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Education Of Water Needs And Management For Agriculture In Garagahan Irrigation Area

Edukasi Kebutuhan Dan Pengelolaan Air Untuk Pertanian Di Daerah Irigasi Garagahan

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Abstract
Irrigation Areas (DI) were built to meet various needs of life, especially to achieve the level of community welfare. D I Sangkir Garagahan was built by the Department of Water Resources and Construction Development in 1986 and is located in the Lubuk Basung sub-district, Agam regency. The current irrigation management is 671 hectares covering 3 working areas, namely Nagari Garagahan which has an area of 415 hectares of irrigated rice fields, Nagari Kampuang Tangah 136 hectares and Nagari Manggopoh 120 hectares. On April 15, 2022 an educational training was conducted to determine the needs and management of water for agricultural land. The methods used are lectures, discussions and training on the use of formulas to regulate plant water and soil management. The training was attended by the Nagari Garagahan community who are members of the Water User Farmers Association (P3A) and Water User Farmers Association (GP3A). Availability of water by adjusting plant water in the field and at the entrance gate for an area of 415 hectares of irrigated rice fields, the water requirement is 0.7204 m3/second. Soil management for agriculture is carried out by biological, non-biological and mechanical methods. By adjusting the capacity of the nagari for its implementation

Keywords: Irrigation Area, Water Management, Agriculture

Abstrak
Daerah Irigasi (DI) dibangun untuk memenuhi berbagai kebutuhan kehidupan, terutama untuk mencapai tingkat kesejahteraan masyarakat. D I Sangkir Garagahan dibangun oleh Dinas Sumber Daya Air dan Bina Konstruksi tahun 1986 terletak di kecamatan Lubuk Basung Kabupaten Agam. Pengelolaan irigasi saat ini sebesar 671 Ha meliputi 3 wilayah kerja yaitu nagari Garagahan memiliki luas sawah irigasi 415 ha, nagari Kampuang Tangah 136 ha dan nagari Manggopoh 120 ha Pada tanggal 15 April 2022 dilakukan pelatihan edukasi menentukan kebutuhan dan pengelolaan air untuk tanah pertanian. Metode yang digunakan adalah ceramah, diskusi dan pelatihan penggunaan formula untuk mengatur air tanaman dan pengelolaan tanah. Pelatihan diikuti oleh masyarakat nagari Garagahan yang tergabung dalam kelembagaan Perkumpulan Petani Pemakai Air (P3A) dan Gabungan Petani Pemakai Air (GP3A). Ketersediaan air dengan melakukan pengaturan air tanaman dilapangan dan pada pintu pemasukan untuk luas areal sawah irigasi 415 ha kebutuhan air sebesar 0.7204 m^3/detik. Pengelolaan tanah untuk pertanian dilakukan dengan cara biologis, non biologis dan metode Mekanik.dengan menyesuaikan kemampuan nagari untuk pelaksanaannya

Kata kunci: Daerah Irigasi, Pengelolaan Air, Pertanian

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PRELIMINARY

The Sangkir Irrigation Area (DI) was built by the Department of Water Resources and Construction Development which aims to have a wide impact in various lives, especially to achieve the level of community welfare. Irrigation is an infrastructure that is built for the benefit of the public/community, requires a large investment cost (1). Irrigation is an asset, which must be beneficial to the community. In order for irrigation assets to be used sustainably, it needs to be continuously utilized, so that it can provide the best irrigation services possible to farmers in support of food security programs. DI Sangkir is located in Lubuk Basung District, Agam Regency, West Sumatra Province. The total area of irrigated rice fields is 671 ha covering 3 (three) working areas, namely Nagari Garagahan having an area of 415ha irrigated rice fields, Nagari Kampuang Tangah 136ha and Nagari Manggopoh 120 ha. The survey results from the Bung Hatta University LPPM team found several obstacles in the irrigation area including: 1) drought/lack of water; 2) land use change: 3) channel does not function properly/changes in function: 4) no water distribution; 5) no water regulation for plants: 6) no regulation of cropping pattern and 7) land cannot be managed properly.

The availability of water for crops, especially rice is the main thing in the success of agriculture, this is due to the maintenance of food security so that the welfare of the community is guaranteed. Irrigation functions to channel water systematically for the purposes of growing food crops, especially rice and secondary crops. Government Regulation No. 20/2006, irrigation is an effort to provide, regulate, and discharge water to support agriculture whose types include surface irrigation, swamp irrigation, underground water irrigation, pump irrigation, and pond irrigation. (2) Sangkir irrigation is a surface irrigation with allotment for the provision and regulation of rice field water for rice plants. In recent years, people have preferred corn to rice. From the results of the interview (September 2021), from the Water User Farmers Association (P3A) the change from rice to secondary crops (maize) was due to the lack of water in the rice fields, especially in the middle and downstream areas of DI. Seeing this condition, it is necessary to manage crop water regulation in rice fields. . So that water is sufficient and evenly distributed in DI.

Irrigation network is all buildings and canals that function to channel irrigation water from agricultural land water sources and dispose of excess water on agricultural land. In addition to distributing irrigation water and disposing of excess water in paddy fields, network exploitation is expected to be able to utilize the available water effectively and efficiently, to be distributed fairly and equitably, to be given to tertiary plots of land appropriately and at the right time and amount according to the needs of plant growth so as to increase productivity. agricultural production (3)

Availability of water for plants is the amount of water that can be used by plants. There are three factors that determine the availability of water in the soil. First, precipitation through infiltration and percolation mechanisms as a source of filling in the system, Second, evapotranspiration as emptying which causes loss of water from the system. Third, Water Holding Capacity (WHC), which is the capacity of the soil to bind water (4). The regulation of water availability can be done by calculating the water requirement for food crops (rice and secondary crops), and determining the cropping pattern in DI.

Management of water resources, especially in the management and development of the government's irrigation system, uses the principle of one management (single management). Law on Water Resources No. 17 of 2019 develops and manages the irrigation system as a unified system in irrigation areas that are under the authority of the Central Government. The authority for irrigation management is carried out based on the area of DI, namely: 1. Irrigation areas with an area of 3,000 ha or more, the management is under the authority of the Central Government 2. Irrigation areas with an area of 1,000 ha – 3,000 ha, the management is under the authority of the Provincial Government. 3. Irrigation areas with an area of less than 1,000 ha, the management of which is under the authority of the Regency/City Government. IN Sangkir Garagahan with a large area of 1000, namely 1031 Ha, management is the authority of the Province.(5)

Palawija as a food crop instead of rice is an annual plant that does not require a lot of water and is usually planted in the dry season. Palawija can thrive in lowland and highland areas. Types of secondary crops include corn, beans, tomatoes, chilies, cassava, potatoes, etc. The water needs of each palawija are not the same, the success of the cultivation of palawija is in regulating water and determining the right time for planting patterns (6).

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METHOD

Based on the existing problems, through community service activities, a method is carried out by direct observation and assistance in the field. The activity was carried out in Nagari Garagahan, Lubuk Basung District, Agam Regency, West Sumatra Province. The activity begins with conducting a field survey to determine the targets of non-productive partners who have rice fields that cannot function properly and find solutions. Then, training activities to increase knowledge for WUAs were carried out to regulate the water needs of DI's plants
This is done with the following stages of activity:
1. Survey on partners/farmers/P3A and collect partners.
2. Lectures and discussions.
3. Demonstration and Training

Partner Contribution

Partners who are invited to collaborate are non-productive partners, namely Farmers/P3A whose rice fields do not get water/experienced drought. They will be assisted in solving problems and finding solutions. The expected contribution is openness and willingness to participate in a series of activities so that partners can solve problems. Participants who took part in this community service, apart from P3A, there were also nagari officials, clever and pious scholars.

RESULTS AND DISCUSSION

The implementation of community service was carried out in Nagari Garagahan on April 15, 2022 with the following activities:
1. Opening and remarks by resource persons, village apparatus, and P3A Chair
2. Submission of materials and demonstrations by resource persons
3. The training was attended by resource persons and participants

Figure 1. Submission of material through discussions, and videos

Source: dedication team documentation

The implementation of community service is carried out in the Garahan village, Lubuk Basung district. The area of Garagahan village is 26.25 Km2. The total population is 7441 people. Rice field area 415 Ha. The areas that receive irrigation services consist of 4 Jorongs:

Jorong4Garagahan(LabuPacah)

Jorong3Garagahan(KampungCaniago)

Jorong2Garagahan(DurianBungkuk)

Jorong1Garagahan(BancahPaku,RimboNunang,SimpangAmbacang)

The following is a map of Nagari Garagahan and Lubuk Basung sub-district, Agam Regency.

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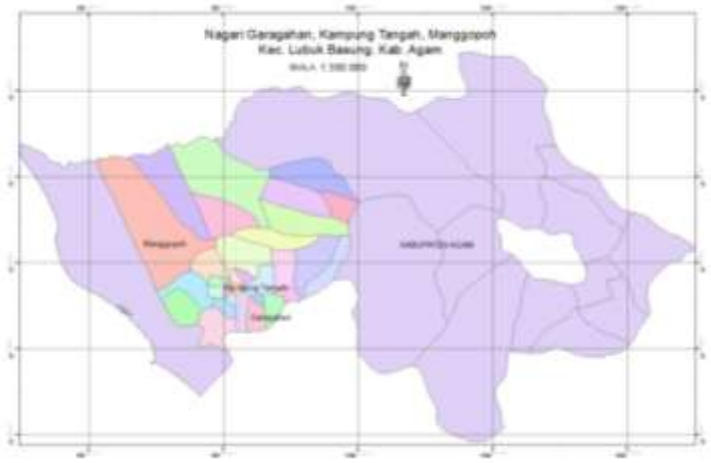

Figure 2. Map of Nagari Garagahan in Lubuk Basung and Agam districts
Source: Results of processing (2021) by the service team

The training materials were delivered by resource persons by means of lectures, demonstrations through videos and implementation of the formula for plant water requirements. It was also conveyed that the existing water must be managed according to its designation. Irrigation management is an effort to provide, share, and regulate water in order to increase agricultural production, so that agriculture is sustainable and sustainable. (7)

Drought of irrigated paddy fields is a problem caused by not yet built all irrigation channels, leakage/illegal extraction of water and accumulation of garbage in certain places in the canal that must be addressed immediately. This problem can be explained by management activities such as stakeholders, physical and non-physical.

Stakeholders are all parties who take part in the organization in solving problems. ; In this service activity the parties involved are the people who are registered as members of the Water User Farmers Association (P3A), the Water User Farmers Association (GP3A), provincial and district government agencies in charge of irrigation and nagari government. At DI Sangkir P3A and GP3A, it has been officially formed, namely there is a deed of formation from a notary and an institutional certificate from the central government. In Sangkir, there are 1 GP3A and 7 P3A which can be seen in the following table:

Table 1 Water User Farmers Association (P3A) Sangkir Garagahan Irrigation Area

GP3A/P3A Name	**Intake**	Area of irrigated rice field	**Status**
GP3A AntokanMengalir	D.I. Sangkir Garagahan	1.151 Ha	Aktif
P3A Taratak Indah	BBS.1 – BBS.5	104,8 Ha	Aktif
P3A Setia Kawan	BD.1 – BD.5	100,9 Ha	Aktif
P3A Antokan Jara	BG.1 – BBA.1	112,1 Ha	Aktif
P3A Usaha Bersama	BBA.2 – BBA.4 , BBT.1 – BBT.2	118 Ha	Aktif
P3A Tani Saraso	BD.5	75 Ha	Aktif
P3A Elok Basamo	BBA.5 – BBA.8	129,3 Ha	Aktif
P3A Hula AiaLabuah Pacah	BBS.1.a – BBS.1.b – BBS.2	24,5 Ha	Aktif

Source:Profile of Observer Region II 2021

The implementation of the P3A service provides information on dry rice fields, leakage of channels / illegal water withdrawals and places where waste accumulates in irrigation canals. Based on information from P3A, the

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resource persons offered to conduct training on water management for crops in the fields. The activities carried out are in the form of assistance to P3A to calculate/know how the water needs in DI. The training carried out is by explaining some data needs and using the data in the prepared formula. The formula used is as stated in the plant cultivation expertise program module entitled regulating water supply. To regulate the supply of water to the fields, it is necessary to know the daily water capacity in the field (Q1) in m3/second units and the daily water requirement at the entrance gate (Q2) in m3/second units. (8) The following equation is used:

1. $Q_1 = ((H \times A)/T) \times 10.000$
2. $Q_2 = (Q_1/86.400) \times (1/(1-L))$

Where: Q1 = Daily water requirement in the field in m3/second
Q2 = Daily water requirement at the inlet in m3/second
H = Flooding height in meters
A = Area of paddy field in ha
T = Interval of giving water in days
L = Water loss in field and channel in %
The following is an example of calculating water requirements for plants given during the training:
Known: The area of the plant to be irrigated is 415 ha. Calculate the water requirement in the field and entrance using the following provisions:
Rotation interval: 4.5 days
- ETP (water requirement for plants) until the plants are 30 days old is 10 mm/day
- ETP after 30 days of plant is 12 mm/day
- Water loss in the field and drains 20%.

Solution
1. Plant water needs up to 30 days old is 10mm/day
Given: T = 4.5 days: H = 4.5 x 10 mm = 0.045 m
A = 415 Ha
L = 20%
Q1 = ((0.045m x 415 Ha)/4.5 days) x 10 = 41.5 m3/day
= 41.5 x 86.4 = 0.4803 m3/sec
Q2 = (41.5/86.4) x (1/(1-0.2)) = 0.6004 m3/sec
2. Water requirement of plants up to 30 days old is 12 mm/day
Given: T = 4.5 days: H = 4.5 x 12 mm = 0.054 m
A = 415 Ha
L = 20%
Q1 = ((0.054m x 415 Ha)/4.5 days) x 10 = 49.8 m3/day
= 49.8 x 86.4 = 0.5763 m3/second
Q2 = (49.8/86.4) x (1/(1-0.2)) = 0.7204 m3/sec
Plant water requirements are divided into uncultivated plants and cultivated plants as shown in the following table:

Table 2. Water requirements of treated plants

No	Periode/Fase	Lama/Hari	Komponen	Kebutuhan Air L/det/Ha	Jumlah Kebutuhan Air L/det/Ha
1	Pengolahan tanah	30	Penjenuhan Tanah	0,648	1.111
			Genangan Pertama	0,127	
			Evaporasi	0,266	
			Perkolasi	0,069	
2	Pertumbuhan vegetasi	50	Genangan kedua	0,127	0,787
			Evaporasi	0,590	

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			Perkolasi	0,069	
3	Petumbuhan	30	Evaporasi	0,613	0,706
	reproduksi		Perkolasi	0,093	
4	Pemasakan	18	Evaporasi	0,637	0,741
			Perkolasi	0,104	
				Rata-rata nilai K	0,836

Source: Puslitbang Sumber Daya Air, 2002 (9)

Table 3. Plant water requirements without cultivation

Kedalaman air (cm)	Lama genangan (hari)	Tanah dan Air	Tanaman Padi
0,0 -0,0	7 atau 15	Petakan sawah Dikeringkan	-Pasca panen buat pembenihan -Semprotkan herbisida ke sisa tanaman
2,0 - 5,0	5 - 7	Masukan air ke sawah	- Proses pengemburan tanaman
2,0 - 5,0	8 - 10	Masukan air ke sawah	- Penanaman benih padi
2,0 - 5,0	25 - 79	Masukan air ke sawah	- Masa pemeliharaan tanaman padi
0,0 -0,0	80 - 110	Petakan sawah dikeringkan	- Padi siap di panen

Source: Planting lowland rice without cultivation (Muhajir Utomo, 2002)(10)

Acc

According to the head of P3A and village officials, the availability of irrigation water for Nagari Garagahan is very large, because the Garagahan area is in the upstream area of DI Sangkir. The area of rice fields in the Garagahan area, about 40% of the area of DI Sangkir, is well watered. Irrigation infrastructure has been built such as primary, secondary, tertiary canals and other complementary buildings (buildings for tapping). All buildings are still functioning properly so that irrigation water is very sufficient and even seems to exceed the capacity of the irrigation canal. To be more useful, irrigation water is currently used for fisheries. Fish cages are placed in irrigation canals and in canal border areas. To meet the water needs for fisheries, there have been many channel breaches or illegal water extraction.

The resource person (Lusi Utama, Zuherna Mizwar) explained that currently the condition of water availability in Sangkir DI is sufficient, especially in the upstream area, namely Nagari Garagahan as stated by the head of P3A Setia Kawan (Mr. Nurmatias) and Mr. Agus Surya Abadi as DI interpreters. cup. To say whether or not water is sufficient in a DI, one must look at the area in the DI area. In this case, the water upstream is quite good, but in the middle (Nagari Kampung Tangah) and downstream (Nagari Manggopoh) the water is not enough. Many rice fields are not cultivated by farmers. This resulted in farmers planting corn and secondary crops to maintain the economy.

Irrigation water management is carried out so that plants during the dry season do not suffer from drought and during the rainy season they are not flooded or excess water is too long, so that the plants get enough water during their growth. Water management to meet water sufficiency in the villages of Tangah and Manggopoh villages by carrying out water management by using the cropping pattern method, this method by planting secondary crops such as chilies, corn and others, so that the soil before planting rice can restore humus/soil fertility. Change of crop species after harvest can control and improve soil conditions improve (11). Increasing soil fertility can be done by means of biological, non-biological and mechanical methods as follows:

Biological way: Using the following materials::

- Saw ash
- Fertilizer
- Animal material
- Seaweed
- Kascing (worm droppings)
- Manure

- Compost (from leaves2)
- Green cover is to plant plants, when the plants die, they will provide fertility for the soil
- Organic fertiliser

Non-Biological Method: Using the following materials::
- Chemical fertilizer
- Adding mineral content (in the form of rock material)
- Debugranite
- Limestone
- Regulates PH (acidity) by using sugarcane

Mechanical Method: That is by using: watering and or making a water network using a paralon pipe
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CONCLUSION

The Sangkir Gagahan Irrigation Area (DI) was built by the Department of Water Resources and Construction Development which aims to have a wide impact in various lives for the community. The total area of DI is 1151 Ha. The current irrigation management is 671 ha covering 3 working areas, namely Nagari Garagahan which has an area of 415 ha of irrigated rice fields, Nagari Kampuang Tangah 136 ha and Nagari Manggopoh 120 ha. Irrigation water must be available throughout the year for that irrigation water management is carried out in two aspects. The first is from the aspect of water availability by regulating plant water in the field and at the entrance gate. For the area of 415 ha of irrigated rice fields, the water requirement is 0.7204m3/second. Second, from the aspect of soil management for plants, it can be used by biological, non-biological and mechanical methods by adjusting the capacity of the nagari for its implementation

BIBLIOGRAPHY

1. O&P DB. Modul Pengelolaan Aset (PAI). In Bimbingan Teknik Pengembangan Tata Guna Air Dalam Rangka Pelatihan Teknis Instruktur PTGA. 2019.
2. Peraturan pemerintah (PP) tentang irigasi. Jakarta; 2006.
3. Zuherna M. Roadmap Cabai. Padang; 2016.
4. Zuherna M. Neraca Air DAS Arau. Padang; 2017.
5. Undang-Undang RI. Undang-Undang Republik Indonesia tentang Sumber Daya Air (UU Nomor 17 Tahun 2019) [Internet]. 2019. Available from: https://peraturan.bpk.go.id/Home/Details/122742/uu-no-17-tahun-2019
6. Zuherna M. Pemanfaatan Embung di Kota Padang. Buletin Forum DAS Kota Padang. 2016 Dec;13–5.
7. Zuherna M. Manajemen Sungai DAS Arau. Buletin Forum DAS Kota Padang. 2015 Aug;16–21.
8. Hidayat A. M e n g a t u r p e m b e r i a n a i r. Vol. SMKP2O05. 2001. p. 38.
9. Puslitbang sumber daya air. Penelitian dan pengembangan pengairan. 2002.
10. Muhajir U. Bertanam padi sawah tanpa olah tanah. rev.cet.8 ed. Jakarta: Swadaya; 2006. 52 p.
11. Triharso. Dasar - dasar perlindungan tanaman. Yogyakarta: Universitas Gajah Mada Press; 2010.