Optimization Of Implementation Of System Irrigation For Improving Agricultural Results In Cepu-Blora

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Abstract- The productivity of agricultural products in Cepu decreases in 2015 -2016 per hectare by an average of 5 tons with the management cost per hectare of 8.6 million rupiah, especially irrigation, which applies electric and diesel pumps during one season, the cost of fuel oil and electric pulse is 4.6 millions of rupiah, the condition is caused by the pattern of irrigation network application has a resistor related to the availability of water and technical management of both wet and dry land has not been optimal, based on the problem the irrigation network model needs optimal assessment, to fulfill the increasing need of irrigation water, one alternative is done the application of an efficient model of irrigation networks with the consideration of knowing the water requirements of both wet and dry crops calculates the existing water discharge as a system of applying the appropriate and efficient pattern of water distribution of irrigation. To fulfill the water needs of the ground and the river water use plants for irrigation is greatly enhanced witches by farmers, by providing the resources (human, equipment, materials) available, optimal modeling of the irrigation system is required. The main objectives of the study to be achieved are 1). Knowing the applied irrigation system, 2). Knowing the crops of agriculture in the last two years. 3). Knowing the availability of water. As a reference to optimization and broader development of irrigation networks in accordance with the availability of water in each farmer's rice fields. The method of the study is quantitative descriptive method that is designed to collect data, by surveying the field to find out the existing irrigation network model, water discharge, crop water requirement, harvested yield. Sampling was conducted by quota sampling all rural of each 3 (three) farmers in 17 (seventeen) villages total sample 51 people who were considered able to represent the farmers. The survey result showed that 17 (seventeen) villages in Cepu there are nine villages which implements irrigation technical and semi technical means such as Ngadon, Jipang, Kapuan, Ngeloram, Nglanjuk, Sumber Pitu, Getas, Kentong and Mernung average debit is 0,020 M3 / second farmer area average 0,50 ha. The results showed that 9 (nine) villages implemented technical irrigation by utilizing underground water as irrigation network in each plot of farmer land there was one village applying an irrigation network of open tapping channel from the river. The results showed that there were 8 (eight) villages with rain-fed irrigation system. Farmers harvested in Cepu from 17 villages on average of 2.35 tons in 2015 and 2.33 in 2016 average land area of 0.5 ha. Types of irrigation networks covered by 0.42 m3 / min average water discharge able to win the average land of 0.5 ha for 40 hours (two days) of water flowing into rice fields, planting pattern with SRI method applying 2/10 to achieve optimal and efficient results water usage

Keywords: *Irrigation System, Rice Field, Agricultural Product*

1. Introduction

A. Background of The Study

Cepu, Regency Blora has many natural resources, especially Natural Gas as state income which has been running 55 years, while the existence of agriculture is less attention that impacts agricultural productivity is not optimal which resulted in high price of staple goods in Cepu (Nariyo, 2014)

The need for food as one of the strategic role of agricultural sector is a task that is not light so that, Blora Regency Government placed rice, corn, soybeans, become main food commodity which is given special attention in achieving sustainable self-sufficiency target, so action is needed to reach the target.

Irrigation network as a medium to fulfill the needs of agricultural water requires to be managed effectively and efficiently, one way to manage the underground water and the river water is utilized optimally. It needs the right system in its application such as underground water with pumps which is distributed to rice fields according to its capacity. The water from the river, needs to be applied by making the open channel of either dry or wet land created with water catchment by using gravity system, that can flow through rice fields with the calculating discharge technique and the needs of water on the plant according to the growing season and the plant species which is developed optimally. By the application of irrigation networks which considers the aspect of water availability, the application of sustainable irrigation systems is more evisien by gravity method requires a big role of farmers in achieving such technology with the help of the academics and related institutions. (M.Bisri, Titah Andalan N P, 2009)

Irrigation networks are needed by farmers who need the resources (human, equipment, materials) available. To place resources, a model is needed that affects the implementation of systematic irrigation utilization in a systematic manner, so it can predict the course of the program.

The productivity of agricultural products tends to decrease in 2015 -2016 per hectare by the average of 5 tons with the management cost per hectar 8.6 million rupiah special irrigation utilization of electric pumps during one season cost 4.6 million. The condition is caused by pattern of application of irrigation network which has resistor related availability water and technical management of both wet and dry areas that has not been optimal. Based on these problems, the irrigation network model needs an optimal assessment. To fulfill the increasing of irrigation water needs, one alternative is to apply the efficient model of irrigation network with the consideration of knowing the water needs of the good crop wet or dry land counts the existing water discharge as an appropriate and efficient irrigation system. (Hariyanto, Augustine N, 2014)

B. Limitation of The Study

The timitations of the study as follows are:

a. 17 villages in Cepu and each represents 5 farmers who have wet and dry land
b. The type of irrigation applied
c. Water source used by irrigation
d. Water debit of irrigation network
e. Yields of corn, soybeans and rice in Cepu.

C. The Objectives of The Study

Based on the formulation of the above problems, this study aims to:

a. Know the number of irrigation networks that have been applied.

b. Know the availability of water that can be applied to irrigation

c. Improve farmers' crop yields in Cepu

d. Apply the irrigation network model according to the needs of planting

e. Increas the irrigation use on dry and wet lands

D. Research Hypothesis

a. Given the number of irrigation networks in Cepu.

b. Given the availability of water applied for irrigation

c. There is a harvest obtained by farmers

E. Output of The Study

Table 1. Output of The Study

No	Kinds of Output	Accomplishment Indicators
1	Scientific Publications in the National Journal	National Journal Magazine
2	Teaching materials	Irrigation And Water Building Material Modules

2. Literature Review

A. Definition of Irrigation System

Irrigation in general is an activity related to efforts to obtain water to support agricultural activities such as rice fields, fields or plantations. Its effort involves the making of irrigation facilities and infrastructure, namely in the form of buildings and channel networks to carry and divide the water regularly to the irrigation boats which are then used for the needs of the plants themselves (Effendi Pasandara and Donald C. Tylor 2007)

The effort of water supply has eight uses as follows:

1. Adding water into the soil to provide enough water for plant growth.
2. Providing the harvest guarantees during short dry season.
3. Cooling the soil and atmosphere, so it creates a good environment for environmental growth.
4. Reducing the danger of freezing.
5. Reducing or washing the salt in soil.
6. Reducing the danger of soil erosion.
7. Softening the piracy and clumps of soil.
8. Delaying shoot formation.

B. Types of Irrigation System

There are 4 kinds of irrigation systems that we use, which system selection will be used depends on topography, cost and existing technology. (Effendi Pasandara and Donald C. Tylor 2007)

The four kinds of irrigation systems are:

1). Gravitational Irrigation (Oven gravitation Irrigation)

This system is an irrigation system that utilizes the gravity of the earth for its water drainage. The water flows from a high place to a lower place because of the influence of gravity. The types of irrigation systems that include gravity irrigation systems are:

a. Illegal puddle irrigation

The water flows through the paddy field through a regulating building. This type of irrigation includes:

1) Irrigation of lebak land (lebak land is lower along the river) irrigation of lebak land at the time of big water (after rain) , the water is abundant and filled the river. When the water at low tide, it will be little leftover water left.
2) Flood irrigation
   Basically its principle is same with the irrigation of lebak land, it is just in this flood irrigation the plain beside the river is not lebak's plain, so it needs the floodgates. This door is opened when the river flood. The flood can flow through the side of river plains. When the water begins to recede, the door is closed so the water does not return to the river.
3) Tidal irrigation
   This irrigation system utilizes tides from sea water to irrigate rice field water. Unlike with the tidal irrigation pool, this tidal irrigation can be fully controlled. At the time of the tide, it is expected that the fresh top layer of water can fulfill the needs of the land at low tide the drainage process.

b. Irrigation pool from channel

Giving and disposal of water can be fully controlled, both its large and its time. These types include:

1) Irrigation pool
   Used for plants that requires a lot of water (eg rice). The system is cheap in its operation, but the water used is very much and tends to be wasteful.
2) Border strip irrigation
   This type of irrigation is very good for tobacco, corn and so on. In this type of irrigation, it is cultivated that the land is not too sloping so the water is quickly descended, it needs a bush between to accelerate the flow.
3) Box irrigation (basin irrigation)
   This type of irrigation is used for plantations.

c. Flow and wave irrigation

The water is passed through the grooves on the side of the row of plants.

The number of groove depends on:

1) Types of soil
2) Tilt
3) Type of plant

The rate of flow should not be too large to avoid scouring.

2). Sub-Irrigation (subsurface Irrigation)

The soil is flooded beneath its surface. The water is streamed through the channels that exist on the side of the rice field plot. Due to the presence of this water, the groundwater level on the rice fields will rise. Then groundwater will reach root area capillary. Thus the plants will get water. Here are some requirements that must be fulfilled:

a. The top soil layer has a high permeability.
b. The ground layer is stable and waterproof at a depth of 1.5 to 3 meters.
c. The surface of the ground is very flat
d. Good quality water and low salt content.
e. The regulatory organization works well.

3). Closed Gravitation Irrigation

In this system, the water will be streamed through the pipeline, then sprayed to the ground surface with the power of the water pump machine. This system is more efficient than the way gravity and underground irrigation.

4). Trickle Irrigation

The water of irrigation is streamed through pipelines and dropped directly in the root areas of plants. This irrigation also uses a water pump machine as a driving force. The differences with closed gravitation irrigation are:

a. The tertiary pipe goes through the tree.
b. The required pressure is small, since it is only dropped with one field pressure evenly. (Abdul Usman, Yusman S, Kuntjoro, Nunung Kusnadi, 2014)

C. Data for Planning the Irrigation

There are some data needed in planning the irrigation:

1) Rainfall Data.
   They are required to determine rainfall. The plan is in irigation area.
2) Evapotranspiration Data
   Data on evapotranspiration is needed to determine the extent of plant evaporation. The data required for this calculation are temperature, relative humidity, sunlight, wind, etc.
3) Topographic Data
   Topographic maps are required to see contour or elevation lines at the study sites of irrigated areas.
4) Geotechnical Data
   Soil mechanics data is needed in the form of properties and characteristics of soil at the site. (Prayudi Ardianto, 2014)

D. Irrigation Network

Based on the regulation, measurement of water flow and the complete facilities, irrigation networks can be divided into 3 (three) levels, namely:

1. Nontechnical
2. Technical Semi
3. Technical

The differences from the above irrigation network classifications are based on the main building, the ability to manage and measure discharge, channel network shape, tertiary plot development, overall efficiency, and size. (Dept.Pek.Umum, 2008)

In the context of this irrigation standardization, only technical irrigation is reviewed. This is more advanced form of irrigation and it is suitable to be practiced in most irrigation projects in Indonesia. In the irrigation network, it can be distinguished the existence of four main functional elements, namely:

a. The main buildings (head works) where water is taken from the source, generally rivers or reservoirs
b. The carrier network, in the form of channels that drain irrigation water to tertiary plots
c. Tertiary plots with water distribution systems and collective irrigation drainage systems are distributed and channeled into fields and excess water stored in a sewage system inside the tertiary plot.
d. Drainage system outside of the irrigation area is used to dispose of excess water over river or natural channels.

1). Nontechnical Irrigation

In the projects of water allotment are not measured or regulated, the plantiful water will flow into the sewers. Water users are belong to the same group and no government involvement is required in the organization of this irrigation network. Water supply is usually abundant and slopes range from medium to steep. Therefore, it is hardly necessary to have a difficult technique for water distribution.

The simple network is easy to organize but has serious flaws. The disadvantages are the first of which there is a waste of water and because in general these networks are located in high areas, the wasted water is not always able to reach the more fertile lower areas. Second, there are many intercepts that cost more from the population because each village creates its own network and take-off. Because the building is not a permanent building then its age may be short. (M.Bisri, Titah Andalan N P, 2009)

2). Semiteknis Irrigation

In most cases, the only difference between a simple irrigation network and a semitechnical network is that the dam is located in the river complete with the uptake and measuring building downstream. There may also be some permanent buildings in the channel network. The water distribution system is usually similar to a simple network.

It is likely that retrieval is used to serve a wider area than a simple network service area. Therefore the cost is borne by more service areas. The organization is more complicated and if the permanent building takes the form of a river-taking it will require more involvement from the government. (M.Bisri, Titah Andalan N P, 2009)

3). Technical Irrigation

One of the principles in technical network planning is the separation between irrigation networks and disposal networks. This means that both irrigation and drainage channels work in accordance with their respective functions from base to tip. The irrigation channel drains irrigation water to the rice fields and the drainage channels drain more water from the rice fields to the natural waste ditches which will then dump them into the sea.

Tertiary plots occupy a central function in the technical irrigation network. Tertiary plot area is maximum 150 ha. The distribution of water in tertiary plots is left to the farmers. The tertiary and quartz streams the water into the fields. The excess water is accommodated in a tertiary and quartile droplet network and is then fed to the primary discharge tissue.

The technical irrigation network based on the above principles is the most efficient method of water distribution by taking into account the times of declining water supply and agricultural needs.

The technical network allows for the measurement of flow, the distribution of irrigation water and the discharge of water more efficiently. If tertiary plots only obtain water in one place from the main carrier network, this will require less number of buildings in the primary canal, better exploitation and cheaper maintenance than if each farmer is allowed to take water himself from the carrier network. Errors in water management in tertiary plots will also not affect water sharing on the main network.

The advantage that can be gained from this combined network is the utilization of water which is more economical and the cost of making the channel lower because the carrier channel can be made shorter with a smaller capacity.

The disadvantages are that such networks are more difficult to manage and exploit, more quickly damaged and exposed uneven distribution of water. Certain buildings within the network will have properties such as weirs and are relatively expensive. (Sri Baroroh A.Y, 2009)

3. Research Methodology

A. Location and Time of The Study

The research location is in Cepu, an agricultural area that partially utilizes underground water and part of Solo river for irrigation channel. The survey location can be seen at (Table 3.1) during the planting season I and II of 17 villages were taken 17 (Seventeen) Villages each of which implements irrigation and does not apply irrigation.

Table 2. Area of Wetland District of Cepu

No	Villages	Land		No	Villages	Land	
		Rice field (ha)	Dry			Rice Field (ha)	Dry
1	Ngadon	124,54	61,99	11	Tambakromo	214,27	527,73
2	Ngeloram	307,00	81,00	12	Nglanjuk	103,00	41,00
3	Cabean	389,00	76,00	13	Balun	94,14	347,00
4	Kapuan	102,00	148,00	14	Cepu	16,92	229,09
5	Jipang	107,06	85,24	15	Ngelo	9,41	73,53
6	Getas	121,74	156,26	16	Karangboyo	15,93	314,07
7	Sumberpitu	54,64	58,36	17	Ngeroto	40,87	96,13
8	Kentong	155,00	110,00				
9	Mernung	98,39	241,61				
10	Mulyorejo	117,76	194,25				
Total						**2,072,36**	**2,842,17**

Data Source: BPN Kab. Blora 2014

B. Materials and Tools

The materials needed are: pipe, stationery such as paper, ink, computer. The tools used is the measurement of discharge (mecanical flowmeter UR 400), stop watch, meter.

C. Method of Collecting Data

Method of collecting data in this study used survey method, and only use primary data, that is data collected from farmers that directly related. The type of data needed is: (Sugiono, 2005)

a. The irrigation network model.
b. Availability of water resources
c. Debit flow
d. Area of managed area
e. Harvest Results 1 year last

The direct interview to fill out the questionnaire given after the survey of 17 villages was taken by all irrigated villages according to the criteria established by applying irrigation, each represented 10 peasants as for the number of respondents who apply the irrigation of each village 10 peasants, able to represent the farmer as for the data entry (see attachment 1).

D. Method of Analysing Data

Method of analysing data uses statistical and empirical model that already exist that are: (Sugiono, 2005)

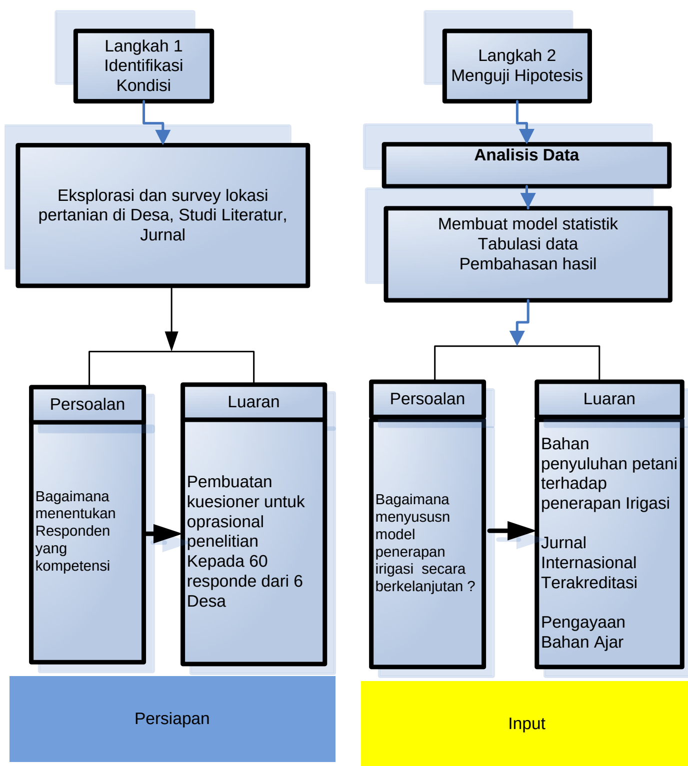
a. Permiting the Irrigation Network applied
b. Calculating the availability of water that does not permit Irrigation
c. Calculate the flow discharge of each Irrigation
d. Calculate average farmer yield, lowest and highest yield
e. Make tabulation of each data
f. Analysis of water requirements during land-treatment using methods as proposed by Van de Goor and Ziljstra (1968) as follows

IR = M: ek / ek - 1
M = Eo + P
k = MT / S
With
IR = water requirements for land treatment (mm / day)
M = water requirement to replace water losses from evaporation and percolation in saturated fields (mm / day)
Eo = potential evaporation (mm / day)
P = percolation (mm / day)
k = constant
T = processing period (days)
S = water requirement for saturation (mm)
E = exponent number: 2.7182
7. To analyze the availability of water to the application of irrigation networks
Q1 = (H X A) / T x 10,000
Q2 = Q1 / 86.400 x 1 / ((1-L))
Is known

Q1 = Daily water requirement in field / rice field (m3 / hr)
Q2 = Daily water requirement at entrance door (m3 / sec)
H = High inundation (m)
A = Area of rice field (ha)
T = watering interval (days)
L = Loss of water in field / rice field and channel

E. Flow Chart of Research

Flowchart of research for the Flow of activities, this study starts from looking at the situation in the field, looking for literature such as books, journals and peper. Then examines the problems in Cepu about the irrigation network which is not optimal yet. The next step is to take the irrigation network data that have been utilized how big is produced. Then conducting interview with farmer related to the farm result, the data obtained are tabulated, analyzed according to the description of the field, and give conclusion and recommendation according to the results of the analysis, then the results are prepared in the research report.



Picture 1: Flow Chart of Research

4. Research Result And Discussion

The results of research and discussion of farmers who apply irrigation networks based on a survey in 17 (seventeen) Village sub-district Cepu

A. Analysis of Respondents (Farmers)

Descriptive analysis conducted on the respondents that is the farmers, this research aims to know the characteristics of respondents. The identity of the respondents revealed in this study include: education, location of respondents. The full identity of the respondents is shown in Appendix 1. The following is an overview of the respondent's identity.

1). Last Education

Here is the distribution of research respondents based on recent education

Table 3. Distribution of farmers respondents by level of education
Farmer Education Percent

Education	Farmer	Percent
Elementary School	30	35.3
Junior High School	29	34.1
Senior High School	19	22.4
D3	1	1.2
S1	6	7.1
Total	85	100.0

The result of this research shows that most of the farmers have elementary education as many as 30 respondents (35.3%) have education up to S1 and the least are respondents who have D3 education that is 3 farmers (1,2%)

2). Age of Respondents

Table 4. Distribution of farmers respondents by Age Level
Age Group of Farmers Percent

Group of Age	Farmer	Percent
15 – 25	0	0,00
26 – 35	4	4,71
36 – 45	18	21,18
46 – 55	34	40,00
>56	29	34,12
Total	85	100.00

Source: Primary data processed, 2017

The results showed that most of the farmers aged 46 - 55 years (32.94%) of the data showed the level of experience in land management is quite high as 6 respondents of farmers aged 15-25 years (07.06%) the data shows the role of society in the management of agricultural land decreased, data that have p respondents who have D3 education that is as much as 3 farmers (1,2%)

3). Farming Experience

Table 5. Distribution of farmers respondents Based on Farmers Experience level

Farming Experience	Farmer	Percent
Low (1 – 10 th)	8	9,41
Average (11 – 20 th)	36	42,35
High (>20 th)	41	48,24
Total	85	100

Source: Primary data processed, 2017

The result of the survey showed that small farmers with low experience of 8 personnel (9.41%) showed that the level of experience in low land management was 36 (42.35%) of farmers with moderate experience, year (48.24%) the data show the experience of the community in the management of agricultural land is very high

B. User Analysis Irrigation Network and Water Debit

Survey mechanism with questionnaires and direct interviews on 17 (Seventeen) Villages of each village were taken 3 respondents with considerations representing farmers data obtained by farmers who apply irrigation both technically and semi-technical survey results obtained results measurement of free intake measurement, water discharge at door of clay taking table below:

Villages	**Kinds of Irrigation**	***Water Debit*** **m^3/menit**	***Land area*** **ha**
Ngadon	Semi Technical	0,045	0,33
Jipang	Technical	0,058	0,58
Kapuan	Semi Technical	0,042	0,87
Ngeloram	Semi Technical	0,032	0,70
Nglanjuk	Semi Technical	0,036	0,70
Sumber Pitu	Semi Technical	0,034	1,00
Getas	Technical	0,064	0,73
Kentong	Semi Technical	0,035	0,66
Mernung	Semi Technical	0,032	0,60
Rata-rata		0,42	0,68

Source: Primary data processed, 2017

From the field data obtained 9 (nine) villages from 17 (seventeen) villages including Ngadon, Jipang, Kapuan, Ngeloram, Nglanjuk, Sumber pitu, Getas, Kentong and Mernung from the results indicated that each village with representatives of 3 (three) farmers surveyed with the lowest land area 0.33 ha for the largest land area of 1 ha the average water debit of 0.042 m3 / minute of the largest water debit of the village of brittle with a result of 0.068 m3 / sec while the lowest discharge data of 0.032 m3 / minute and land area 0.68 ha of data shows that nine villages in Cepu apply irrigation technique with various system such as ground water pump, open channel and closed channel, based on data above farmer apply 3 planting season in one year.

C. Analysis of the Planting Season

Here is the distribution of farmers who apply planting in the growing season

Table 6. Implementation of Planting Season

Planting Season	*Types of Plants*		
MT.1	Rice	51	100.00
	Rice	-	0
	Corn	-	0
MT.2	Rice	48	56.47
	Corn	36	42.35
	Empty land	-	0
MT.3	Rice	53	62.35
	Corn	9	10.59
	Empty land	22	25.88

Source: Primary data processed, 2017

The results showed that 51 farmers in 17 villages in Kedungtuban district had the planting season in the first planting season in which the farmers of 85 farmers (100%) planted rice, in the second planting season 48 farmers (56.47%) planted rice, 36 farmers (42.35%) Planting the corn. In the third growing season 53 farmers (62.35%) planted rice, 9 farmers (10.59%) planted corn, 22 farmers (25.88%) emptied their land.

D. Analysis of Agricultural Crops

The results showed that from 51 farmers in 17 villages in Cepu kecep have average yield of 2015 in all study villages reaches 2.35 tons with an average land area of 0.65 ha in 2016 average farmer harvests reach 2 , 33 tons with the same land area, the result of the diata shows there is a fairly small decrease of agricultural product along with the detailed data of 9 (Nine) Villages implementing irrigation network while the 8 (eight) villages still apply rainfed system.

E. Discussion

The results showed that 9 (nine) villages from 17 (seventeen) villages included Ngadon, Jipang, Kapuan, Ngeloram, Ngelanjuk, Sumber pitu, Getas, Kentong and Mernung. The results showed that each village with 3 (three) farmers surveyed with the lowest land area 0.33 ha for the largest land area 1 ha the average water debit 0.020 m3 / second the largest water debit of the village of brittle 0.089 m3 / sec while the lowest discharge data of 0.011 m3 / sec and the land area of 0, 65 ha of harvest, especially paddy 2.35 tons of data indicate that nine villages in Kecamatan Cepu apply Tekni irrigation with various system such as ground water pump, open channel and closed channel, based on data above farmer apply 3 planting season in one year. Special 8 (eight) Villages still implement rainfed systems.

1). Optimization of rainfed land

Based on the results of village studies of rainfed agriculture systems, it is recommended to apply the embung development to meet the needs of water, to achieve optimal results of the analysis of the water needs of the crops, especially the MT II and MT III in the palawijan plants, the water requirement for the preparation of land can be determined empirically by 250 mm, the need for land preparation and for the initial water layer after transplantation is completed. (Irrigation Planning Criteria KP 01). For land that has not been planted (bero), the water requirement for the preparation of land can be determined at 300 mm. The water requirements for the nursery are included in the water requirement for the preparation of the land, during the processing of the water requirement of 11.69 mm / day of the above results using methods as proposed by Van de Goor and Ziljstra (1968)

Average water demand for agricultural land with an area of 0.5 ha requires 58.45 m3 of water with a required land area of 23.36 M2 with a depth of 2.80 m

2). Optimizing Irrigation Network

Based on the results of the study there are six villages that implement technical irrigation networks with closed system such as Ngadon, Kapuan, Ngeloram, Ngelanjuk, Sumberpitu, Kentong and Ngeloram. Open irrigation system is implemented by two villages of Jipang and Ngetas with debit 0,089 m3 / s to win 2 days without break, with debit 200 m3 based on water availability in 9 nine villages above enough able to expect MT II and MT III of rice plant result of calculation indicate the need 0.5 ha of rice plantation land in ready-to-process / ready for planting conditions ie for rice crop 10 mm / h or 0.5 ha 100 m3 able to wet for 10 days with 20 mm water level above ground level to know the need of water in the fields and the average yield of 0.044 m3 / min with the irrigation system of the pump / channel closed for 38 hours of water should be distributed, to meet the needs of the plants for 10 days, the results provide sufficient contribution by farmers. Based on farmers' observations each malem drains the irrigation network early in the morning. To help optimize yield and water efficiency, SRI (System of Rice Intensification) method of planting on rice cultivation is done by providing intermittent irrigation water based on alternation between wet period (shallow and dry). This irrigation method accompanied by good crop management methods can increase the productivity of rice plants up to 30-100% when compared with using conventional irrigation method (continuous flood). This method of irrigation was first developed for the SRI method which has the following characteristics: The water requirement in wet area 2/10 plant means water supply as high as 2 cm for 10 (ten) days, for dry area initial supply 7 days. Rice plants from early planting until harvest reaches 90 days of rice plant water needs for 26 days.

5. Conclusions and Suggestions

A. Conclusion

Based on the achievements of the above research progress can be concluded as follows:

1. The survey results show that 17 (seventeen) villages in the Kecamatan are nine villages implementing technical and semi-technical irrigation works such as

Ngadon, Jipang, Kapuan, Ngeloram, Ngelanjuk, Sumber Pitu, Getas, Kentong and Mernung average discharge 0.020 M3 / second of farmers' land area is 0.50 ha
2. The results show that 9 (nine) villages apply technical irrigation by utilizing underground water as irrigation network in each plot of farmer's land there is one village applying an irrigation network of open channel intercepts from the river
3. The results showed that there were 8 (eight) villages with rain-fed irrigation system
4. Farmers' crop yields in Kecamatan Cepu from 17 villages averaged 2.35 tons in 2015 and 2.33 in 2016 average land area of 0.5 ha
5. Types of closed irrigation networks Average water debit 0.042 m3 / min able to win the average land of 0.5 ha for 40 hours (two days) of water flows to the rice field area, cropping pattern with SRI method applying 2/10 to achieve optimal results and efficient use of water

B. Suggestions

Based on the results of research achievements and conclusions can be suggested as follows:

1. There is a need for counseling farmers who use underground water and river water as irrigation networks with the appropriate method of existing discharge
2. The average yield of crops is less than the maximum and many farmers are cultivated in the second and third crops are not planting the land left to dry (rainfed) using rain water as the main water source for irrigation by painting the area according to the needs of the crops, especially the crops
3. For irrigation land, it is necessary to apply SRI planting methods whose water requirements are efficient and the results of which are more improved.

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