THESIS

STUDY OF LAND AND WATER MANAGEMENT FOR RICE (Oryza sativa) FIRST CULTIVATION SEASON (MT1) IN TIDAL SWAMP LAND TYPOLOGY C TELANG JAYA VILLAGE MUARA TELANG DISTRICT BANYUASIN REGENCY

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SOIL SCIENCE STUDY PROGRAM LAND DEPARTMENT FACULTY OF AGRICULTURE SRIWIJAYA UNIVERSITY

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Submitted As One Of The Requirements To Get A Bachelor's Degree In Agriculture At the Faculty of Agriculture, Sriwijaya University

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SUMMARY

EDWIN MARDIANSA. Study of Land and Water Management for Rice Cultivation *(Oryza sativa)*First Planting Season (MT1) in Tidal Swamp Land Typology C Telang Jaya Village, Muara Telang District, Banyuasin Regency (Supervised by **MOMON SODIC IMANUDIN**).

Tidal swamp land in Indonesia reaches 20.13 million hectares. So it has a wide potential to be utilized, especially in agriculture. In the management of tidal swamp land in supporting rice cultivation, there are still many problems, especially in land and water management. This study aims to examine the management of land and water in the village of Telang Jaya, Muara Telang District, Banyuasin Regency. The water management studied is a micro-level water system in the form of canal water levels with groundwater levels, gate operations and water pumps. In addition, this study aims to determine the physical characteristics of the soil in the rice field plots. The research method used is a survey with direct observation of the field.
Observation of groundwater level and channel using manual observation in the form of Wels pipe and piscal board for measurement. The physical characteristics of the land have different values and the relationship between the water level in the channel and the ground water level is quite strong. To support rice cultivation activities in tidal land, it is necessary to improve the water system, especially at the micro level.

Keywords: Rice Cultivation, Management, Tidal Swamp

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LEMBAR PENGESAHAN

Kajian Pengelolaan Lahan dan Air untuk Budidaya Padi (*Oryza sativa*) Musim Tanam Pertama (MT1) di Lahan Rawa Pasang Surut Tipologi C Desa Telang Jaya Kecamatan Muara Telang Kabupaten Banyuasin

SKRIPSI

Sebagai Salah Satu Syarat untuk Mendapatkan Gelar Sarjana Pertanian
pada Fakultas Pertanian Universitas Sriwijaya

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Indralaya, Mei 2022
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Indralaya, Juni 2022

[Edwin Mardiansa]

BIOGRAPHY

The author is the second of three children named Edwin Mardiansa. Born in Lubuk Tanjung Village, Air Napal District, North Bengkulu Regency on March 11, 2000 to Rusman and Rasima. The author has one older brother named Heri Agustian and one younger brother named Efo Muhammad Febrian.

Elementary school education was completed by the author in 2012 at SD Negeri 02 Air Napal. In 2015 the author completed his first secondary education at MTs TI KERKAP. Then, in 2018 he managed to finish his secondary education at SMA Negeri 01 Lais. The author continued his education at Sriwijaya University in 2018 through the SNMPTN entry route for the Soil Science study program, Department of Soil, Faculty of Agriculture.

During his time as an active writer student in the Study Program organization Soil Science (HIMILTA), the organization of the Student Representative Council of the Faculty of Agriculture (DPM KM FP) and the organization of the Raflesia Earth Student Family Association (IKMABIRA).

FOREWORD

Praise and gratitude the authors pray for the presence of Allah SWT who has given His greatest mercy, grace, and love so that the preparation can complete the thesis report entitled "A study of land and water management for rice cultivation (*Oryza sativa*) the first planting season (MT1) in tidal swamp land typology C, Telang Jaya Village, Muara Telang District, Banyuasin Regency.” is one of the requirements to get a Bachelor of Agriculture degree of 6 credits.

The author expresses his gratitude to Dr. Momon Sodik Imanuddin, SP., M.Sc. as a Advisory Lecturer who has guided and provided direction in writing this report. In addition, the author would like to thank both parents who always support in every way. As well as fellow mentors, the class and the entire academic community of the Soil Science Study Program, so that the authors can complete the writing of this field practice report.

The author is fully aware that in this compilation there are many mistakes and shortcomings. Therefore, the author really expects criticism and constructive suggestions. The author hopes that this report can be useful for all people.

Indralaya, June 2022

Writer

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CHAPTER 1
PRELIMINARY

1.1. Background

The area of swamps in Indonesia is in the range of 33.4 million hectares, composed of tidal swamp land (tidal) reaching 20.13 million hectares and swamp swamp land reaching 13.28 million hectares. In addition, this swamp land is classified based on the type of soil, namely mineral soil and peat soil with an area of l8.56 million hectares of mineral and 14.87 hectares for peat (BBSDLP, 2014). In 2006 the swamp land used as rice fields was approximately 800 thousand hectares of tidal swamp (tidal) and 350 thousand hectares of swamp swamp, the plantation area consisted of 350 thousand hectares of tidal swamp (tidal) and 140 thousand hectares of swamp swamp. of 430 thousand hectares of tidal swamp and 4000 hectares of swamp swamp and the rest is used for residential areas, roads,*et al.*,2012).

South Sumatra has a variety of agricultural ecosystems including rice fields, such as waterways, rainwater reservoirs and swamp areas. This swampy agricultural ecosystem has the largest land area, which is about 555 thousand hectares or equivalent to 72.3% of the land, for the remaining land consists of irrigated rice fields covering an area of 117,757 hectares or 15.2% of the land area and rainfed rice fields around 96,885 hectares or 12.5% of the existing rice field agro-ecosystem area. For the agro-ecosystem, the swamp land is divided into tidal and tidal swamp areas with an area of approximately 285,941 hectares and 273,919 hectares, respectively, of which specific local varieties of rice are still being cultivated (BPSPSS, 2016). In South Sumatra, the total area of swamp land is 613. 795 hectares consisting of tidal swamp (tidal) and swamp swamp with an area of 157,846 hectares and 455,949 hectares in each area. For the regency area with the outermost swamp area, it is in Musi Banyuasin Regency with a total area of about 322,821 hectares consisting of 1 ebak and tidal swamp land with an area of about 320,921 hectares and 1,100 hectares, respectively (Khadijah, 2015).

The transmigration program was carried out by the Indonesian government in the 1970s to open up the existing swamp land in that year to be developed into an agro-ecosystem area in the basic needs sector, preferably rice. The program was created with the aim of being able to meet basic needs and in line with addressing the high population growth (Puspiastuti, 2012). The Indonesian government is responsible for realizing food self-sufficiency in Indonesia, especially to meet the basic needs of the community. In order to achieve the goal of increasing production and increasing agricultural area, especially the tidal swamp area (tidal) in the areas of Papua, Sumatra and Kalimantan. Opportunities for processing tidal swamp land (tidal) are not impossible to see the various latest technological discoveries, starting from irrigation and drainage systems such as water systems, land management, soil processing and fertilizer application. In addition, the availability of the latest types of seeds to the availability of adequate ALSINTAN (agricultural tools and machines) can make this program achievable (Arsyad*et al.*,2014).

The water system network is a major key in plant cultivation for tidal swamp land areas. In general, the water system has a function as irrigation and water drainage. The water system network is divided into two networks, namely the main network and the micro network. This main network is re- divided into two, namely primary and secondary networks, in which conditions must have a good function in order to work optimally. The primary canal has a function as the main water supply and disposal site and can also be used as a water transportation route for the community. At the secondary level, the water system uses a paired water system model that aims as a way to anticipate flooding. For micro water systems, priority is given to tertiary channels which are directly connected to secondary channels. Each tertiary channel must be connected to one of the secondary channel sections. If the tertiary channel is already connected to the SPD channel so that the other is not connected to the secondary main drainage channel (SDU) and vice versa (Bakri*et al.*,2018).

The micro water system network really needs to be optimized so that it can make improvements to land quality (Imanudin*et al.*,2017). If we want to design a land so that it can be planted 2 to 3 times for one year, good water management network management is very mandatory, starting from setting the sluice gate according to the typology of the land so that we can overcome the problem of good water in terms of availability. water or overcoming excess water (Bakri*et al.*,2015).

In carrying out a plant cultivation, we need to make arrangements for the time and location from planting preparation to harvesting or in general commonly referred to as a system of cropping patterns. In addition to this, we also need to adjust the selection of types or varieties according to the time period we want, especially according to the state of available water or the effects of existing rainfall (Sari, 2017). Determining cropping patterns and planting time by taking into account climatic conditions is one of the best ways to deal with climate change and uncertain weather (Runtunuwu*et al.*, 2013).

In 2015 Indonesia had a population of about 255 million people, with a relatively increasing population making the number of food needs also increase. If in a year we assume the food needs of the Indonesian population as much as 135 kg per capita, then we need at least about 38 million tons of rice per year (Haryono, 2013).

Rice is a food crop that grows with grass - clumps that are identical in the tropics and subtropics, more precisely from Asia and West Africa. Indonesia makes rice as the main commodity in economic needs because rice is the main food that is difficult to change with other foods for the people of Indonesia. In fulfilling carbohydrates to make you full and being an important source of carbohydrates in fulfilling energy sources, making rice a top priority for the people of Indonesia. In general, approximately 90% of Indonesians use rice as a food crop to be processed into their daily staple food. So that rice farming activities become one of the right choices for farmers in determining the plants to be planted.

In 2020, rice production in Indonesia increased by around 45 thousand tons or 0.08% from the previous year which resulted in production of 54 million tons of dry milled grain (GKG). In addition, in 2020, rice converted into rice for public consumption will gain an increase of about 21 thousand tons or 0.07% more than the previous year (BPS, 2020). During the period from month 1 to month 9 2021, the possibility of rice production reaching 45 million tons of GKG (dry milled grain) so that it experienced an increase of 0.14% compared to the previous year. In addition, rice production during the 10 to 12 months of 2021 is estimated to reach 9.6 million tons of dry milled unhulled rice (GKG). Thus, for a year, rice production is estimated to be around 55 million tons of dry milled grain (BPS, 2021).

1.2. Formulation of the problem

The formulation of the problem in this study are:

1. What is the state of some soil physical properties for rice cultivation in the first planting season (MT1) in the tidal zone of typology C, Telang Jaya Village.
2. How is the influence of canal water management on groundwater level and groundwater status on the growth and production of rice cultivation in the first planting season (MT1) in the tidal zone of typology C, Telang Jaya Village.

1.3. Destination

The objectives of this research are:

1. To determine the physical characteristics of the soil for rice cultivation in the first planting season (MT1) in the typological tidal area of Telang Jaya Village.
2. To study the water management system for the production of rice cultivation and the relationship between the water level in the channel and the groundwater level in the first planting season (MT1) in the tidal zone of typology C, Telang Jaya Village.

CHAPTER 2
LITERATURE REVIEW

2.1. Swampland

Land that is in a state of*saturated water*(always saturated with water) or *waterlogged*(flooded) at a certain time or throughout the year always in such a state can be called swamp land. Swamp land in Indonesia has an area of around 33 million hectares, then it is further divided into 2 areas namely tidal swamp land and 1 ebak swamp land with each land having an area of about 2O million hectares and 13 million hectares. Meanwhile, the division of swamp land by soil type is further divided into two types, namely mineral soil and peat. The management of this swamp has an innovation component that must be met, starting from water and soil management applications such as water systems and land management, application of fertilization and soil fertility, use of resistant seed types, technology for controlling pests and plant diseases, development of agricultural machine tool technology (ALSINTAN) and most importantly the empowerment of farmer institutions. Tidal lands have not or not all been used optimally, about 3.8 million hectares of reclaimed land consisting of 0.9 million hectares is managed by the government and the rest is managed by the local community. In peatlands, precisely in the former activities of the one million hectare peatland project (PLG) in Central Kalimantan, it has the potential for development in agriculture and as a conservation area. Peat areas that can be used as a place for agricultural cultivation are peat land areas that have a gambaut depth of less than three meters, the area can be used as cultivation land in the fields of rice fields, plantations, fisheries to industrial forest plantations (HTI) depending on the land suitability criteria owned. Swamp land that has a peat thickness of more than three meters is used as conservation area land, besides that, land that has biological ecosystems, both fauna and flora, to land that has a bottom layer of quartz sand or sulfidic layer, needs to be used as conservation land. Understanding of the use of peatlands to the community needs to be done so that the clearing of peatlands can later be done with careful and careful planning and supported by a reliable environmental impact analysis (Suriardikata, 2012).

Based on Article 1, Government Regulation no. 73 of 2013 concerning Swamps, swamps are described as water resources contained in them and containers of water and water, which are seasonally or continuously inundated, naturally formed with mineral deposits or peat in relatively flat land or basins and overgrown with vegetation which is one ecosystem unity. The purpose of making this government regulation is to get a uniform opinion about swamps and that uniformity means that the swamp area refers to a hydrological unit area. Land typology will make a difference in the impact of climate change in swampland. The area of planting that affects the impact of climate change in swamps, then increases the attack of plant pest organisms (OPT) and biophysical processes on soil and plants. The deep bog and the middle trough of the swamp area have decreased, resulting in a decrease in the submerged area and an increase in the planted area due to El Nio. The effect of El-Niño in peatlands can cause peat decomposition and increase the likelihood of fires in addition to increasing carbon emissions, while in acid sulfate soils it causes increased salinity and pyrite oxidation. When La Nia occurs in tidal land, there is a change in cropping patterns and in lowland swamp land there is a decrease in the planted area. So that the existing potential can be utilized optimally, the swamp ecosystem requires special handling. To realize sustainable agriculture, swampland management must pay attention to aspects of adaptation. In adapting to climate change, among others, dissemination, Developing and designing appropriate adaptation innovations, growing research and development performance in the field of climate change adaptation is the medium term in the development of agricultural technology in swamps to increase the capacity of the agricultural sector. Innovative technologies for optimizing swamp land include the use of a planting calendar, land use with a surjan system, amaliation, fertilization, regulation of water management and the use of high yielding varieties specific to swamp land (Maftu'ah, 2016).

2.1.1. Lebak Swampland

Indonesia has 13-14 million hectares of swamp land with this area having great potential for agriculture at least about 8.88 million hectares.
0.96 million hectares of lebak swamp land have been reclaimed (BBSDLP, 2014). Lebak swamp land can be used as a farming business when it is entered during the dry season because the land that previously could not be planted due to flooding, in the dry season becomes dry so that it can be planted. Therefore, during the El-Nino period, the area for planting and harvesting becomes wider. This is shown by data on the existing area of lebak swamp nationally planted with rice during dry season conditions (El- Nino) increasing to 802 thousand hectares, which in normal climate conditions is 564 thousand hectares.

Lebak swamp land has enormous opportunities and potential to carry out integrated farming (plantation, food crops and livestock) by utilizing environmentally friendly technology and paying attention to land conditions (Suryana, 2016). The unpredictable rainy season and dry season are the main obstacles in developing farming in lowland swamp land (Djafar, 2013). In the shallow swamp area, water problems are also a major obstacle. According to Guswara and Widyantoro (2012), because excess water or drought does not only occur on individual land, but in one stretch so that this problem is difficult to overcome by individual farmers and the role of the Regional Government is highly expected to regulate water management in swampy swamps. Nutrient management needs to be carried out because the soil in the Lebak swamp land has a low soil nutrient content. Optimal nutrient management has not been done by farmers for fertilizer, farmers give it not based on the availability of soil nutrients and plant needs but only in accordance with the ability of farmers to provide it.
Generally, the dose of fertilizer used by farmers is 100 166.5 kg urea/ha, 0 – 53.3

kg SP36/ha, 100 – 105.5 kg phonska/ha and have not used lime in processing the land, even though the optimization of fertilizer application will increase the amount of land production (Kiswanto and Adriyani, 2014).

2.1.2. Tidal Swamp Land

Indonesia has a tidal swamp land area of about 20.1 million hectares, consisting of 0.4 million hectares of saline land, 10.8 million hectares of peatland, 6.7 million hectares of acid sulfate land and 2 million hectares of potential land. Around 8.5 million hectares of tidal swamp land that has the potential to be used as agricultural land. Of this area, around 5.7 million hectares have not been reclaimed and about 2.8 million hectares have been reclaimed. Until 2011, the area of tidal swamp land that had been converted into paddy fields was only about 407 thousand hectares. Tidal swamp land has a well-tested water management system is*dam overflow*(block system) and *one way flow system*(one-way flow system). The use of this water system needs to be adjusted to the type of land overflow and land typology as well as the cultivation of plants that are often carried out. On land with typology A, it should be arranged in the system*one way flow system*, while on land with typology B, it should be regulated by a combination of system*one way flow system*and*dam overflow*This is because the high tide during the dry season often does not enter the plots of agricultural land. The water management system with typologies C and D is intended to save water, because the only source of water comes from rainwater. Therefore, the water channel in the water management system on land with typologies C and D should need to be blocked with a stoplog door to keep the ground water level in accordance with the wishes and allow rainwater to be accommodated in the channel (Nazemi, 2012).

Tidal swamp land is a marginal land that is seen from the physical environment and the soil has problems, including physical - soil mechanics, state of water channels, virulence of pests and plant diseases, chemical-fertility of the soil. The formation of a canal that connects two rivers makes the flow of goods and services change, including science as an initiation in the clearing of tidal swamp land. Tidal swamp land spread across several provinces covers an area of 20.1 million hectares, of which 2.2 million hectares are cleared for the displacement program.

population by the government, of which about 9.5 million hectares are declared suitable for agriculture. The area of tidal swamp land that is currently used is estimated to be only around 5.2 million hectares and 3 million hectares have been opened independently by the community. The development of tidal swamp land is supported by various results of exploration, research, studies in the form of cultivation and management technology, especially for the development of rice as the core crop. Seeing the opportunities that exist proves that there is optimization through input of management technology, supply of fertilizers, pesticides to ameliorants. 6.4 million tons of dry milled grain per year can be found from an area of about 7OO thousand hectares of tidal swamp land (Noor and Rahman, 2015).

2.2. Types of Tidal Swamp Land Overflow

The typology of the land and the type of overflow are the benchmarks in determining the technological components so that farming businesses can be developed by farmers and can produce optimal results. Farming techniques generally contain land and water management methods that include farming, livestock and fish techniques, including appropriate varieties, types of fertilizers and fertilization methods, control and prevention of plant pest organisms (OPT), and methods of reclamation of tidal swamp land. recede. Land and water management is one of the main indicators of successful land management for farming in tidal areas in relation to optimizing the use and conservation of land resources. One of the crops that can be cultivated in tidal land is rice.*et al*., 2014).

Land productivity in tidal swamp areas is strongly influenced by problems with the physical condition of the land which include water status and soil fertility. Often the same land typology has different water status (Imanudin*et al.,* 2017). Water management is one of the determining factors for the success of agricultural development, which can be arranged as rice fields, fields and surjans adapted to the type of water overflow and land typology as well as the purpose of its use. Based on the influence of tidal overflow and the level of its regulation, tidal land can be divided into four types of overflow, namely types A, B, C and D. Type A is an area that always gets tidal overflows either by single or double tides. This region lies between the mean low tide and double tide, receiving daily water during low tide. Type B is a Region that gets overflow only by large tides. This region lies between the mean double and single tides, experiencing displacement during low tides. Type C is an area that does not get direct tidal surges during both high and low tides.

Ground water level varies < 50 cm. This region is above the single tide, Tidal movement only affects the water table through infiltration and undergoes permanent settlement. Type D is This region never gets overflow. Ground water level > 50 cm. This area is identical to dry land and is permanently displaced (Masulili, 2015).

2.3. Rice Plants in Tidal Swamps

In the economic life of Indonesia, rice is a food crop that produces rice which has an important role. Rice is a staple food that is difficult to replace by other staples in Indonesia such as corn, tubers, sago and other carbohydrate sources. Thus, a source of carbohydrates that can be filling and become the main choice that is easily converted into energy is rice. Only 10% of Indonesians do not use rice as the main food ingredient for their daily staple food. Rice is a promising commodity in many countries and more than half of the world's population uses rice as a source of carbohydrates. For half of the Indonesian people, making rice as a staple food makes rice a promising source of livelihood. Rice plants (*Oryza sativa*L.) is a food plant with the most needed source of carbohydrate energy for half of the people in Indonesia, even rice is a source of energy for more than half of the people in Indonesia

Half of the world's people, especially from Asia. Thus, this food crop becomes an important priority in increasing production in order to meet the needs of the community (Patti*et al.*,2013).

Development of staple crop agriculture in tidal swamp land especially rice production in supporting the improvement of national food security is increasingly important and strategic when it is associated with the increase in population and industry as well as the decrease in the number of arable lands for various uses other than agriculture. Rice cultivation activities in tidal lands have their own peculiarities because with a low interval of use of chemical insecticides, even in some places they do not use them but can suppress the development of rice stem borer pests at low grades. The causes include planting at the same time, planting methods by cutting rice turiang and letting it decompose, transplanting and cutting rice leaves at the time of planting (Thamrin*et al*., 2013).

Rice plants are included in monocotyledonous plants. According to ITIS (2022) taxonomically, rice plants can be classified as follows:

Kingdom	: Plantae
Division	: Tracheophyta
Sub Division	: Spermatophytina
Class	: Magnoliopsida
Order	: Poales
Family	: Poaceae
Genus	:*Oryza L.*
Species	:*Oryza sativa*L.

Rice is included in the rice tribe - grains or*Poaceae*(synonym:*Graminae*or *Glumiflorae*). Included in seasonal plants, stems are very short, have fibrous roots, stem structures formed from a series of leaf midribs that support each other, lanceolate, perfect leaves with upright midribs, light green and dark green in color, parallel leaf bones, covered by thick hair. short and rare, compound flowers arranged, branched panicle type, flower units called florets, located on a spikelet that sits on the panicula, the fruit of the type of grain or karyopsis which is indistinguishable which is the fruit and seed, almost round to oval shape, size 3 mm - 15 mm, covered by palea and lemma.

In one stretch there are plant heights that are more prominent than each plant population. The rapid growth of plant height does not guarantee high crop production yields. Well-developed plants are able to absorb large amounts of nutrients, the availability of nutrients in the soil affects plant activities including photosynthetic activity, therefore plants can increase the rate of growth and production. Meanwhile, the number of tillers will be optimal if the plant has good innate characteristics and is supported by favorable environmental conditions or is suitable for plant growth and development. Furthermore, it was stated that the maximum number of tillers was also influenced by the spacing, because the spacing determines the reach of sunlight, mineral nutrients and the cultivation of the plant itself.

2.4. Soil Physical Properties

The physical properties of the soil are the aspects that are responsible for the transport of heat, air, water and dissolved materials in the soil. The physical properties of the soil have a lot to do with the suitability of the soil for various uses. Bearing capacity and strength, the ability to store water in the soil, drainage, penetration of plant roots, air conditioning, and nutrient binding are all closely related to the physical properties of the soil. The physical properties of soil depend on the number, size, composition and mineral composition of soil particles, the type and amount of organic matter, volume and shape, its pores and the ratio of water and air occupying the pores at a given time. (Pardosi*et al*., 2013). In creating soil fertility the role of organic matter is very large. The role of organic matter for the soil is as a change in soil properties, namely physical, biological and chemical properties of the soil and organic matter can form granules in the soil and is very important in the formation of stable soil aggregates (Tolaka, 2013).

Soil texture is the relative percentage of clay, silt and sand in a mass soil. Generally, texture is influenced by water and nutrients found by plants, total humus, volume of pores, aggregates with each other, the ability of the soil to absorb and hold certain chemicals, water disposal, and the ability of the soil to retain water. The ability of the soil to pass water through the soil is called soil permeability (Eash .).*et al*., 2016). Texture is the ratio of the silt, and clay, sand fractions in the soil mass determined in the laboratory as a percent value. The definition of soil texture is the relative arrangement of three sizes of soil particles, namely sand measuring 2 mm – 50 m, dust measuring 50 – 2 m and clay measuring < 2 m. Soil texture is one of the soil properties that greatly determines the ability of the soil to support plant growth. Differences in soil texture will affect the ability of the soil to store and deliver water, store and provide different sources of plant nutrients as well. Determination of soil texture in the field can be done by the taste method, namely by feeling or squeezing the soil sample between the thumb and forefinger. Determination of texture in the field based on the roughness or smoothness of the soil sample, the pyridan or coil phenomenon and the stickiness are the key to its determination. Determination of texture in the laboratory is carried out using the Bouyoucos hydrometer method and the pipette method (SSS, 2012).

Soil compaction is the arrangement of solid particles in the soil caused by the pressure force on the soil surface so that the porosity of the soil decreases. Soils that have not been touched from the outside usually have greater brittleness and porosity stability and soil mass density (*Soil Bulk Density*) which is smaller than that which has undergone external changes. The density of a soil or bulk density (BI) shows the division between dry soil weight and soil volume including the volume of soil pores. The density of the soil means the condition of a soil density which shows that the denser the soil will cause the higher the density of the soil (Annisah, 2014). The density is the weight divided by the unit volume of soil that has dried from the oven process (grams per cubic centimeter). Bulk density is used as a soil compaction factor that affects the process of entering water into the soil (*Infiltration*), soil porosity and aeration, available water capacity, availability of nutrients for plant use, depth of roots penetrating the soil, and activity of soil micro- organisms. Several factors can change the state of bulk density, such as soil texture. Where soils that have a sandy texture have a lower bulk density than silty or clay soils because they have denser total pore space (USDA, 2019).

Soil pore space is the part of the soil that includes water and air and is not filled with soil solids. The total pore space is the total pore content of the soil in an intact soil sample which is found to be a percent value. The overall result or division of pore space in a soil is obtained from the composition of soil aggregates such as sand, silt and clay. The density of the soil is one of the characteristics of the total pore space, so that if the density of the soil is low, such as in clayey soils, the total pore space will be high (Abdulkadir, 2016). Permeability is a rate of soil velocity to pass a certain amount of water expressed in the frequency and time of water saturation. Permeability shows the ability of the soil to penetrate water, texture and structure and organic matter also plays a role in determining permeability (Munandar, 2013).

2.5. Water Management Network

The existing water system in the tidal swamp area has primary channels, Primary channel is usually defined as a navigation channel which is the connecting access to the river. The distance between the primary channels is about 8 km, in addition to the primary channel there is also a secondary channel that connects the primary and tertiary channels,

generally the distance between the secondary is about 1 km. There are two types of secondary canals, namely village irrigation canals (SPD) and also main drainage channels (SDU) which have benefits for irrigation and disposal located at land boundaries. One secondary block contains 16 tertiary canals (TC) with a distance of about 200 m between tertiary channels that have been made to drain and discharge water into secondary canals for irrigation.

optimize the land. The quaternary channel, which is the link between the rice fields and the tertiary channel, is made around the land, this channel is the key to connecting to the land (Megawati, 2012). The shortcomings in current water management policies are often the same for each reclaimed delta, even though the conditions in the field are very diverse and this condition causes many water structures to not function properly because of their incompatibility. In the case with the same typology of tidal swamp land, it turns out that the water level is different. This difference in water level will greatly affect the physical, biological, and chemical processes of the soil which will make it a determinant of the level of soil fertility itself (Imanudin and Budianta, 2016). One of the main indicators towards the success of agricultural development in tidal land is water management. Water management in tidal areas includes various components ranging from water management at the macro level and also at the micro level and especially water management at the tertiary level which links between macro and micro water management. Macro water management aims to ensure that sewers and irrigation can run optimally. The micro water system network aims to meet evapotranspiration needs and regulate water level and maintain water quality in the land (Arsyad Water management in tidal areas includes various components ranging from water management at the macro level and also at the micro level and especially water management at the tertiary level which links between macro and micro water management. Macro water management aims to ensure that sewers and irrigation can run optimally. The micro water system network aims to meet evapotranspiration needs and regulate water level and maintain water quality in the land (Arsyad Water management in tidal areas includes various components ranging from water management at the macro level and also at the micro level and especially water management at the tertiary level which links between macro and micro water management. Macro water management aims to ensure that sewers and irrigation can run optimally. The micro water system network aims to meet evapotranspiration needs and regulate water level and maintain water quality in the land (Arsyad*et al.,*2014).

The most important factor in the success of agricultural cultivation in tidal land is the ability of farmers to manage water at the tertiary level as the main water supply for plants. In order to create this situation, it is necessary to improve network facilities and infrastructure through the construction of sluice gates. Serves as a control of altitude fluctuations in accordance with the needs of the plant needed. The floodgates that are suitable for tidal land are generally fiber valve type sluice gates (Imanudin and Bakri, 2016).

Improvements in the quality of land in the water system are needed, especially at the micro level. Especially if the land is designed to be able to do two or three plantings in a year. The use of water management facilities such as sluice gates and plant calendar arrangements must be enforced.

throughout the year and no excess water in the rainy season. One of the sluice gate models that has been tested is the goose-neck sluice model, water control in tertiary canals becomes more practical because it is easy to set up (Imanudin, 2010). *et.al.*,2017). Water is a very important natural resource in the agricultural sector because it is also a determining factor for the good or bad of a land. one of them is for irrigation and drainage of plants in order to meet the water needs of plants. The availability of water is also a determining factor for the success of agricultural cultivation. The process of moving water requires special treatment to get the water and one way to move water is by using a water pump machine. A pump is a device used for the process of moving water from one place to a different place by increasing the water pressure and flowing it through a piping medium. The increase in water pressure is used to overcome obstacles during flow in the form of pressure differences,

Groundwater level fluctuations are the most important parameter in plant cultivation in swamps. The existence of the groundwater table is very important to meet the water needs of plants. In tidal land, the water level in the tertiary channel greatly affects the presence of groundwater in the land map. In addition, the condition of the rainfall that falls will also greatly affect. Soil conditions with high water loss require total water retention before the dry season with a bulkhead system or stoplog at the end of the tertiary canal. For this reason, a stoplog or sliding sluice gate model is needed. (Imanudin*et al*., 2019). The dynamic pattern of the groundwater level is highly dependent on the water level in the channel. So to keep the ground water level from falling quickly, the water in the tertiary canal must always be there. Therefore, it is clear that the role of water level management in tertiary canals is very important in planning water management in tertiary blocks. This condition is due to the relatively high porosity on tidal soils, especially on typology C land, especially on peatlands (Hafiyan).*et al*.,2017).

CHAPTER 3
RESEARCH IMPLEMENTATION

3.1. Place and time

This study of land and water management for rice cultivation was carried out on tidal land type C overflow in the Telang Delta I Tertiary Block 8, Telang Jaya Village P8-2S, Muara Telang District, Banyuasin Regency. Soil analysis was carried out at the Physics and Soil Conservation Laboratory and the Chemistry and Soil Fertility Laboratory, Faculty of Agriculture, Sriwijaya University. The time interval of this study began at the time of the first planting season (MT1) from November 2021 to February 2022.

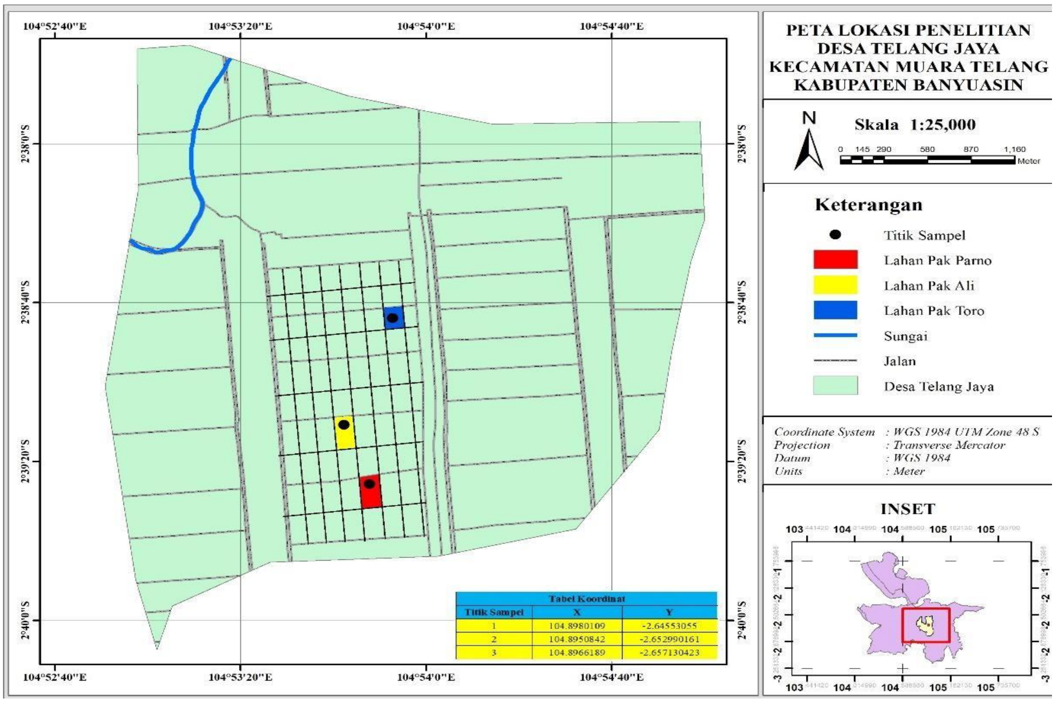


Figure 3.1. Research Site Map

3.2. Tools and materials

The tools used in this research are: 1) Stationery; 2) Belgian drill; 3) Camera; 4) Meters; 5) Piscal Board; 6) Pipe wells; 7) Scrub; 8) Belgian drill; 9) Sample Ring.

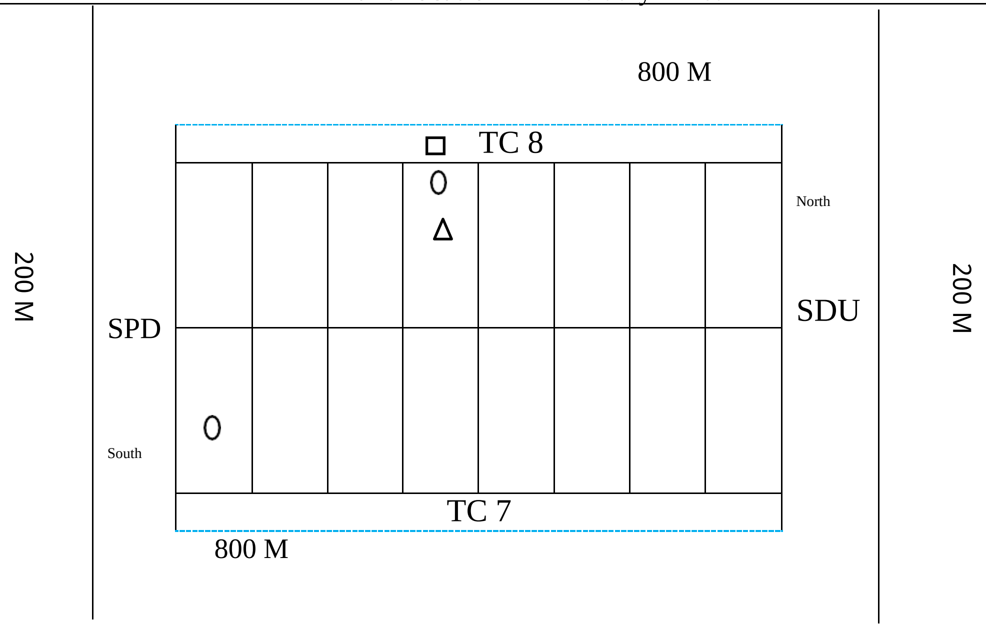
The materials used in this research are: 1) Aquadest; 2) Rubber Band; 3) Gauze; 4) Label paper; 5) Plastic Size 2kg; 6) Soil samples.

3.3. Research methods

The method used in this study is a survey method with direct field observation. The research area located in P8-2S is 16 Ha per tertiary canal. From several existing rice cultivation lands, three lands will be taken to be observed. For the land to be observed, it can be seen from table 3.1 and for the location plan for each land, it can be seen in Figures 3.3, 3.4 and 3.5.

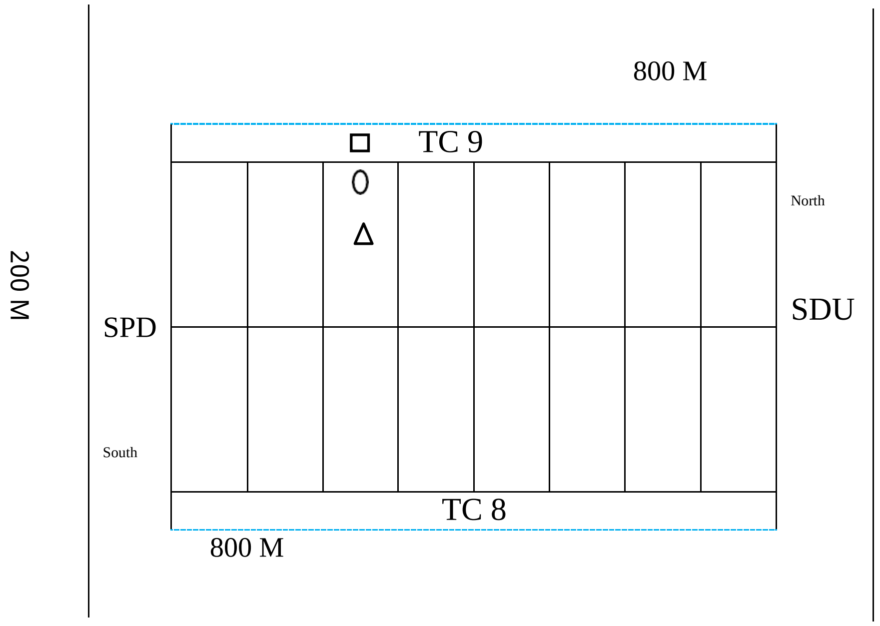
Table 3.1. Observed land

Land	Information	
A land	- Farmer's name	: Mr. Parno
	- Planting time	: October 24, 2021 :
	- Land location	Tertiary 9 Plot 3:
B land	- Farmer's name	Mr. Ali
	- Planting time	: October 24, 2021 :
	- Land location	Tertiary 8 Plot 4:
C land	- Farmer's name	Mr. Toro
	- Planting time	: October 24, 2021 :
	- Land location	Tertiary 2 Plot 1



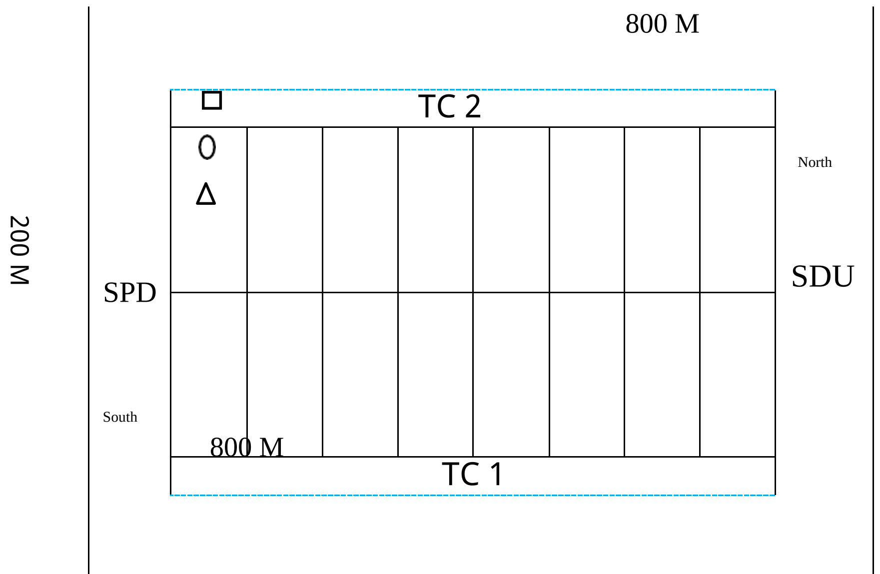
Information : △ = Pipe Wells, □ = Piscal Board, and = O Sampling Point

Figure 3.3. Pak Ali's Land Research Site Plan (Land B)



Information : △ = Pipe Wells, □ = Piscal Board, and = ○ Sampling Point

Figure 3.4. Pak Parno's Land Research Site Plan (Land A)



Information : △ = Pipe Wells, □ = Piscal Board, and = ○ Sampling Point

Figure 3.5. Pak Toro Land Research Site Plan (Land C)

The parameters observed in this study were the observation of the water management network at the study site, the measurement of the water level of the canal during the first growing season (MT1) using a piscal board, the measurement of the groundwater level during the first growing season (MT1) using the wells pipe, data processing using the SEW-20 (Surplus Excess Water) to analyze excess water in the root zone as deep as 20 cm, taking soil samples at a depth of 0-30 cm as many as three points to be analyzed in the laboratory including bulk density, soil pore space, soil permeability and soil texture, measuring plant height and number of tillers every 2 weeks.

3.4. Procedure

The work procedures carried out in this study include:

3.4.1. Preparation

The series of activities carried out at this stage are:

1. Observations and surveys directly to the field to find out the conditions and problems that exist in the research location.
2. Prepare all the tools and materials that will be used in the research.
3. Determination of sampling points, installation of piskal boards and well pipes in tertiary channels.

3.4.2. Field Activities

The series of field activities include:

1. Installation of wells pipes in the paddy fields of each observed land and piskal boards in the tertiary canals of each land in a perpendicular position to the wels pipe. This tool will be observed every day during the periodic planting to determine the dynamics of the groundwater level and water level in the tertiary channel of the first planting season (MT1) for rice cultivation (*Oryza sativa)*in the village of Telang Jaya.
2. Observation of floodgate operation in tertiary canal once a month and every phase of rice plant growth in each tertiary channel on the observed land.

3. Sampling of the soil after harvest at three points with a depth of 0-30 cm each as much as 1 kg for analysis of physical properties in the laboratory.
4. Observation of plant height and number of rice tillers in each research area by determining the measurement point with an area of 1 meter x 1 meter perpendicular to the Wels pipe with a boundary marked with a square made of rope making it easier for observations carried out every 2 weeks.
5. Collecting primary and secondary data taken from existing sources ranging from journals, theses and so on, also by observing directly the situation in the field, interviewing farmers in Telang Jaya village regarding the activities carried out during rice cultivation (*Oryza* sativa) in the field, and rainfall data based on the Meteorology and Geophysics Center (BMKG).

3.4.3.Activities at the Laboratory

The series of activities in the laboratory include:

1. Analyzing the calculation of bulk density, total soil pore space from three samples that have been taken in the field.
2. Analyze the calculation of soil permeability from three samples that have been taken in the field.
3. Analyze the type of soil texture that has been taken in the field.

3.4.4. Data analysis*Surplus Excess Water*(SEW – 20)

The data obtained in the field during the first planting season will be processed using calculations*Surplus Excess Water*(SEW-20) with the formula

$$SEW\,20 = \sum_{i=1}^{n} (20 - x_i)$$

where is $x_i$is the depth of groundwater on day i, i as the first day and n as the number of days during the growing period. The term SEW is a certain depth which is defined as the beginning of excess water, usually used a depth of 20 cm for rice plants. Data is presented in the form of tables, graphs, and images and then compiled in the form of reports.

3.4.5. Analysis of the Relationship between Water Level in Channels and Groundwater Analysis of the relationship between the water level in the channel and the groundwater level was carried out using a simple linear regression correlation method. Where the result of this relationship is the strength of the relationship from the ground water level to the water level in the channel.

CHAPTER 4
RESULTS AND DISCUSSION

4.1. Regional Overview

The research area is located in Telang Jaya Village, Muara Telang District, Banyuasin Regency, South Sumatra Province. This area was the area of the transmigration village program in the 1980s from the island of Java. Telang Jaya Village is surrounded by the Musi River flow so that access to this area uses water transportation. Because this area is a transmigration area, the majority are Javanese, precisely from East Java. The administrative boundary of Telang Jaya village is bordered by Mukti Jaya village in the south, in the north it is bordered by Panca Mukti village, for the east it is bordered by Mekar Mukti village and Upang Ceria village and for the west it is bordered by Telang Makmur village. The village administration map can be seen in Figure 4.1.

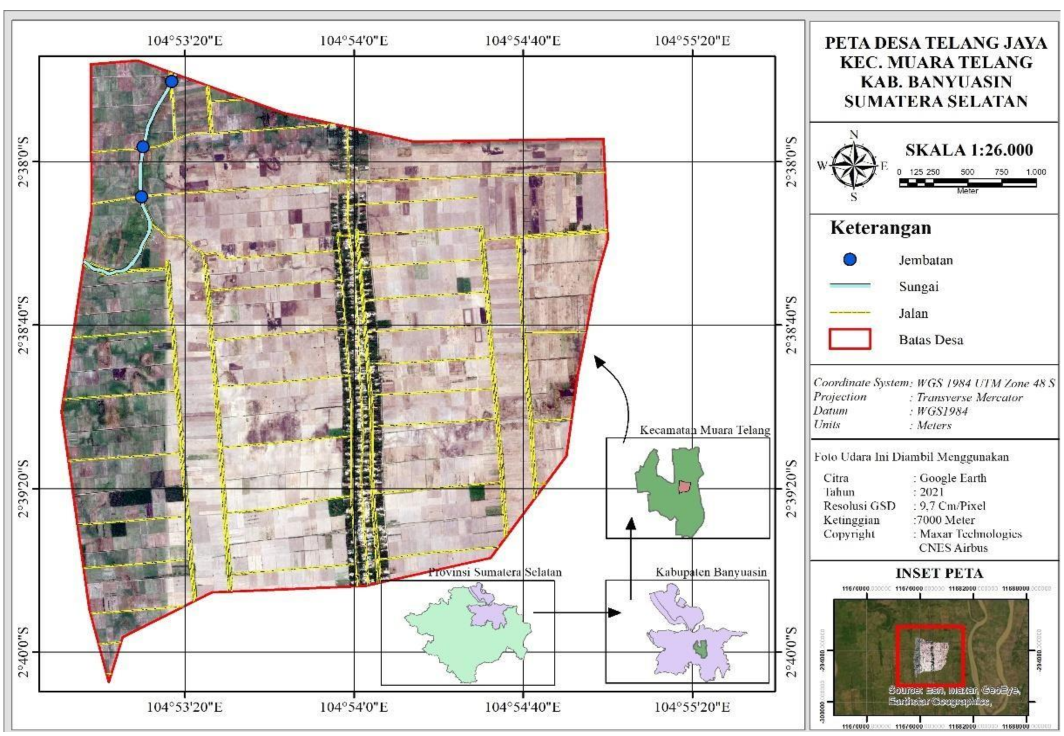


Figure 4.1 Administrative Map of Telang Jaya Village, Kec. Muara Telang Kab. Banyuasin

Telang Jaya Village is located in a tidal swamp area typology C, where the water level is less than fifty centimeters deep, is connected to the Musi River which causes sea tides to occur from the Sunda Strait. With this condition, to support land optimization, it is necessary to implement good water and land management, especially in the process of agricultural cultivation later. Based on the condition of the area in the research area, the water system network created is a concept*one way flow system*(one- way flow). The concept has a tidal channel entering through the primary channel to the secondary channel giving the village (SPD) followed by the tertiary channel until it is divided into each direction of the rice field which then recedes to the main drainage channel (SDU) and returns to the Primary channel and the cycle repeats continuously. . With the optimization of the water system network and coupled with good land management, agricultural cultivation activities will be optimal.

Figure 4.2. Primary Channels in Telang Jaya Village, Muara Telang District Banyuasin Regency

Waterways originating from the main river and as a connecting water channel between the two main channels with a length of each channel of about 25 km are called primary channels. The appearance of the primary canal in Telang Jaya Village can be seen in Figure 4.2. The primary channel in this area is used as the main drainage and disposal channel so that it is included in the macro water system category.

In addition, this primary channel is also used as a water transportation route for the local area because there is no land access to exit this area. The primary channel has a cycle of tidal and ebb and flow of water starting from the main river flow bringing water to the primary channel to be forwarded to the secondary channel giving and heading to the secondary drainage channel which then returns to the primary channel and continues to repeat every day like that.

Figure 4.3. Secondary Channels in Telang Jaya Village, Muara Telang District Banyuasin Regency

The water channel that functions as a connecting channel between the primary and primary channels is the secondary channel. For the appearance of the secondary channel in this area, it can be seen in Figure 4.3 where it was taken at high and low tide so that the lighting and color conditions tend to be different. This secondary channel is included in the micro water system network which in this area is divided into two parts which are distinguished based on their function. The village irrigation channel (SPD) is a secondary channel that functions as a water channel from the primary channel to the tertiary channel and the main drainage channel (SDU) is a secondary channel that functions as a drainage channel from the tertiary to the primary channel. The secondary channel in this area traverses residential areas and village agricultural land for the length of this channel about 4 km with a width ranging from 8 to 11 meters and a depth of 200 – 350 centimeters. Between giver channels with a sewer about 850m away. The secondary channel that passes through the residential area is the SPD channel which is also used by the community as a place to wash clothes, while the channel that passes through the community's agricultural land is the main drainage channel.

In farming activities in Telang Jaya Village, they have cultivated 3 times a year. Generally, it is planted once every 4 months, so in that year people do the rice-rice-corn cropping pattern. From November to February, people in the Telang Jaya area cultivate rice. This was done based on the conditions of the season, which in that month the rainfall was quite high so that rice cultivation was very suitable because it required high water requirements and the market opportunity for rice was very strategic so it was very suitable for rice business in that month. In the previous year, the area's crop yields reached 7 tons per hectare.

4.2. Soil Physical Characteristics

Soil physical characteristics are part of soil properties (Chemistry, Biology and Physics) which for these physical characteristics are soil properties that we can feel and see directly or with the naked eye in the field, it can be from color, shape and so on. These physical properties can affect the growth and development of a plant, so we need to know the state of the soil for processing or management that we will do in the future in order to increase the rate of growth and development of a plant. Soil physical characteristics that we need to know include texture, density, total pore space to soil permeability.

4.2.1. Bulk Density and Total Pore Space of Soil

Bulk density (BD) is also known as the bulk density of the soil which means a ratio of weight per unit volume of soil dried in an oven at 105°C.

Celsius degrees expressed in grams per cubic centimeter. The total pore space (RPT) of soil is the content of all pores in an intact soil content expressed in percent (%).

Table 4.1. Results of BD and RPT Analysis in the Laboratory

Land (0 – 30cm)	Planting Time	BD (g/cm_3)	RPT (%)
A land	October 24, 2021	0.98	64
B land	October 17, 2021	1.01	62
C land	October 10, 2021	0.91	66

Note : BD = Bulk Density, RPT = Total Pore Space1
Source: *Analysis of the Physics Laboratory, Soil and Water Conservation Department of Soil Faculty
Sriwijaya University Agriculture (2022)

We can see the state of the physical characteristics of the soil in the soil from the results of the analysis of the physical properties of the soil in the laboratory starting from*bulk density*and also the total pore space of the soil. Anatara*bulk density*with the total pore space of the soil has a relationship where if*bulk density*high, the total pore space will be low. For the density of the soil, it can be seen from the state of its bulk density, the denser the soil, the higher the value of the bulk density. For indicators that change in bulk density in the form of organic matter, texture to structure and water content also affect the value of the bulk density (Noorhasanah*et al.*, 2019).

Score*bulk density*the highest is found in material B with a value of 1.01 g/ $cm_3$and for value*bulk density*the lowest is in 1ahan C with a value of*bulk density* that is equal to 0.91 g/cm_3, while for the value of*bulk density*property of 1hold A is 0.98 g/cm_3. Then, for the value of total soil pore space with the highest percentage found on land C with a percentage of 66% and for the value of the other two lands it is not much different from the smallest on land B with 62% for land A having a total soil pore space value of 64%. The difference in the value of each land is due to differences in land management. Starting from the treatment to the processing of the land given to the land. Besides

In addition, other soil physical characteristics can also cause differences in values such as soil texture and structure. Score*bulk density*and the total pore space of this soil we need to know so that we can determine the management of each of these lands later.

4.2.2. Soil Permeability

Soil permeability is defined as the ability of the soil to pass water. There are several aspects to be able to increase the rate of soil infiltration including structure, texture and organic matter. Low soil permeability will reduce the infiltration rate and vice versa. The permeability results can be seen in table 4.2.

Table 4.2. Results of Permeability Analysis in the laboratory

Land (0 – 30cm)	Planting Time	Permeability (cm/minute)	Criteria
A land	24 October 2O21	0.46	Slow
B land	17 October 2O21	0.92	Slightly Slow
C land	10 October 2O21	0.48	Slow

Source: *Analysis of the Physics Laboratory, Soil and Water Conservation Department of Soil Faculty Sriwijaya University Agriculture (2022)

Based on the results of the permeability analysis in the laboratory, the results vary from slow to fast. This permeability criterion is obtained from the comparison of time with the volume of water that comes out. Of the three lands that have been observed in this study have different permeability values. Land B has a rather slow criterion with a permeability value of 0.92 cm/minute and land A has a permeability value of 0.46 cm/minute with a slow permeability criterion while for land C has a slow permeability criterion with a permeability value of

0.48 cm /minute. With the differences in terms of land management so that the differences in soil texture and structure make a difference in the value of permeability in each land.

4.2.3. Soil Texture

Soil texture is defined as the relative ratio of the primary soil fraction (clay, dust and sand) expressed as a percent (%). In addition, soil texture can also be interpreted as the union of the three soil fractions, namely sand, clay and dust. Soil texture is included in the physical properties of the soil, so that it allows us to determine it in the field by feeling it, but to get the accuracy of the results, we should do the determination by analysis in the laboratory.

This can be seen in table 4.3.

Table 4.3. Texture Analysis Results in the Laboratory

Land (0 – 30 cm)	Planting Time	Texture Fraction			Class Texture
		%Sand	%Dust	%clay	
A land	October 24, 2021	21.2	37.2	41.6	clay
B land	October 17, 2021	29.2	39.2	31.6	Clay look
C land	October 10, 2021	24.4	34	41.6	clay

Source: *Analysis of the Physics Laboratory, Soil and Water Conservation Department of Soil Faculty Sriwijaya University Agriculture (2022)

* * USDA Based Texture Class

The results of laboratory analysis for this soil texture have different values in each land for the texture class itself, it is found that there are two classes, namely clay and clayey clay. For the percentage of the texture fraction is divided into three namely sand, dust and clay. Land A has a value of 21.2%, 37.2%, 41.6% with a clay texture class and land B has a percentage value of 29.2%, 39.2%, 31.6% with a clay texture class while for land C has a value of 24.4%, 34%, 41.6% with clay texture class. Soils with coarse textures have less water resistance than those with fine textures, therefore soils with a sand texture are more likely to dry out than soils with clay or clay textures. For plant growth, soil conditions are in a state of excess or

Lack of water will affect the plants, besides that it also affects the availability of soil nutrients where the clay or clay texture will have a large surface area which makes water resistance higher and can provide higher nutrients compared to sand texture (Arisandy, 2010). 2012)

4.3. Hydrological Conditions of Research Land

A state of the water system in a land ranging from water use, conditions to water quality in a land is called hydrological conditions. At the stage of hydrological conditions, there are two aspects that need to be studied, namely the groundwater level and the water level in the canal. Observations of these two aspects were carried out manually every day using measuring instruments in the field, namely Wels pipe and Piskal boards.

4.3.1. Water Level in Channel

Observation of the water level in the channel is carried out starting on December 19, 2021 in each land until the land enters the harvesting period. To observe the water level in this channel, it is done manually with the help of a piscal board installed in the tertiary channel of the land that we will observe. The results of observations of channel water levels in delta 8 of Telang Jaya village, Muara Telang district can be seen from Figure 4.4.

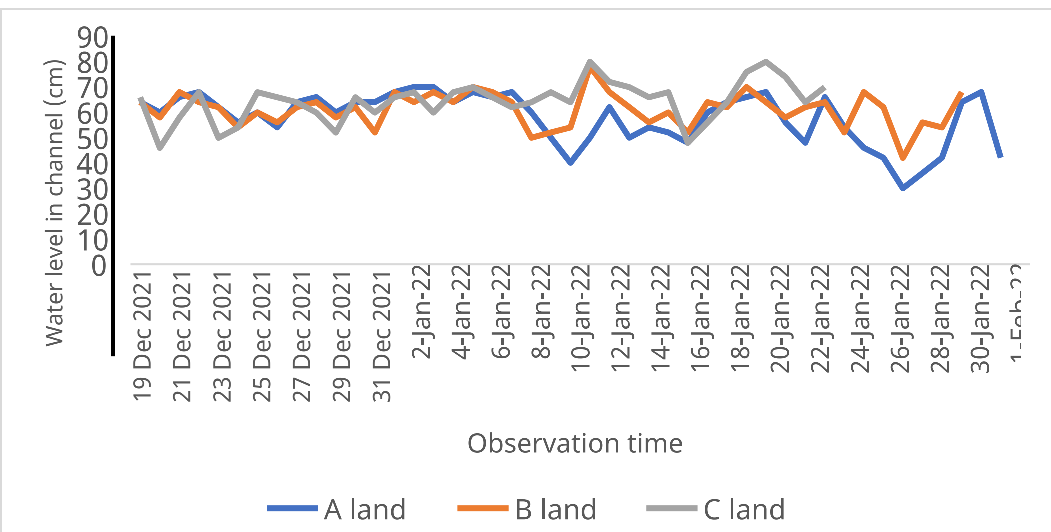


Figure 4.4. The dynamics of the water level in the channel

Based on the picture above, it can be seen how the dynamics of the water level in each channel are observed. This observation is carried out every morning starting from December 19, 2021 until the harvest period for each land. The dynamics of the water level in this channel have changes which can be seen in Figure 4.4. Changes in high and low water levels in this channel are caused by several aspects ranging from rainfall, climate and so on. Swamp areas at the tertiary level of water dynamics will be influenced by several aspects, namely the operation of water systems, the condition of the water system, drainage potential, tidal overflow potential, land hydrotopography and the amount of rainfall (Syarifudin and Destania, 2019). For 24-hour observation of the water level in the channel can be seen from Figure 4.5.

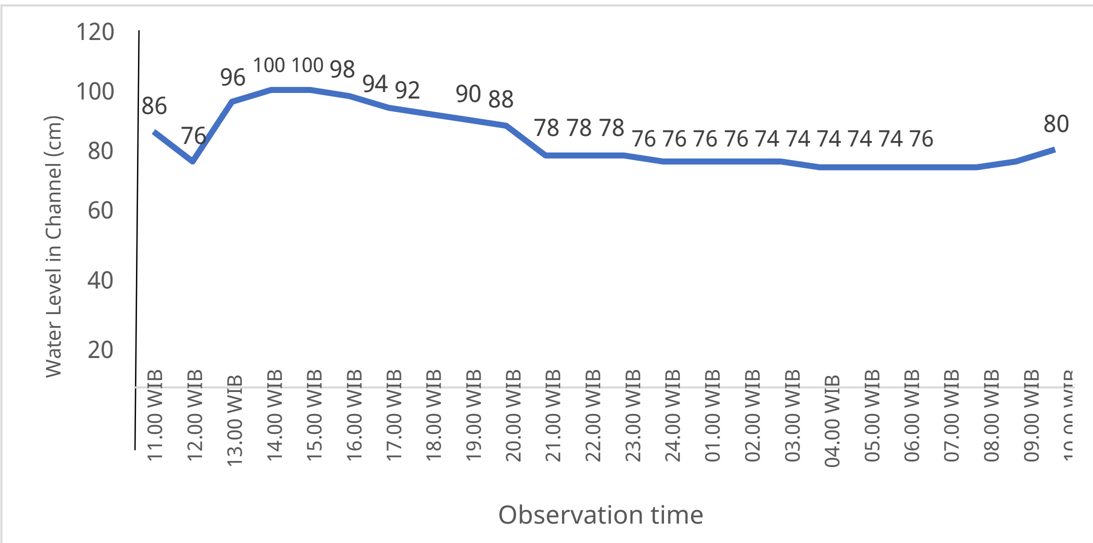


Figure 4.5. 24 Hours Observation of Water Level in Channel

This 24-hour observation was carried out to determine how and when the highest water level was high tide and low tide in the tertiary channel. For this observation time, starting from January 23, 2022 at 11.00 WIB until 10.00 WIB on January 24, 2022. From the picture above, it can be seen that the peak height of the tide is at a height of 100 centimeters at 2 - 3 pm and the lowest low tide is at an altitude of 74 centimeters during 4 a.m. to 8 a.m.

4.3.2. Ground water level

Observation of groundwater level fluctuations is carried out starting on December 19, 2021 until the land is harvested. To observe the groundwater level, the monitoring well observation method uses a wells pipe that is installed on the land to be observed. The results of observations of groundwater and canal water levels in delta 8 Telang Jaya village, Muara Telang district can be seen in Figure 4.6.

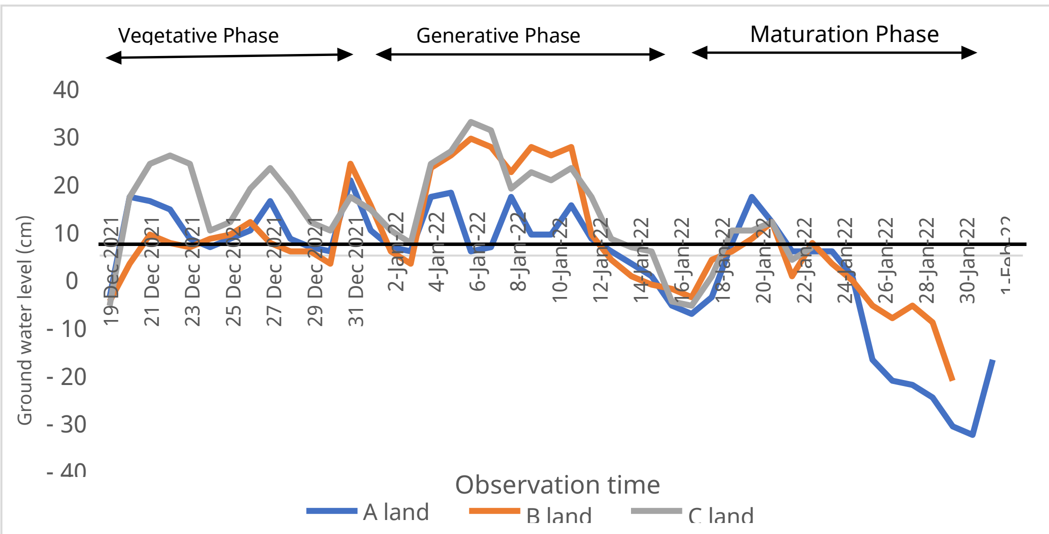


Figure 4.6. Ground water level fluctuation

Figure 4.6 shows the state of groundwater level fluctuations in each observed rice field. This observation was carried out every morning using a Wels pipe planted in rice fields. The way this groundwater level measurement works is by inserting a bamboo slat into the pipe until it touches the water and then measuring the distance between the water to the end of the pipe, then subtracting the distance from the soil to the top of the pipe. The result of this reduction is the result. ground water level. This change in ground water level is influenced by several things, especially the aspect of rainfall which provides a significant aspect. In supporting national food security, tidal swamp land can be used as an agricultural production area with great potential.

and besides that human resources need to be developed to a certain extent to support a balanced increase. Groundwater control activities are one of the efforts to improve these functions and objectives (Hasanudin, 2015). For 24-hour ground water observations, it can be seen from Figure 4.7.

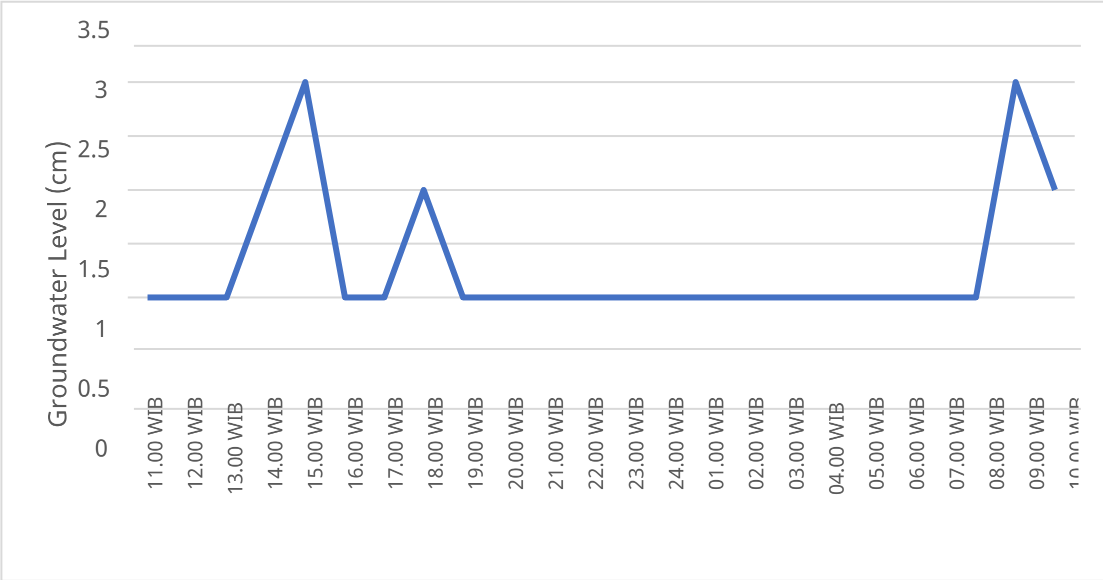


Figure 4.7. 24-Hour Groundwater Observation

This 24-hour observation was carried out to determine whether there was a change in the ground water level in the paddy fields. For this observation time, starting from January 23, 2022 at 11.00 WIB until 10.00 WIB on January 24, 2022. From the picture above, for 24 hours it did not change too much, only about 1 or 2 cm, even overall it was at a height of 1 cm.

4.4. Water System Operation

We can use tidal swamp land to its full potential if we pay attention to the condition of the water system, which continues to run well. In the cultivation of tidal swamp land, the thing that is highly regulated is the drainage system and water irrigation. The basic need for sustainable agricultural cultivation is to pay attention to the characteristics of the tidal swamp land water system. In addition, land can be said to be good or bad, it can be seen from the water as the main factor in the evaluation. Therefore, we need to pay attention to the facilities and infrastructure of the drainage system and irrigation of tidal swamp land. Drainage is a system to regulate water disposal and irrigation is a system to regulate water distribution. These two aspects are always related to each other in the process of managing water systems, we can adjust water discharge as we want by using irrigation and drainage systems, especially in agricultural cultivation in tidal swamp land. This is because the tidal swamp land has a water level that is always changing along with the tides and ebbs of sea water. To fulfill this, we need to pay attention to macro and micro water systems and the use of sluice structures and sluice gate operations.

Telang Jaya Village is a tidal swamp area of typology C, which means that the tides, both large and small tides, only affect the water level in the tertiary channel. The water system network is divided into two, namely macro and micro water systems, macro water systems consist of primary and secondary channels and micro water systems are divided into tertiary channels, quarter channels and worm channels. The water system in Telang Jaya Village uses the concept of one-way water flow (*one way flow system*) which means that the process of tidal water from the river flows in one direction to the primary channel leading to the secondary rural channel (SPD) then flows into the tertiary channel and begins to be divided into each plot of land. Due to this research area the tides only reach the level of the tertiary channel, we need a tool to enter water into the plot of land by using a water pump machine. The mechanism for using this water pump is used when water is being installed at the new tertiary level and is entered into the plot of land as needed. When the water recedes from the tertiary channel it will go to the main drainage channel (SDU) which will end up in the primary channel until it returns to the river.

4.4.1. Micro Water Management

Micro water system network, which is a division of waterways on a smaller scale, generally this water system is at the level of farmer management. This micro water system is divided into several types of channels, namely tertiary channels, quaternary and worm channel. Tertiary channel (TC) is a channel that serves as a liaison between the village supply channel (SPD) and the main drainage channel (SDU) and a link to each rice field plot. The tertiary channel has a length of approximately 800 meters with a distance between the tertiaries of about 200 meters. In one secondary channel it can cover 16 tertiary channels and each tertiary can cover 16 hectares of rice fields. Each tertiary channel is built with a sluice gate with alternate and translucent systems. When the tertiary channel is directly connected to the village supply channel (SPD), the other end of the channel is not directly connected to the main drainage channel (SDU) and vice versa. The appearance of the tertiary channel in the area can be seen in Figure 4.8.

Figure 4.8. Tertiary Channel in Telang Jaya Village, Muara Telang District, District Banyuasin

A quarter channel is a channel that functions to channel water from a channel that taps water from a tertiary channel to be divided into each of the rice fields served by each of the quarter canals. With the existence of this quarter channel, it is easier for us to divide and regulate water needs in each rice field. The length of this quarter channel is about 200 meters with the distance between the quarter channels generally being around 200 meters. For the appearance of the quarter channel can be seen in Figure 4.9.

Figure 4.9. Picture of Quaternary Channel in Telang Jaya Village, Muara Telang District
Banyuasin Regency

Worm channels are channels that are formed longitudinally or crosswise in each plot of rice fields. Worm channels serve as a way for farmers to carry out pest control, fertilization applications and so on. The distance between the worm channels is about two meters, this is done in order to make it easier for farmers in processing later and it is made so based on the distance range of farmers who generally use spray tanks for pesticide applications with a reach on the left and right of one meter. The appearance of the worm channel in this area can be seen in Figure 4.10.

Figure 4.10. Pictures of Worm Channels in Telang Jaya Village, Muara Telang District
Banyuasi District

4.4.2. Sluice Operation

Sluice gate operation is one of the water system network systems that functions as a door for the entry and exit of water. As the name implies, the way this floodgate works is that it can be opened and closed like a door in general. If we want to enter water we only need to open it or for we want to remove the water and we will close to hold and throw water. So, with this floodgate operation, we can adjust the amount of water needed according to our wishes. In this research area there are several types of sluice gates ranging from valve sluice gates, swan neck sluice gates and sliding sluice gates. For water pump operation during periodic planting can be seen in table 4.4.

Table 4.4. Sluice Operation

Land	Month	Information
A land	October	Open
	November	1 Open 1 Close
	December	1 Open 1 Close
	January	1 Open 1 Close
B land	October	Open
	November	Open
	December	Closed
	January	1 Open 1 Close
C land	October	Open
	November	Open
	December	1 Open 1 Close
	January	1 Open 1 Close

In table 4.4 it can be seen that the operation of the sluice gate has changed for four months. In this research area, a goose-neck type of sluice gate is used, where each sluice has two parallel pipes with a size of 8 inches. For the process of opening or closing this sluice by directing it up to close and releasing it or directed it to the side to open this sluice. By using this goose-neck sluice building, farmers can regulate the rate of water entering and leaving as desired.

4.4.3. Water Pump Operation

The operation of this water pump is a process of entering water from the tertiary channel to the paddy field by using a tool in the form of a water pump machine for its own use, which is used when the tide occurs at the tertiary level.

Table 4.5. Water Pump Operation

Land	Pump Usage	Operation time
A land	Not	-
B land	Yes	October 10, 2021
		October 15, 2021
		October 24, 2021
		01 November 2021
C land	Yes	08 October 2021
		October 18, 2021

The use of water pumps on this land can be seen in table 4.5. This water pump operation is used when the land is experiencing a water shortage. To do this water pumping it takes time when the tertiary channel has a tide so that the amount of water that we can pump can be maximized. In one pumping it takes about 3-4 hours and for the fuel used is diesel and one pumping requires about 4 liters of fuel.

4.5. Rice Cultivation First Season (MT1)

The farming system in Telang Jaya Village, Muara Telang District, Banyuasin Regency is included in the optimal category which in a year on average this area can do three planting seasons. Starting from rice plants for the first and second 4 months to continue with corn plants for the last 4 months. In the effort of farming in this area, starting from land processing, planting, fertilizing, maintaining to the harvesting process. Land management and water management systems are the main keys in production on tidal agricultural land. Integrated farming is needed in the farming system in wetlands, especially in the management of micro-water systems and land which is a key factor for the success of farming in wetlands (Rahmi*et al.*,2015).

4.5.1. Soil Cultivation

Soil tillage is a process in which there is a change in the state of the soil, whether it is loosened or softened, either with the help of agricultural machinery such as plows or by manual equipment such as hoes and harrows pulled with various sources of energy such as animal power, human power, and agricultural machinery. . Through this process, the soil surface will be stirred, thus allowing sunlight and air to penetrate the soil deeper and can increase its fertility. However, if the soil is treated too often, it will reduce its fertility level, especially if it is not accompanied by fertilization of the soil.

Table 4.6. Soil Cultivation

Land	Tillage System	Time
A land	Piracy	October 24, 2021
B land	Piracy	October 13, 2021 October 16, 2021
A land	Piracy	07 October 2021

Tillage systems in general vary according to the land and various other aspects. For management in this area can be seen in table 4.6. Land B at the stage of land processing uses a plowing tillage system. The plowing process uses agricultural machinery in the form of a tractor, which during land preparation is carried out twice, but before plowing the land, the farmers usually burn the remaining land from the previous planting season. For land B, land preparation was carried out a week before planting, namely on October 13, 2021 and October 16, 2021. For the other two lands, one plowing was carried out about three days before planting.

4.5.2. Planting Preparation

Planting preparation is a process that we need to do before we plant, starting from determining the variety of seeds, the number of seeds needed, surveying the price of seeds to determining the planting time. The mini-plant preparation process is very important to do because it will affect the results that we will find later if we are wrong in choosing the seeds we will plant or being late in determining the planting time will greatly affect our production results later. That's why we really need to pay attention to planting preparation. For planting preparations used can be seen in table 4.7.

Table 4.7. Planting Preparation

Land	Varieties Seed	Number of Seeds	Seed Price	Planting Time
A land	Inpari 33	47 kg	Rp. 65.000/kg	October 24 2021
B land	Inpari 33	47 kg	Rp. 65.000/kg	October 17 2021
C land	Inpari 33	47 kg	Rp. 65.000/kg	October 10 2021

From table 4.7 it can be seen that each land has an area of one hectare which will later be planted with Inpari 33 rice. Rice seeds before planting will be soaked for a day and night. For one land requires about 47 kg of rice seeds with a seed price of Rp. 65,000/kg. The method of planting in each of these fields is direct seed sowing (TABELA). The planting time of each land is different depending on the processing of the land. Land A will be planted on October 24, 2021, B on October 17, 2021 and for land C, planting will be on October 10, 2021.

4.5.3. Rice Plant Maintenance

Plant maintenance is the treatment of plants and their environment so that plants grow healthy and normally through weeding, weeding, replanting, fertilizing and eradicating pests and diseases.Fertilizer is a material that contains one or more plant nutrients which, if given to plants, can increase plant growth and yield. While fertilization is the process of adding one or more plant nutrients that are available or can be available into the soil or plants to maintain the fertility of the existing soil in order to support high production yields. This maintenance must be done regularly and structured so that we can prepare everything needed and wanted as quickly as possible. The fertilization system can be seen in table 4.8.

Table 4.8. Fertilizer Application

Land	Fertilizer Type	Amount Fertilizer	Fertilizer Price	Time Fertilization
A land	Urea and Phonska	100 kg Phonska dan 100 kg Urea	IDR 540,000 Phonska/50kg and IDR 560,000 Urea/50kg	25 and 50 HST
B land	Urea and Phonska	100 kg Phonska dan 150 kg Urea	IDR 540,000 Phonska/50kg and IDR 560,000 Urea/50kg	25, 45 and 70 HST
C land	Urea and Phonska	100 kg Phonska dan 100 kg Urea	IDR 540,000 Phonska/50kg and IDR 560,000 Urea/50kg	25 and 45 HST

In this study, each land was fertilized twice in one planting period. The fertilizer used is also the same in each field, namely Phonska and urea fertilizers, only the amount of fertilizer dosage is different in each land. Land B has more applications than the other two lands. In general, in one growing season using a dose of fertilizer as much as 400-800 kg and given gradually as much as 2 times. For the application method itself, it is spread evenly to each rice field.

Pest control is the process of controlling organisms or nuisance creatures called pestspest because it is considered harmful to health economic, ecological or human . Pest control is carried out at least the same as the time of cultivationagriculture This is because farmers need to defend their crops from pests in order to maximize production yields. Pests that appear on agricultural land are influenced by several factors ranging from land characteristics, climate, weather and many others. So with the difference in planting time from each land will affect the pests that appear so uniformity in planting and harvesting times needs to be done so that the spread of pests can be emphasized. For activities related to pest control, see table 4.9

Table 4.9. Pest Control

Land	Type Pest	Control	Type Pesticide	Pesticide Price	Time Application
Land A	Caterpillar, Mold and planthopper	Use Pesticide	Ammate 150 EC, Antracol 70Wp Kojo 300 SC	Rp.130.000/100 ml Ammate, IDR 100,000/liter Kojo dan IDR 240,000/kg Antracol	17, 30 and 70 HST
Land B	Caterpillar, Mold and planthopper	Use Pesticide	Ammate 150 EC, Antracol 70Wp Kojo 300 SC	Rp.130.000/100 ml Ammate, IDR 100,000/liter Kojo dan IDR 240,000/kg Antracol	17, 30 and 60 HST
Land C	Caterpillar, Mold and planthopper	Use Pesticide	Ammate 150 EC, Antracol 70Wp Kojo 300 SC	Rp.130.000/100 ml Ammate, IDR 100,000/liter Kojo dan IDR 240,000/kg Antracol	17, 30 and 70 HST

In the time span of this study, there were various types of pests ranging from caterpillars, fungi to planthoppers so in this case we need to control these pests so that production can be maximized. The control that is usually done by farmers in this village is by spraying pesticides on the land about 4 -7 days before fertilization. with different time of application of fertilization so that the time of application of pesticides is also different, generally in one periodic planting as much as 2-3 times of application. The types of pesticides used tend to be the same because the types of pests that attack are also the same.

However, if we are late in harvesting with others, it will make the number of pests that attack more because we are the only ones left, so the importance of uniformity of planting and harvesting times in each planting season.

Table 4.10. Sluice Operation per Rice Plant Growth Phase

Phase	Land	Door Operation
Vegetative	A land	Open all
	B land	Open all
	C land	Open all
Reproductive	A land	1 Open 1 Close
	B land	Open all
	C land	Open all
Maturation	A land	1 Open 1 Close
	B land	Close all
	C land	1 Open 1 Close
Harvest	A land	1 Open 1 Close
	B land	1 Open 1 Close
	C land	1 Open 1 Close

We need to pay attention to the operation of the floodgate during periodic rice cultivation, so that we can regulate the water needs for rice cultivation later. For observations can be seen in table 4.10. We have to regulate the operation of the floodgates for each phase of plant growth starting from the vegetative, reproductive phase to the maturation phase. Due to each phase the amount of water needed in the paddy fields is different. In the early to mid vegetative phase, the reproductive phase requires a lot of water.

Meanwhile, during the final reproductive phase until maturation, the amount of water needed is not too much. On each land using a swan neck sluice building which is placed in a tertiary channel as many as two pipes per sluice building. When this operation is carried out, there are three possible conditions for the swan- neck sluice gate, namely, all open, all closed and one open and the other closed. Each phase of plant growth will require different water requirements so that the existence of this floodgate operation can make it easier for farmers to regulate the amount of water entering and leaving. If farmers want to hold water in tertiary canals, the floodgates must be closed and vice versa. Meanwhile, if you want to slow down the rate of water entering or leaving, only one paralon pipe is opened. If farmers want to hold water in tertiary canals, the floodgates must be closed and vice versa. Meanwhile, if you want to slow down the rate of water entering or leaving, only one paralon pipe is opened. If farmers want to hold water in tertiary canals, the floodgates must be closed and vice versa. Meanwhile, if you want to slow down the rate of water entering or leaving, only one paralon pipe is opened.

4.5.4. Harvest

Harvesting is the process of collecting mature plants from the fields. In addition, harvesting is a form of moving plants from where they are grown to a safer location for processing, consumption, or storage. In this harvesting activity, local residents will help with the cost of harvesting around Rp. 400/kg. After harvesting, the farmers immediately sell their harvests to sellers so that later profits will be found during this growing season by reducing the yield of all costs during cultivation from land preparation to harvesting with production profits from rice cultivation in the first planting season (MT1). For a general description of harvesting activities in each land, see table 4.11.

Table 4.11. Advantages of rice cultivation in the first planting season (MT1)

Land	Cost Whole	Results Harvest	Price Sell per kg	Results Production	Profit Clean	Time Harvest
Land A	Rp. 13,905,000	7.6 tons	Rp. 4,500	Rp. 34.200.000	Rp. 20,295,000	02 February 2022
Land B	Rp. 16,101,000	8.9 tons	Rp. 4,600	Rp. 40,940,000	Rp. 24,299,007	31 January 2022
Land C	Rp. 15,201,000	8.34 tons	Rp. 5,000	Rp. 41,700,000	Rp. 26,499,000	24 January 2022

Harvesting activities for rice cultivation in Telang Jaya village have used agricultural machines commonly called combine harvesting machine farmers so that in the harvesting process it is more practical where the results that come out of the machine are already grains of rice. Meanwhile, the profit for farmers in one harvest season reaches tens of millions of rupiah. For the selling price at any time it always changes as the situation can be cheaper or more expensive. Generally, farmers in this area sell grain in a wet state not in dry milled grain (GKG), which means that rice from the time of harvest is immediately sold, it does not have to be dried again, it's just that the selling price will be cheaper than dry milled grain (GKG).

4.6. Analysis of the Relationship between Water Level in Channels and Groundwater. Correlation analysis is a statistical method used to determine

a quantity that states how strong the relationship of a variable with other variables is without questioning whether a certain variable depends on other variables. This relationship analysis was conducted to determine the strength of the relationship between one variable and another. On this occasion there are several variables that we will look at the relationship between the water level of the canal and the ground water level. To find out the relationship using a simple linear regression correlation method. Analysis of the relationship between the canal water level and the ground water level was carried out from observations of water levels in canals and soil from December 19, 2021 to February 1, 2022, 45 data were found for each variable.

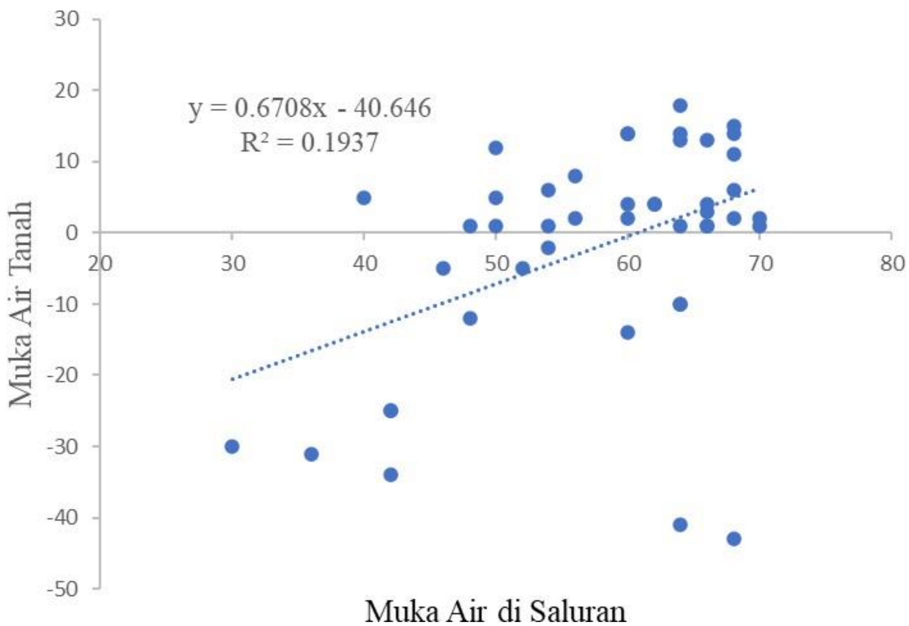


Figure 4.11. Water Level Regression Test in Channels with Groundwater Level

Based on Figure 4.11 that there is a relationship between the water level in the channel and the ground water level with a fairly strong level of relationship. The dynamics of the water level in the channel and the groundwater table can be seen in Figure 4.12.

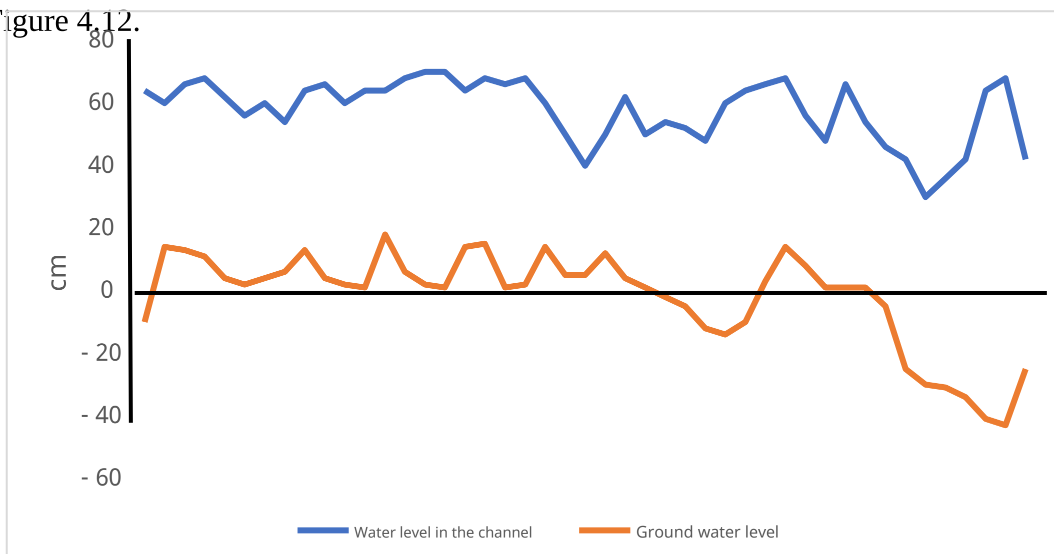


Figure 4.12. Dynamics of Water Level in Channels and Groundwater Level

The correlation value between x and y is 0.440 and the coefficient of determination is 0.174 or 17.4%. The significance value < alpha = 0.005, so it can be concluded that there is a significant effect. The water level in the channel is influenced by each unit of groundwater level increase, it can raise the water level in the channel by
0.466. The variation in the amount of water level rise in the channel can be explained by the large percentage of water level of 17.4% while the rest is explained by other factors.

4.7. Data analysis*Surplus Excess Water*(SEW – 20) and Rice Growth SEW

-20 is the sum of the groundwater table with a depth of -20 cm for rice cultivation and is expressed in cm per day. This method is used to evaluate the status of water in the soil. Growth is a process of increasing physical size and body structure that can be measured in units of length, weight and so on. In observing the growth of rice plants, two variables were observed, namely plant height and the number of tillers of rice plants.

4.7.1. Data analysis*Surplus Excess Water*(SEW – 20)

SEW -20 is the sum of the groundwater table with a depth of 20 cm for rice cultivation and is expressed in cm per day.

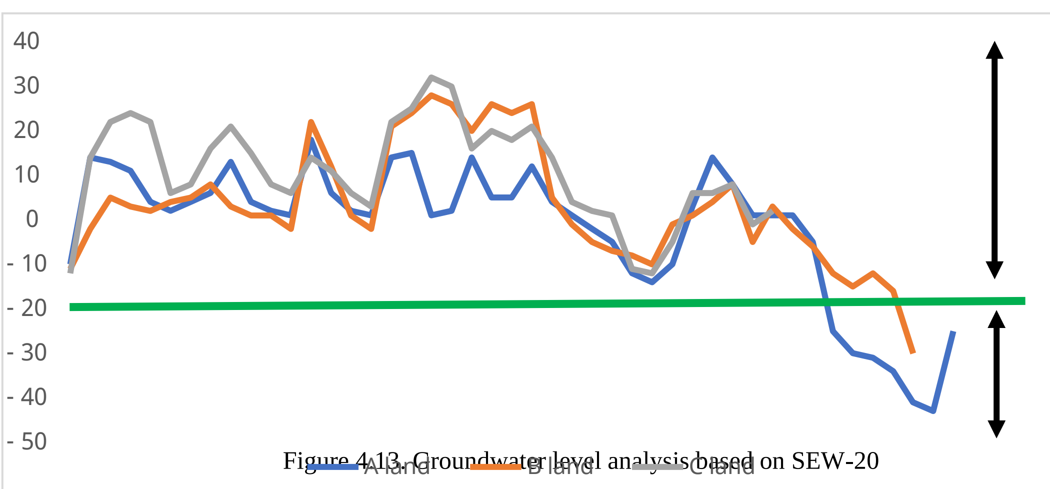


Figure 4.13. Groundwater level analysis based on SEW-20

The number -20 cm is used as an indicator of rice plants to determine the lack or excess of water by using the root zone concept approach. This method is used to evaluate the status of water in the soil. To view the SEW – 20 data, it can be seen from Figure 4.13. Groundwater level analysis based on SEW-20 in Figure 4.13. shows the dominant groundwater level at numbers above -20 cm, this indicates that the water level on the land still shows normal and safe numbers for the growth of rice plants and the amount of water available on the land can be met and the land is not in a state of water shortage during cultivation of rice crops in the first planting season.

4.7.2. Rice Plant Growth

Growth is a process of increasing physical and body size that we can measure. For rice plants in this study, two variables will be measured, namely plant height and the maximum number of tillers which will be measured every two weeks. For the average plant height growth can be seen from table 4.12.

Table 4.12. Average height of rice plants

X	A land	B land	C land
2 MST	22.1	22.6	24.2
4 MST	29.7	31.6	31.7
6 MST	35.7	36.4	35.1
8 MST	38.7	40.7	39.2
10 MST	54.4	60.8	58
12 MST	60.9	70.3	67.2
14 MST	64.0	73.3	69.3

The height of this rice plant is measured every two weeks and for each field about 20 plants are taken, where each field is taken as a representative of rice to be measured with an area of 1 m x 1 m so that the plants measured for each week do not change. For plants with the highest mean, it is found on land B with the last height is 73.3 cm and the other land has the last height of 64 cm and 69.3 cm. In addition, measurements of the number of tillers in rice plants were also carried out.

Table 4.13. Average number of rice tillers

X	A land	B land	C land
2 MST	4	4	4
4 MST	5	5	5
6 MST	10	11	11
8 MST	20	25	24
10 MST	23	28	28
12 MST	27	32	31
14 MST	31	35	35

For data - the average number of tillers can be seen from table 4.13. The number of tillers of this rice plant is measured every two weeks and for each field about 20 plants are taken, where each field is taken as a representative of rice to be measured with an area of 1 m x 1 m so that the plants measured for each week do not change. The plants with the highest mean were found on lands B and C with the same final height, namely 35 tillers and the other land belonging to land A had 31 tillers.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusion

The conclusions that can be drawn from this research are as follows:

1. The physical characteristics of each land have different values. For the highest bulk weight found in land B with a value of 1.01 gr/cm3and the lowest on land C with a value of 0.91 gr/cm3. The highest porosity is found on land C with a value of 66% and land with the lowest porosity is on land B with a value of 62%. The permeability value of land A has a rather slow criterion with a permeability value of 0.92 cm/minute, land B has a permeability value of 0.46 cm/minute with a slow criterion and for land C has a fast permeability criterion with a value of 14.94 cm/minute. . In this research land, two texture classes were found, namely land B with clayey clay texture class while the other two lands had clay texture classes.
2. Water management systems need to be implemented to support rice cultivation activities, starting from door operations or water pump operations and water level connections in canals have a strong enough effect on groundwater levels.

5.2. Suggestion

Setting the planting schedule in each season should be paid more attention to. so that farmers can prepare everything that is needed more maturely. Water management in tertiary canals must be more disciplined, especially in terms of the time to open or close the channel door so that the water needed by rice plants can be fulfilled optimally so that rice crop yields can reach the target. Farmers must also be compact to carry out harvesting at the same time, because if there is land that is late in harvesting, its production will decrease because pests in the land that have been harvested will attack the remaining land.

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Appendix 1. Condition of the Water System


Figures 1 and 2. Primary channel at high and low tide in Telang Jaya Village, Kec. estuary
Telang District. Banyuasin


Figures 3 and 4. Secondary channel at high tide and low tide in Telang Jaya Village, Kec. estuary
Telang District. Banyuasin


Figures 5 and 6. Tertiary channel at high and low tide in Telang Jaya Village, Kec. estuary
Telang District. Banyuasin

Continued Appendix 1. Condition of the Water System


Figures 1 and 2. Quaternary canals and wormholes in Telang Jaya Village, Kec. estuary
Telang District. Banyuasin


Figures 3 and 4. Gooseneck sluice gates are closed and open in the village
Telang Jaya District. Muara Telang Kab. Banyuasin


Figures 5 and 6. Water pumps in Telang Jaya Village, Kec. Muara Telang Kab. Banyuasin

Appendix 2. Activities in the Field

Figures 1 and 2. Installation of wels pipe and piscal board

Figures 3 and 4. Observation of water level in canals and groundwater level

Figures 5 and 6. The completion of the goose-neck sluice

Continued Appendix 2. Activities in the Field

Figures 1 and 2. Sampling of intact and incomplete soil

Figures 3 and 4. Observation of the number of tillers and height of rice plants

Figures 5 and 6. Interviews with farmers in Telang Jaya Village, Kec. estuary
Telang District. Banyuasin

Appendix 3. Data on Observation of Canal Water Level

Daily Monitoring of Water Level in Channels

Date	Land A	B land	C land	Date	Land A	B land	C land
19 Dec 2021	64	64	66	12-Jan-22	62	68	72
20 Dec 2021	60	58	46	13-Jan-22	50	62	70
21 Dec 2021	66	68	58	14-Jan-22	54	56	66
22 Dec 2021	68	64	68	15-Jan-22	52	60	68
23 Dec 2021	62	62	50	16-Jan-22	48	52	48
24 Dec 2021	56	54	54	17-Jan-22	60	64	56
25 Dec 2021	60	60	68	18-Jan-22	64	62	64
26 Dec 2021	54	56	66	19-Jan-22	66	70	76
27 Dec 2021	64	62	64	20-Jan-22	68	64	80
28 Dec 2021	66	64	60	21-Jan-22	56	58	74
29 Dec 2021	60	58	52	22-Jan-22	48	62	64
30 Dec 2021	64	62	66	23-Jan-22	66	64	70
31 Dec 2021	64	52	60	24-Jan-22	54	52	HARVEST
1-Jan-22	68	68	66	25-Jan-22	46	68	-
2-Jan-22	70	64	68	26-Jan-22	42	62	-
3-Jan-22	70	68	60	27-Jan-22	30	42	-
4-Jan-22	64	64	68	28-Jan-22	36	56	-
5-Jan-22	68	70	70	29-Jan-22	42	54	-
6-Jan-22	66	68	66	30-Jan-22	64	68	-
7-Jan-22	68	64	62	31-Jan-22	68	HARVEST	-
8-Jan-22	60	50	64	1-Feb-22	42	-	-
9-Jan-22	50	52	68	2-Feb-22	HARVEST	-	-
10-Jan-22	40	54	64				
11-Jan-22	50	78	80				

Appendix 4. Groundwater Level Observation Data

Daily Observation of Groundwater Level

Date	Land A	B land	C land	Date	Land A	B land	C land
19 Dec 2021	- 10	- 11	- 12	12-Jan-22	4	5	14
20 Dec 2021	14	- 2	14	13-Jan-22	1	- 1	4
21 Dec 2021	13	5	22	14-Jan-22	- 2	- 5	2
22 Dec 2021	11	3	24	15-Jan-22	- 5	- 7	1
23 Dec 2021	4	2	22	16-Jan-22	- 12	- 8	- 11
24 Dec 2021	2	4	6	17-Jan-22	- 14	- 10	- 12
25 Dec 2021	4	5	8	18-Jan-22	- 10	- 1	- 5
26 Dec 2021	6	8	16	19-Jan-22	3	1	6
27 Dec 2021	13	3	21	20-Jan-22	14	4	6
28 Dec 2021	4	1	15	21-Jan-22	8	8	8
29 Dec 2021	2	1	8	22-Jan-22	1	- 5	- 1
30 Dec 2021	1	- 2	6	23-Jan-22	1	3	2
31 Dec 2021	18	22	14	24-Jan-22	1	- 2	HARVEST
1-Jan-22	6	12	11	25-Jan-22	- 5	- 6	-
2-Jan-22	2	1	6	26-Jan-22	- 25	- 12	-
3-Jan-22	1	- 2	3	27-Jan-22	- 30	- 15	-
4-Jan-22	14	21	22	28-Jan-22	- 31	- 12	-
5-Jan-22	15	24	25	29-Jan-22	- 34	- 16	-
6-Jan-22	1	28	32	30-Jan-22	- 41	- 30	-
7-Jan-22	2	26	30	31-Jan-22	- 43	HARVEST	-
8-Jan-22	14	20	16	1-Feb-22	- 25	-	-
9-Jan-22	5	26	20	2-Feb-22	HARVEST	-	-
10-Jan-22	5	24	18				
11-Jan-22	12	26	21				

Appendix 5. Data on Observation of Rice Plant Height

X	P1	P2	P3
2 MST	20 20 23 22 23 23 23 25 22 23 22 22 21 21 24 24 18 21 19 24 25 23 23 20	25 23 23 27 26 24 18 21 23 21 22 21 24 25 28 18 23 22 22 19 21 24 22 22 23	22 28 27 24 22 24 24 24 26 27 26 28 23 21 23 25 28 26 22 19 26 22 23 23
4 MST	30 29 29 31 29 34 31 28 29 31 31 27 27 31 35 27 27 34 29 28 31 28 31 27	31 28 31 36 35 31 28 30 29 30 31 31 28 28 36 34 29 30 31 30 34 39 33 33 36	27 29 32 27 28 32 28 33 32 36 35 35 29 30 31 28 36 32 31 30 36 33 36 36
6 MST	34 33 34 36 34 40 38 33 36 39 41 37 34 35 36 31 32 39 37 37 33 35 38 35	33 35 38 30 38 35 35 36 33 36 33 34 38 34 38 37 35 35 34 40 39 43 42 40 40	37 34 33 31 37 32 37 37 32 30 38 35 33 36 31 34 38 32 34 41 36 40 40 36
8 MST	38 39 35 39 36 40 40 40 37 39 42 38 39 41 38 37 39 44 38 39 37 36 39 39	37 36 39 39 39 40 37 49 40 35 38 46 39 41 40 39 41 36 39 39 48 43 42 48 49	38 32 32 37 38 41 39 37 39 39 39 36 40 35 38 41 41 39 39 39 37 48 49 49
10 MST	49 59 48 51 52 57 47 52 39 63 51 50 56 59 56 57 55 63 57 54 60 59 56 57	60 59 56 57 56 63 62 75 60 60 52 64 61 58 58 60 65 52 61 66 61 65 67 61 62	50 57 52 57 50 60 54 62 57 57 56 60 60 60 55 58 58 55 61 65 57 61 62 68
12 MST	54 61 50 57 56 58 54 55 51 67 55 61 65 61 65 60 63 67 67 67 68 71 68 62	68 71 68 62 64 64 63 81 65 67 62 70 65 64 73 66 66 73 66 68 83 78 77 84 91	61 65 62 60 57 67 67 68 72 63 64 71 65 67 62 64 73 65 65 68 69 84 79 76
14 MST	55 63 56 61 62 61 55 56 53 68 62 62 66 64 69 61 66 70 71 69 72 81 69 65	72 81 69 65 65 65 68 86 67 72 68 72 68 66 74 69 74 68 67 70 90 83 83 87 85	62 67 63 61 59 70 69 74 74 65 65 74 67 72 65 67 74 66 67 70 63 87 85 79

Appendix 6. Observation Data on Number of Tillers of Rice Plants

X	P1	P2	P3
2 MST	6 5 6 4 5	6 6 4 4 6	4 5 5 4 5
	5 6 5 4 5	2 5 5 3 5	6 5 6 5 4
	5 4 5 5 8	5 3 3 3 6	6 5 3 5 5
	4 3 3 4 5	5 4 5 5 5	2 6 6 5 5
	6 6 4 4	4 5 6 6 6	6 6 6 3
4 MST	7 6 7 5 6	7 7 5 5 7	4 5 6 5 5
	6 7 6 6 6	4 4 6 5 6	7 6 7 5 5
	5 4 6 6 9	6 5 4 3 7	7 6 5 5 6
	5 4 6 6 6	6 4 6 6 6	3 7 7 6 5
	7 7 5 5	6 5 6 7 8	7 7 8 4
6 MST	8 14 10 9 8	11 12 10 11 10	10 10 9 9 10
	12 9 10 12 11	12 14 8 10 11	12 9 12 9 11
	11 10 9 13 10	12 14 9 12 11	10 10 10 11 12
	9 9 13 10 9	8 10 9 11 10	12 11 11 11 10
	11 12 10 11	19 13 17 20 15	10 20 15 19
8 MST	11 21 15 18 15	18 24 24 27 20	20 24 14 28 17
	18 16 15 15 17	28 23 28 26 24	19 27 25 28 27
	24 20 25 23 17	19 18 28 23 22	20 20 26 24 25
	28 19 22 21 27	24 23 25 27 23	23 22 27 27 23
	18 24 24 27	34 30 31 36 34	25 36 34 35
10 MST	12 25 18 22 18	21 27 27 28 25	25 29 16 32 20
	20 21 17 18 22	34 29 32 31 24	23 32 31 30 28
	29 26 30 26 20	21 21 31 28 22	23 22 31 24 28
	32 23 26 25 32	27 24 32 29 24	27 22 34 29 24
	21 31 27 29	40 31 35 39 38	29 39 38 39
12 MST	18 29 23 26 22	26 28 28 32 31	30 35 20 39 26
	25 28 21 24 27	39 36 38 35 24	23 31 36 37 30
	35 30 36 33 27	24 21 36 31 28	25 26 35 24 34
	37 29 26 29 21	28 27 37 31 26	31 28 39 31 26
	25 37 28 29	40 37 39 40 43	33 40 43 40
14 MST	23 32 28 29 25	32 31 33 36 35	34 39 26 42 31
	31 33 25 28 33	42 40 41 35 28	25 35 39 41 36
	37 36 38 36 31	28 26 37 34 32	25 31 35 28 38
	41 31 29 31 25	32 32 40 33 31	36 34 41 33 31
	32 37 33 30	44 41 43 46 45	38 46 37 42

Appendix 7. Laboratory Analysis Results Data

Permeability analysis data in the laboratory

Land	Q(ml)	L(cm)	t (minutes)	h(cm)	A (cm_2)	Permeability (cm/minute)	Information
A land	110	5	11.00	5.5	19,625	0.46	Slow
B land	110	5	5.53	5.5	19,625	0.92	Slightly Slow
C land	110	5	10.45	5.5	19,625	0.48	Slow

Information : Q = Water discharge, L = Sample thickness, t = Time, h = Water level, A = Cross-sectional area Source :
*Analysis of Physics Laboratory, Soil and Water Conservation Department of Soil, Faculty of Agriculture
Sriwijaya University (2022)

Data analysis of bulk density (BD) and total pore space (RPT) of soil

Land	BC (g)	BR (g)	BTB (g)	BTK (g)	PD (gr/cm_3)	Vring (gr/cm_3)	BTBM (g)	BTKM (g)	BD (gr/cm_3)	RPT (%)
Land A	51.49	61.88	263.91	209.88	2.65	98,125	150.54	96.51	0.98	64
Land B	39.88	61.66	255.27	201.34	2.65	98,125	153.73	99.80	1.01	62
Land C	39.53	61.34	246.05	191.5	2.65	98,125	145.18	90.18	0.91	66

Note: BC = Weight of the cup, BR = Weight of ring, BTB = Weight of wet soil, BTK = Weight of dry soil, PD = Potential density, Vring = Ring volume, BTBM = Weight of absolute wet soil, BTKM = Weight of absolute dry soil, BD = Bulk density, RPT = Total pore space

Source : *Analysis of Physics Laboratory, Soil and Water Conservation Department of Soil, Faculty of Agriculture
Sriwijaya University (2022)

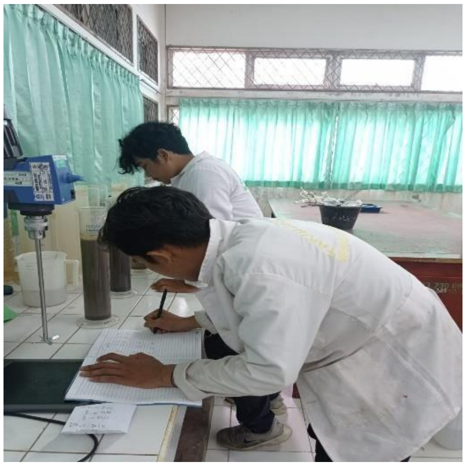
Texture analysis data in the laboratory

Land	R1	T1	R2	T2	%Sand	%clay	%Dust	Information
Land A	37	26	18	27	21.2	41.6	37.2	clay
Land B	33	26	13	27	29.2	31.6	39.2	Clay look
Land C	35	26	18	27	24.4	41.6	34	clay

Description: R1 = First reading, R2 = Second reading, T1 = Time of first reading, T2= Second reading time

Source : *Analysis of Physics Laboratory, Soil and Water Conservation Department of Soil, Faculty of Agriculture
Sriwijaya University (2022)
* * USDA Based Texture Class

Appendix 8. Activities in the Laboratory




Figures 1 and 2. Analysis of soil texture in the laboratory


Figures 3 and 4. Analysis of bulk density and total soil pore space

Figures 5 and 6. Analysis of soil permeability in the laboratory

Appendix 9. Rice Plant Growth Phase


Figures 1 and 2. The Vegetative Phase of Rice Plants


Figures 3 and 4. Reproductive Phase of Rice Plants


Figures 5 and 6. Maturation Phase of Rice Plants

Appendix 10. Rice Harvesting Process


Figures 1 and 2. Rice Plants Ready to Harvest


Figures 3 and 4. Rice Harvesting Process with Combine Harvester Machine


Figures 5 and 6. Harvesting Results of Rice Plants

Appendix 11. Simple Linear Regression Correlation Test

TEST CORRELATION OF WATER LEVEL IN CHANNELS WITH GROUNDWATER LEVELS

PERCENT OF MOMENT PRODUCTS

1. DETERMINING THE HYPOTHESIS

Ho = There is no relationship between the canal water level and the ground water level = There is a
H1 relationship between the canal water level and the ground water level

2. CALCULATE DATA

No	X	Y			XY
1	64	- 10	4096.00	100.00	- 640.00
2	60	14	3600.00	196.00	840.00
3	66	13	4356.00	169.00	858.00
4	68	11	4624.00	121.00	748.00
5	62	4	3844.00	16.00	248.00
6	56	2	3136.00	4.00	112.00
7	60	4	3600.00	16.00	240.00
8	54	6	2916.00	36.00	324.00
9	64	13	4096.00	169.00	832.00
10	66	4	4356.00	16.00	264.00
11	60	2	3600.00	4.00	120.00
12	64	1	4096.00	1.00	64.00
13	64	18	4096.00	324.00	1152.00
14	68	6	4624.00	36.00	408.00
15	70	2	4900.00	4.00	140.00
16	70	1	4900.00	1.00	70.00
17	64	14	4096.00	196.00	896.00
18	68	15	4624.00	225.00	1020.00
19	66	1	4356.00	1.00	66.00
20	68	2	4624.00	4.00	136.00
21	60	14	3600.00	196.00	840.00
22	50	5	2500.00	25.00	250.00
23	40	5	1600.00	25.00	200.00
24	50	12	2500.00	144.00	600.00
25	62	4	3844.00	16.00	248.00
26	50	1	2500.00	1.00	50.00
27	54	- 2	2916.00	4.00	- 108.00
28	52	- 5	2704.00	25.00	- 260.00
29	48	- 12	2304.00	144.00	- 576.00
30	60	- 14	3600.00	196.00	- 840.00
31	64	- 10	4096.00	100.00	- 640.00
32	66	3	4356.00	9.00	198.00
33	68	14	4624.00	196.00	952.00
34	56	8	3136.00	64.00	448.00
35	48	1	2304.00	1.00	48.00
36	66	1	4356.00	1.00	66.00
37	54	1	2916.00	1.00	54.00
38	46	- 5	2116.00	25.00	- 230.00
39	42	- 25	1764.00	625.00	- 1050.00
40	30	- 30	900.00	900.00	- 900.00
41	36	- 31	1296.00	961.00	- 1116.00
42	42	- 34	1764.00	1156.00	- 1428.00
43	64	- 41	4096.00	1681.00	- 2624.00
44	68	- 43	4624.00	1849.00	- 2924.00
45	42	- 25	1764.00	625.00	- 1050.00
Total	**2600**	**- 85.00**	**154720.00**	**10609.00**	**- 1894.00**

Note:
X = Water level in channel Y =
Ground water level

3. CALCULATE PRODUCT MOMENT CORRELATION

$$R = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{(n\sum (X)^2 - (\sum X)^2)(n\sum (Y)^2 - (\sum Y)^2)}}$$

X	2600
Y	- 85.00
XY	- 1894.00
X²	154720.00
Y²	10609.00
(ΣX)²	6760000
(ΣY)²	7225.00
R =	0.44011532

4. DETERMINING CRITERIA

If r-count < r-table = Ho is accepted If r-count > r-table = Ho is rejected

5. DETERMINING r-table

Significant level 0.05

df = n- 2 =	43
r-table	0.294

6. COMPARE r-table AND r-count

0.440 > 0.294 = Ho rejected

CONCLUSION

There is a relationship between the water level in the channel and the ground water level

Interval Koefisien	Tingkat Hubungan
0,80 – 1,000	Sangat Kuat
0,60 – 0,799	Kuat
0,40 – 0.599	Cu[illegible]
0,20 – 0,399	
0,00 – 0,199	

r-count = 0.440 with a fairly strong relationship level

SUMMARY OUTPUT

Regression Statistics		
Multiple R	0.440115	the correlation value between x and y is 0.440
R Square	0.193701	
Adjusted R Square	0.17495	coefficient of determination 0.174 or 17.4%
Standard Error	13.99715	
Observations	45	

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regression	1	2023,879 2	23,879 10,	33013 0.00	2483 43
Residual		8424,565	195.9201		
Total	44	10448.44			

significance value < alpha = 0.005 so it can be it is concluded that there is a significant influence significant

	Coefficients	*ndard Err*	*t Stat*	*P-value*	*aut hority 95%*	*oper 95%*	*we 95.0%*	*pper 95.0%*
Intercept	- 40.6462	12.2379	2 -3.32134	0.001834	-65.3264	-15.9661 -	5.3264 -	5.9661
X Variable 1	0.670	0.208709	3.214051	0.002483	0.249899	1.091702	0.249899	1.091702

regression equation

y=a+bx y=b0+b1x

y=-40,646+0,670x

r2=0.174=17.4%

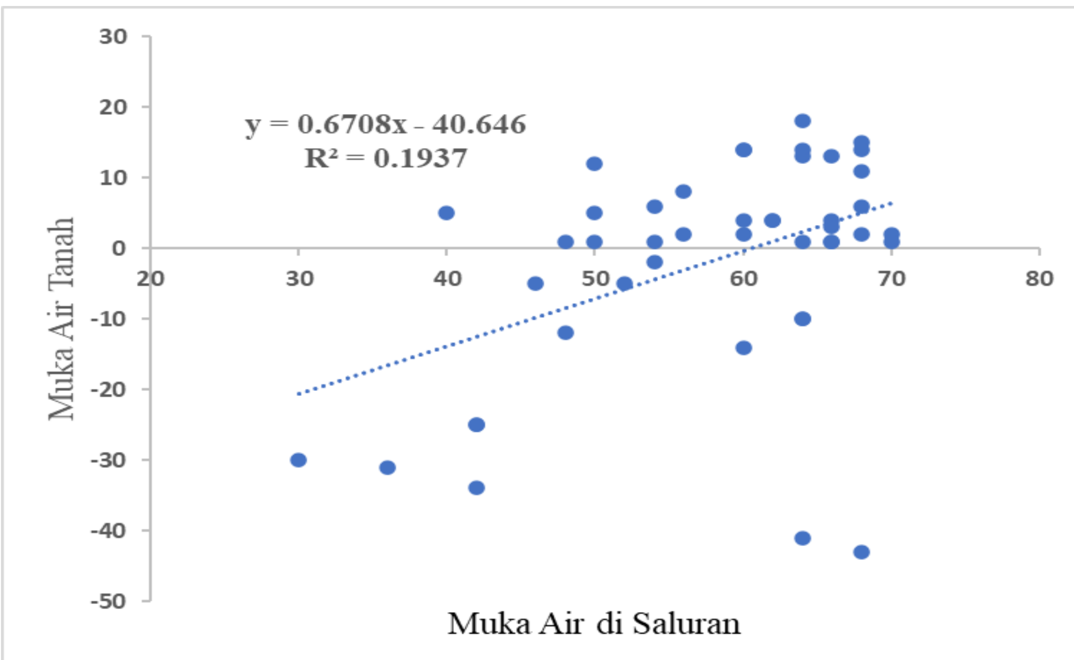
Which means that if X is 0 then Y is 3.909

X is positive so the effect is positive between variable X and variable Y, when X increases by 1 then Y will increase by 0.466

Interpret

The water level in the channel is affected by every one unit increase in the groundwater level, it can raise the water level in the channel by 0.466

The variation in the amount of water level rise in the channel can be explained by the large percentage of water level of 17.4% while the rest is explained by other factors outside the model.



Appendix 12. 24 Hours Observation of Water Level in Channels and Soil

24-hour Observation of Water Level in Channel

Time observation	Water level (cm)	Observation time	Water level (cm)
11.00 WIB	86	23.00 WIB	78
12.00 WIB	76	24.00 WIB	76
13.00 WIB	96	01.00 WIB	76
14.00 WIB	100	02.00 WIB	76
15.00 WIB	100	03.00 WIB	76
16.00 WIB	98	04.00 WIB	74
17.00 WIB	94	05.00 WIB	74
18.00 WIB	92	06.00 WIB	74
19.00 WIB	90	07.00 WIB	74
20.00 WIB	88	08.00 WIB	74
21.00 WIB	78	09.00 WIB	76
22.00 WIB	78	10.00 WIB	80

24-Hour Groundwater Observation

Time observation	Water level (cm)	Observation time	Water level (cm)
11.00 WIB	1	23.00 WIB	1
12.00 WIB	1	24.00 WIB	1
13.00 WIB	1	01.00 WIB	1
14.00 WIB	2	02.00 WIB	1
15.00 WIB	3	03.00 WIB	1
16.00 WIB	1	04.00 WIB	1
17.00 WIB	1	05.00 WIB	1
18.00 WIB	2	06.00 WIB	1
19.00 WIB	1	07.00 WIB	1
20.00 WIB	1	08.00 WIB	1
21.00 WIB	1	09.00 WIB	3
22.00 WIB	1	10.00 WIB	2