), while the minimum temperature is in September (21,000 Celsius). Humidity is relatively high with an average of around 86.00 percent. Wind conditions in 2018, the average wind speed per month ranges from 4 to 7 knots. The highest wind speed occurs in August at 7 knots.

The farming condition in Savana Jaya Village is dry land farming, because it has a fairly wide area of land and it is possible to develop a small-scale irrigation system, which means that it comes from the Wae Bini spring which is located and crosses the village of Savana Jaya.

Food crops, especially rice, are often planted in Savana Jaya Village for up to 2 planting seasons, namely March - June and August - November and 2 months after planting. Farmers often also plant secondary crops (maize, beans), biopharmaca and vegetables (mustard greens, kale, long beans, chilies, etc.) around plantation crops (oranges, coconut, teak, alvucad and others) to last 3-4 seasons planting. This condition occurs almost every year. This is intended to simplify operational costs. This farming system does not require every farmer to come to the fields alone, but they can also do other / side activities such as gardening and livestock.

Analysis of water facts in the village of Savana Jaya

Rainfall

Rainwater is the largest water input in meeting crop needs and in Savana Jaya Village it is supported by Savana Jaya Irrigation. Rainfall varies depending on the topography and climatic conditions in an area. Not all of the rainfall that falls on the earth's surface can infiltrate into the soil. If the rain intensity is high compared to the infiltration rate that occurs, then the water that does not enter the ground will flow as a runoff and when the moisture of the soil has reached a condition of field capacity, with high rain intensity, the water will flow as deep percolation. soil (sideways movement of soil pores).

In water resource assessments, interception is often overlooked. Interception is water that is held back which will evaporate back into the atmosphere before the water undergoes an infiltration process and becomes a surface runoff. This part of the rainfall that is not available for infiltration and becomes runoff is called the initial loss.

Table 1. Results of the Calculation of Effective Rain with the Cropwat 8.0 Application.

Moth	Rainfall (mm)	Effective rain (mm)
Januari	214.5	140.9
Februari	185.1	130.3
Maret	199.9	136.0
April	161.3	119.7
Mei	111.9	91.9
Juni	174.7	125.9
Juli	160.5	119.3
Agustus	68.2	60.8
September	48.7	44.9
Oktober	53.0	48.5
Nopember	102.5	85.7
Desember	187.8	131.4
Total	1668.1	1235.0

Source: 2020 Analysis Results

In Cropwat 8.0, effective rain is determined by the rainfall that occurs minus the initial losses. In determining the initial loss, two equations can be used, namely the FAO and USDA equations. In the USDA

equation, the initial loss is proportional to the square of the monthly rainfall where the amount of rainfall is considered to be the increase in the initial loss of rain. In the FAO equation, the amount of rainfall is considered to decrease the initial loss with increasing rainfall. Effective rain is the share of total rain that is used by plant roots during the growing period to meet the plant's water needs.

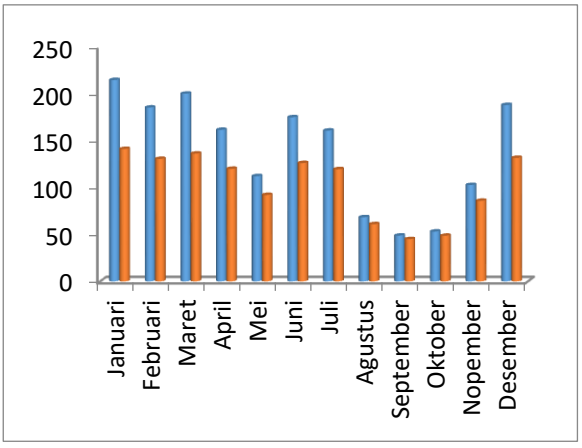

Figure 1. Calculation of Effective Rainfall and Rainfall 2010-2019

Effective Rainfall, effective rainfall calculations are carried out with the help of CROPWAT 8.0 software which uses the Dependable Rain formula (FAO / AGLW formula). In the calculation of effective rainfall, the data used comes from rain gauge stations located in Savana and Namlea Villages by entering the average data for the last ten years from 2010 to 2019.

Climate Conditions in the Village of Savana Jaya

The need for irrigation water is determined by calculating the potential evapotranspiration using the Penman equation with the help of the Cropwat 8.0 software, using climatological data. The climatological data entered is the average data for the last ten years from 2010 to 2019 which were taken from the Meteorology, Climatology and Geophysics Agency of the Namlea Region. Measurements were also carried out to determine the altitude of the place (Alitude) in Savanna Jaya Village and Wae Bini Irrigation, namely 66.60 meters above sea level, latitude (Latitude) 2.26o LS, and longitude (Longitude) 126.00o East Longitude. The calculation process carried out by calculating the potential evapotranspiration using the Penman equation with the help of the Cropwat 8.0 software can be seen in the following table.

It was found that the average potential evapotranspiration (ETo) was 4.44 mm.day-1. The average minimum temperature in 1 year is 21.2 oC and the maximum average temperature in one year is 33.6 oC. The average air humidity in one year is 81%, the average wind speed per month in one year is 14 km day-1, the average length of irradiation in one year is 8.7 hours, and radiation in 1 year is 22.0 mili joul. Square meter-1. Day-1.

Table 2. Results of the Calculation of Effective Rain with the Cropwat 8.0 Application.

	°C	°C	%	(km/hr)	(jam)	MJ/m²/hr	mm/hr
January	21.2	33.6	81	3	6.0	18.4	3.80
February	21.2	33.6	82	5	6.0	18.9	3.91
March	21.2	33.6	82	10	6.0	18.9	3.93
April	21.2	33.6	82	15	6.0	18.2	3.77
May	21.2	33.6	80	15	6.0	17.1	3.49
June	21.2	33.6	80	20	6.0	16.4	3.35
July	21.2	33.6	81	25	10.0	22.2	4.39
August	20.2	33.6	81	20	10.0	23.5	4.64
September	20.5	33.6	81	20	12.0	27.8	5.48
October	20.5	33.6	82	15	12.0	28.2	5.55
November	22.2	33.6	82	10	12.0	27.6	5.52
December	22.2	33.6	82	5	12.0	27.2	5.45
Everage	21.2	33.6	81	14	8.7	22.0	4.44

Source: 2020 Analysis Results

According to the Koppen climate classification, the island of Buru, especially the village of Savana Jaya, is included in the Tropical Rainy Climate with an average temperature of> 18oC with rain and rainfall below 60 mm for 2 months, with the Aw climate type where in dry months, the rainfall unable to compensate for the lack of rainwater in the area.

Soil Condition in Savana Jaya Village

Black clay soil has a higher percentage of dust and clay than sand, and is black. In presenting the soil, we used the flavor method with the soil made a little soft and felt that it felt rough, a little bit slippery, it could be made into a ball and it was very attached to the fingers.

With Cropwat 8.0 for black clay soil, which has been determined by FAO, the total moisture content of the soil is 200 mm.m-1, this means that the moisture content of the soil will store the water needed by plants for the growth process of about 200 milli meters of rainwater in the soil. soil depth of one meter. The maximum infiltration rate of 30 mm. Day-1 means, in this type of soil the rate of rainwater / irrigation water entering the soil is 30 milli meters per day in the soil pores. And the maximum root area is 900 cm due to the depth of the soil until it meets the soil parent material in the form of rocks which can be said to inhibit root growth.

Corn requires fertile soil to produce well. This is because corn plants need nutrients, especially nitrogen (N), phosphorus (P) and potassium (K) in large quantities. Because in general the soil in Buru is poor in nutrients and low in organic matter, the addition of N, P and K fertilizers as well as organic fertilizers (compost and manure) is needed. For good plant growth, a balance of the ratio of soil constituents is needed, namely 45% mineral parts., 5% organic matter, 25% water, and 25% air, in a layer of 0-30 cm thick.

Table 3. Medium Soil Conditions Adjusted to the Needs of the Cropwat Model 8.0

Parameter	Score
Total available humidity (mm m^{-1})	200.0
Maximum infiltration rate (mm $hari^{-1}$)	30.0
Maximum root depth (cm) (cm)	900
Initial soil moisture depletion (%)	50
Initial moisture soil is available (mm m^{-1})	100

Source: 2020 Analysis Results

The soil structure suitable for corn plants is a crumbly soil structure. Suitable soil varies from clayy, fine dust, fine clay to coarse soil and sufficient water is required. It is better if the soil is not rocky, if any, it should be <50%. The acidity (pH) of the soil varies from 5.5 to 8.0. At lower soil pH, P deficiencies, Fe and Al poisoning are generally found. Meanwhile, if the pH is greater than 8.0 can experience Zn deficiency.

In terms of growing medium, maize does not require a special type of soil, however, in order for it to grow optimally, the soil must be loose, fertile and rich in humus. Corn requires drainage: good to moderate and adequate water availability. Soil texture: loam, sandy loam, dusty loam, clayey loam, dusty loam. anah pH 5.5 - 7.8; moderate to high content of N, P, and K with an effective soil depth of 25 - 60 cm.

The State of Plants in the Village of Savana Jaya

The plants used are maize plants with 4 deep growing seasons, namely the first planting in January - March, April - June, July - September and October - December. Corn plants grow in temperate to tropical / subtropical areas. The corn variety commonly planted in Savana Jaya Village is the BBX 228 maize variety, with a long growth period of 60 days.

The maize plant is a type of cereal crop originating from the tropics of Central America, namely Mexico, the part of South Sumatra. In the 16th century, the Purtugis

who brought corn to the Asian continent including Indonesia, thus corn was not native to Indonesia. However, maize is very suitable for the Indonesian ecosystem. Only for optimal growth of maize requires a number of growing requirements (plant requirements).

Table 4. Cropping Model Conditions 8.0.

	Indicator	Growth Phase				
Corn	Period of the Growing Phase	Init.	Deve.	Mid.	Late	Total
	(day)	20	10	20	10	60
	Kc values (Crop coefficients)	0.30	>>>	1.20	0.35	
	Root mark (m)	0.30	>>>	0.60	1.00	
	Depletion (p)	0.35	>>>	0.20	0.20	
	Result response f.	0.40	0.40	1.30	0.50	2.20
				2.00		

Source: 2020 Analysis Results

Corn requires water throughout its growth and this water requirement only relies on rainfall. Plants can grow in areas ranging from lowlands to highlands, from 0 - 600 m above sea level (asl). The desired temperature range is between 21o C - 34o C, with an optimum temperature of around 23o C - 27o C. Dry months of 1-7 months and with an annual rainfall of around 500 - 1200 mm / year, and air humidity around 33 - 90%.

Basically, in plant cultivation, plant growth and development is greatly influenced by genetic factors and environmental factors. The most important environmental factors are soil and climate and the interaction of these two factors.

Plant data obtained in the field adjusted to the Cropwat 8.0 model. The following is a table of corn crop data which is then entered in the Cropwat 8.0 program. Plant data includes the nature of the plant which depends on the crop coefficient (Kc), type of plant, growth phase and duration of plant growth. The crop coefficient (Kc) of maize in the early phase was 0.30 (germination period), 1.20 during the middle period and 1.35 at harvest time. Growth phase and duration of plant growth. corn that is 60 days or 3 months. With the initial period or germination for 20 days, the development period for 10 days, the middle period for 20 days and the final period of growth for 10 days. Meanwhile, the depth of the roots during germination is 0.30 meters to reach 1.00 meters at maturity, and plant height reaches 2.00 meters. These coefficient values relate potential evapotranspiration (ETo) to reference evaotranspiration (ETc).

The tillage system in Savana Jaya Village in particular and Waeapo District in general, which is a corn plant center using perfect tillage / maximum tillage where tilling and harrowing the soil with a hand tractor or even a tractor, so that the possibility of growing weeds is very little and our area is flat enough to be able to store water Soil moisture is good, if the soil is cultivated properly.

Availability of Water for Corn Plants in the Village of Savana Jaya

Corn is a plant that is resistant to water stress that occurs during its growth and ripening period. Corn plants need a lot of water, but if water needs are not met, it will cause the plants to become stunted and the quality of the corn will decline. The water needs of maize for irrigation can be seen in Tables 5 to 8, below.

From Table 5, it explains that the need for irrigation water at the time of soil cultivation is carried out in the first planting season, requires a little irrigation water, which is 1.1 mm.dec-1. When planting, early growth / vegetative phase and harvesting, irrigation water is not needed, irrigation water is needed, namely during the growing period.

Table 5. Water Requirements for Corn (Corn) Planting Season I Cropwat Model 8.0

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
Jan	1	Init	0.30	1.26	10.1	37.2	0.0
Jan	2	Init	0.30	1.08	10.8	47.9	0.0
Jan	3	Deve	0.64	2.35	25.9	46.4	0.0
Feb	1	Mid	1.12	4.33	43.3	44.1	0.0
Feb	2	Mid	1.12	4.38	43.8	42.7	1.1
Feb	3	Late	0.85	3.33	26.6	43.6	0.0
Mart	1	Late	0.43	1.68	5.0	13.6	0.0
					165.5	275.4	1.1

This is due to the rain efficiency that has occurred during the planting period of 85.1 mm.dec-1. Then in the early growth / vegetative phase there was a rain efficiency of 46.4 mm.dec-1. In the maintenance phase, there was a rain efficiency of 86.8 mm.dec-1, and in the harvest process there was a rain efficiency of 57.2 mm.dec-1. With a reference effapotranspiration of 165.5 mm.dec-1.

From Table 6, it explains that the need for irrigation water at the time of soil cultivation is carried out in the second planting season does not require irrigation water, the development period requires irrigation water of 2.9 mm.dec-1, and cooking time requires 1.3 mm.dec-1 of water. With a total amount of water of 4.1 mm.dec-1, because the effectiveness of the rain at that time had reached 249.5 mm.dec-1, and the reference effapotranspiration was 163.4 mm.dec-1.

Table 6. Water Requirements for Corn Planting Season II Cropwat Model 8.0

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
Mart	1	Init	0.30	1.18	9.4	36.3	0.0
Mart	2	Init	0.30	1.18	11.8	46.3	0.0
Mart	3	Deve	0.64	2.47	27.2	44.2	0.0
April	1	Mid	1.12	4.30	43.0	42.0	0.9
April	2	Mid	1.12	4.23	42.3	40.4	2.0
April	3	Late	0.78	2.85	28.5	37.1	0.0
Mai	1	Late	0.35	1.25	1.3	3.2	1.3
					163.4	249.5	4.1

From Table 7, it explains that the need for irrigation water at the time of soil cultivation is carried out in the third planting season does not require irrigation water, the development period requires 44.8 mm.dec-1 of irrigation water, and 24.1 mm.dec-1 for cooking time. With a total amount of water as much as 68.9 mm.dec-1, because the effectiveness of the rain at that time was already. There was a rain efficiency of 193.1 mm.dec-1, with a reference effapotranspiration of 193.3 mm.dec-1.

Table 7. Water Requirements for Maize Planting Season III Cropwat Model 8.0

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
Juni	3	Init	0.30	1.09	6.5	25.5	0.0
Juli	1	Init	0.30	1.21	12.1	42.1	0.0
Juli	2	Deve	0.47	2.08	20.8	42.2	0.0
Juli	3	Mid	1.09	4.86	53.5	34.9	18.6
Agu	1	Mid	1.13	5.16	51.6	25.4	26.2
Agu	2	Late	0.91	4.24	42.4	18.3	24.1
Agu	3	Late	0.43	2.11	6.3	4.7	0.0
					193.3	193.1	68.9

From Table 8, it explains that the need for irrigation water at the time of soil cultivation is carried out in the IV growing season requires irrigation water of 1.7 mm.dec-1, the development period requires irrigation water as much as 48.1 mm.dec-1, and cooking time requires water as much as 20.3 mm.dec-1. With the total amount of irrigation water as much as 70.1 mm.dec-1, because the effectiveness of the rain at that time was in the middle growth of 182.8 mm.dec-1 with a reference effapotranspiration of 235.1 mm.dec-1.

Table 8. Water Requirements for Corn Planting Season IV Cropwat Model 8.0

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
Okt	2	Init	0.30	1.66	1.7	1.5	1.7
Okt	3	Init	0.30	1.66	18.3	19.3	0.0
Nop	1	Deve	0.32	1.79	17.9	24.2	0.0
Nop	2	Mid	0.88	4.87	48.7	28.2	20.5
Nop	3	Mid	1.11	6.10	61.0	33.4	27.6
Des	1	Late	1.09	6.02	60.2	39.8	20.3
Des	2	Late	0.62	3.42	27.3	36.4	0.0
					235.1	182.8	70.1

Rice Planting Patterns in Savana Jaya Village

The cropping pattern for maize in Savana Jaya Village, Waeapo District is influenced by climate, rainfall, soil and the characteristics of the rice plant. climate and rainfall act as water providers while the soil and characteristics of the rice plant act as media for the rice growth. There are soil types with different soil moisture levels that affect the groundwater content. Soil type levels can affect cropping patterns because soil moisture content will store water needed by plants for the growth process.

The water requirement for corn in the first period of planting, January to March, is 163.9 mm. The potential water requirement for rice plants in this season is also 163.9 mm, and this has been fulfilled by the effective rainfall of 269.0 mm with a total rainfall of 433.0 mm, and loss of rain water due to evapotranspiration of 164.0 mm.

Rain efficiency 62.1% and efficiency of irrigation schedule -% with irrigation schedule deviation of 0.0% indicate this planting season is right for good plant growth. Although the efficiency of irrigant patients is invaluable because the rain that falls directly can meet the water needs of maize plants during MT I.

The need for water for maize in the MT II period, namely April to June is 162.2 mm. The potential water requirement for maize in this season is also 162.2 mm, and this has been fulfilled by the effective rainfall of 254.1 mm with a total rainfall of 361.1 mm, and rainfall loss due to evapotranspiration of 107.0 mm.

Rain efficiency of 70.4% and efficiency of irrigation schedule -% with 0.0% schedule setting indicate that this planting season is right for good plant growth. Although the efficiency of the irrigate is infinite because the rain that falls directly can meet the water needs of the maize during MT II.

The need for air for corn in the MT III planting period, from July to September, is 191.2 mm. The air potential of maize in this season is also 191.2 mm, and this can be fulfilled by an effective rainfall of 227.8 mm with a total rainfall of 249.1 mm, and loss of rain water due to evapotranspiration of 21.3 mm.

Rain efficiency 91.4% and irrigation schedule efficiency -% with 0.0% schedule setting indicate that this planting season is right for good plant growth. Although the efficiency of the irrigant patient is invaluable because the rain that falls directly can meet the water needs of the maize during MT III.

The need for air for corn plants in the MT IV planting period, namely October to December, is 231.6 mm. The air potential of maize in this season is also 231.6 mm, and this can be fulfilled by an effective rainfall of 244.7 mm with a total rainfall of 244.7 mm, and loss of rainwater due to evapotranspiration of 0.0 mm. 100% rain efficiency and 100% irrigation schedule efficiency with 0.0% schedule setting indicates that this planting season is right for good plant growth.

CLOSING

Based on the results and discussion of this study, it can be concluded several important things, namely: 1) Soil type Black Clay Soil or black clay soil in the village of Savana Jaya with a total available moisture of 200 mm. m-1, the maximum infiltration rate is 30 mm. day-1, and the maximum root depth that can penetrate the ground as deep as 900 cm. Pores containing 50% water, maximum water depth of 100 mm. meter-1. 2) The planting time for maize in Savana Jaya village is 4 times, namely January - March, April - June, July - September and October - December. 3) The planted maize commodity has a growing time of 60 days (variety BBA 228), with a crop coefficient of 0.30 - 1.20, with 30 days of tillage and planting, 20 days of vegetative phase, and 10 days of generative phase. 4) Rain efficiency during MT I is 62.1% and efficiency of irrigation schedule -% with irrigation schedule deviation of 0.0% indicates this

planting schedule is right for good plant growth. Although the efficiency of irrigant patients is invaluable because the rain that falls directly can meet the water needs of maize plants during MT I. 5) Rain efficiency during MT II is 70.4% and irrigation schedule efficiency -% with an irrigation schedule variation of 0.0% this indicates that this planting schedule is right for good plant growth. 6) Rain efficiency during MT III is 91.4% and irrigation schedule efficiency -% with an irrigation schedule deviation of 0.0% this indicates that this planting schedule is right for good plant growth. 7) Rain efficiency during MT IV is 100.0% and the efficiency of the irrigation schedule is 100.0% with an irrigation schedule of 0.0%, indicating that this planting schedule is right for good plant growth.

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