

Open Access Article

 <https://doi.org/10.55463/issn.1674-2974.50.4.12>

Assessment of a Tidal Marsh Irrigation Area Based on the PAKSI-PU

Mardiah^{1*}, Lily Montarcih Limantara^{2*}, Moh. Sholichin², Tri Budi Prayogo²

¹ Doctoral Program at the Department of Water Resources, Faculty of Engineering, University of Brawijaya, Jl. MT Haryono No. 167, Malang, Indonesia

² Department of Water Resources, Faculty of Engineering, University of Brawijaya, Jl. MT Haryono No. 167, Malang, Indonesia

* Corresponding authors: diahsyaiful76@gmail.com, lilymont2001@gmail.com

Received: February 10, 2023 ▪ Revised: March 8, 2023 ▪ Accepted: March 14, 2023 ▪ Published: April 28, 2023

Abstract: This research intends to investigate the evaluation of existing tidal marsh irrigation areas based on the PAKSI-PU currently in effect in Indonesia. However, the tidal marsh irrigation is needed for the modeling of tidal marsh irrigation performance, which is necessary for developing this type of irrigation. This research is conducted in Terantang irrigation area, South Borneo Province, Indonesia. The methodology consists of literature study for determining the reliability condition of infrastructure facilities; survey or reliability parameter measuring water supply, irrigation management, management institutions, and human resources; and verification of survey or measurement results. The performance of an irrigation area is an indication in the scheme to illustrate the management of irrigation system and based on the performance indexes of the irrigation facilities after the development and rehabilitation. Generally, the development of tidal marsh in the future has to meet three conditions that are technically is easy to be implemented and can be accepted by society, economically is feasible and profitable and does not damage the environment so the natural resources is remain maintained. The result shows that based on the recommendation of the document, if it is reviewed from the performance condition and classification which the criteria due to the excellent performance is from 80 until 100%, good performance is from 70 until 80%, less performance is from 55 until 70%, and bad performance is less than 55%; so there is about 93.6% of 70 unit of IKSI data is in the condition of less until bad; only 6.4% is in the good performance. These results are very needed to support the tidal marsh irrigation performance.

Keywords: assessment, tidal marsh, Terantang, PAKSI-PU.

基于帕克西普的潮汐沼泽灌区评估

摘要：本研究旨在调查基于目前在印度尼西亚生效的帕克西普对现有潮汐沼泽灌溉区的评估。然而，潮汐沼泽灌溉需要用于潮汐沼泽灌溉性能的建模，这对于开发这种灌溉类型是必要的。这项研究是在印度尼西亚南婆罗洲省的特兰当灌区进行的。该方法包括用于确定基础设施可靠性条件的文献研究；测量供水、灌溉管理、管理机构和人力资源的调查或可靠性参数；调查或测量结果的验证。灌区绩效是方案中的一个指标，用于说明灌溉系统的管理情况，并基于开发和修复后灌溉设施的绩效指标。一般来说，未来潮汐沼泽的开发必须满足三个条件：技术上易于实施并为社会所接受；经济上可行且有利可图；不破坏环境，自然资源

得以保持。结果表明，根据文档的推荐，如果从性能条件和分类上来看，性能优良的标准为 80-100%，性能良好的为 70-80%，性能较差的为 55 到 70%，不良表现小于 55%；所以 70 个单位的 IKSI 数据中大约有 93.6%是处于少到坏的状态；只有 6.4%表现良好。非常需要这些结果来支持潮汐沼泽的灌溉性能。

关键词：评估、潮汐沼泽、特兰当、帕克西普。

1. Introduction

The performance of an irrigation area is an indication in the scheme to illustrate the management of irrigation system [1], based on the performance indexes of the irrigation facilities after the development and rehabilitation, and is hoped to determine the design life time, so it can determine what action is needed to maintain the performance and by the end can predict how much cost that is needed for maintaining the performance [2, 3]. However, evaluation of the irrigation network performance index (IKSI) is needed to illustrate the current conditions for determining the priority of program and activity budget allocation [4], so the program and activity that is implemented has the basic that can be held accountable.

The characteristic of less fertile swamp land is the main factor of low area productivity [5], i.e., low soil fertility due to the sour and pyrite soil characteristics [6]. In addition to the constraint problem of area biophysics, according to Kariyasa [7], the limitation of knowledge, skill, and ability of farmers in plantation technology, limited capital, infrastructure; supporting institutions such as counseling, capitalization, and marketing; and lack of interest of the young generation in being involved in the agricultural sector are also trigger factors of low production in the tidal marsh agriculture area.

The success and sustainability of agriculture development in the tidal marsh area [8, 9] through the

technology application of area management and accurate commodity selection is needed to be supported by the human resources ability, suitable means and infrastructure, and the effective [10] and efficient institution. Generally, the development of tidal marsh in the future has to meet three conditions that are technically is easy to be implemented and can be accepted by society, economically is feasible and profitable and does not damage the environment so the natural resources is remain well maintained [11, 12] so the agriculture development can be sustainable.

2. Materials and Methods

2.1. Research Location

The research is conducted in South Borneo Province, which has a sufficiently wide swamp irrigation area that is managed by the central government and the province, regency, or city government. The swamp area in the South Borneo Province based on the Ministry Rule of PUPR No. 14/PRT/M/2015 is about 238,122 ha due to the 583 units of swamp irrigation area that are managed by General Work Department (PU) and are spread in some regencies or cities in the South Borneo region.

The Barito Kuala Regency is selected as the research location, remembering that the area there is still affected by ebb and flow (tides). This research location is presented in Fig. 1.

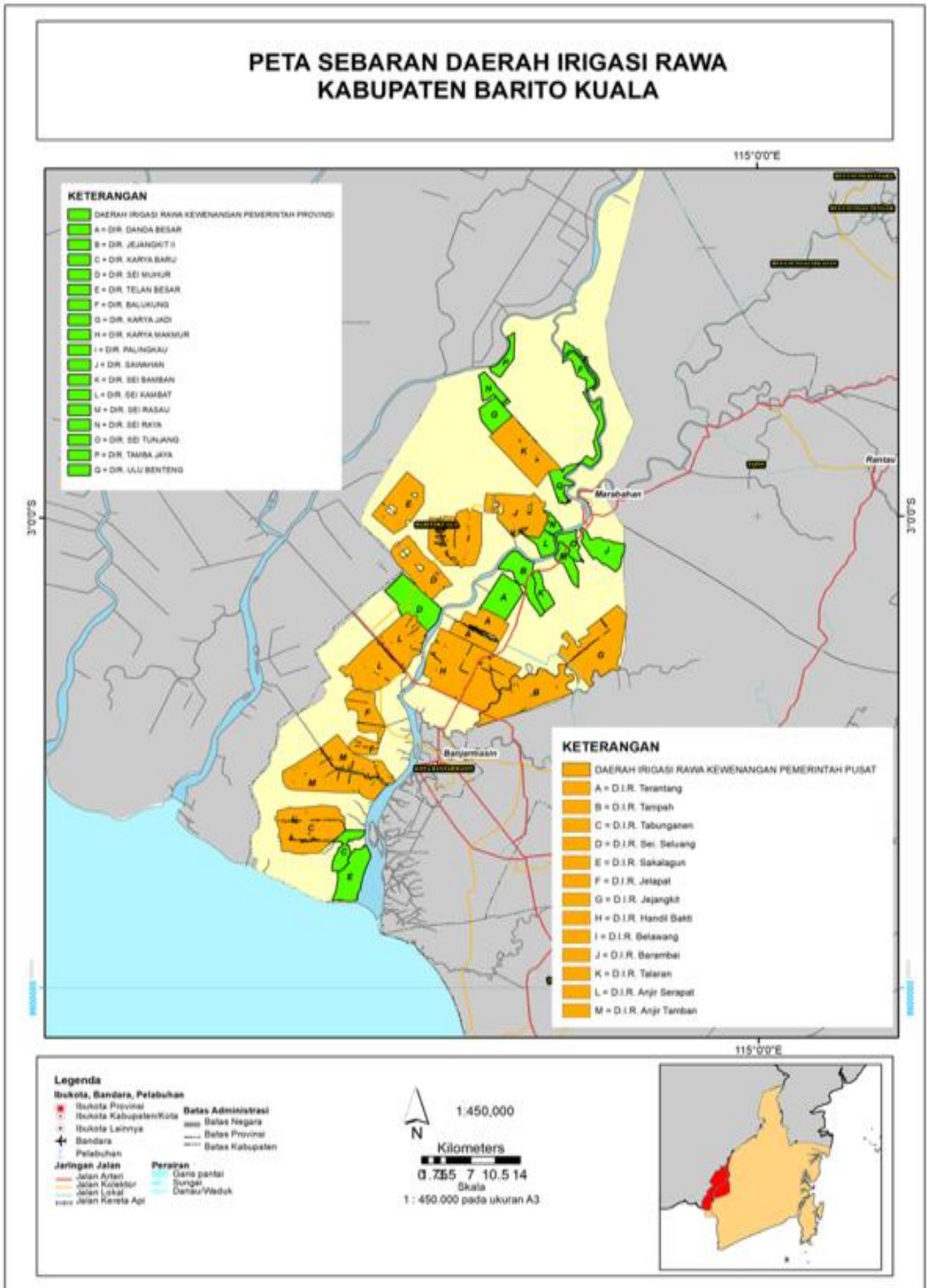


Fig. 1 Location of the tide irrigation area in Barito Kuala Regency

From the illustration of the map above, there is a wide enough area expanse of tidal marsh development

in the Barito Kuala Regency-South Borneo Province. Based on the spreading location above, a tidal marsh irrigation area was selected as the research sample. The research is conducted in the Terantang irrigation

area, which is presented in Fig. 2. The Terantang irrigation area is selected as the research location because the organizational structure of the P3A observations and institution also runs well.

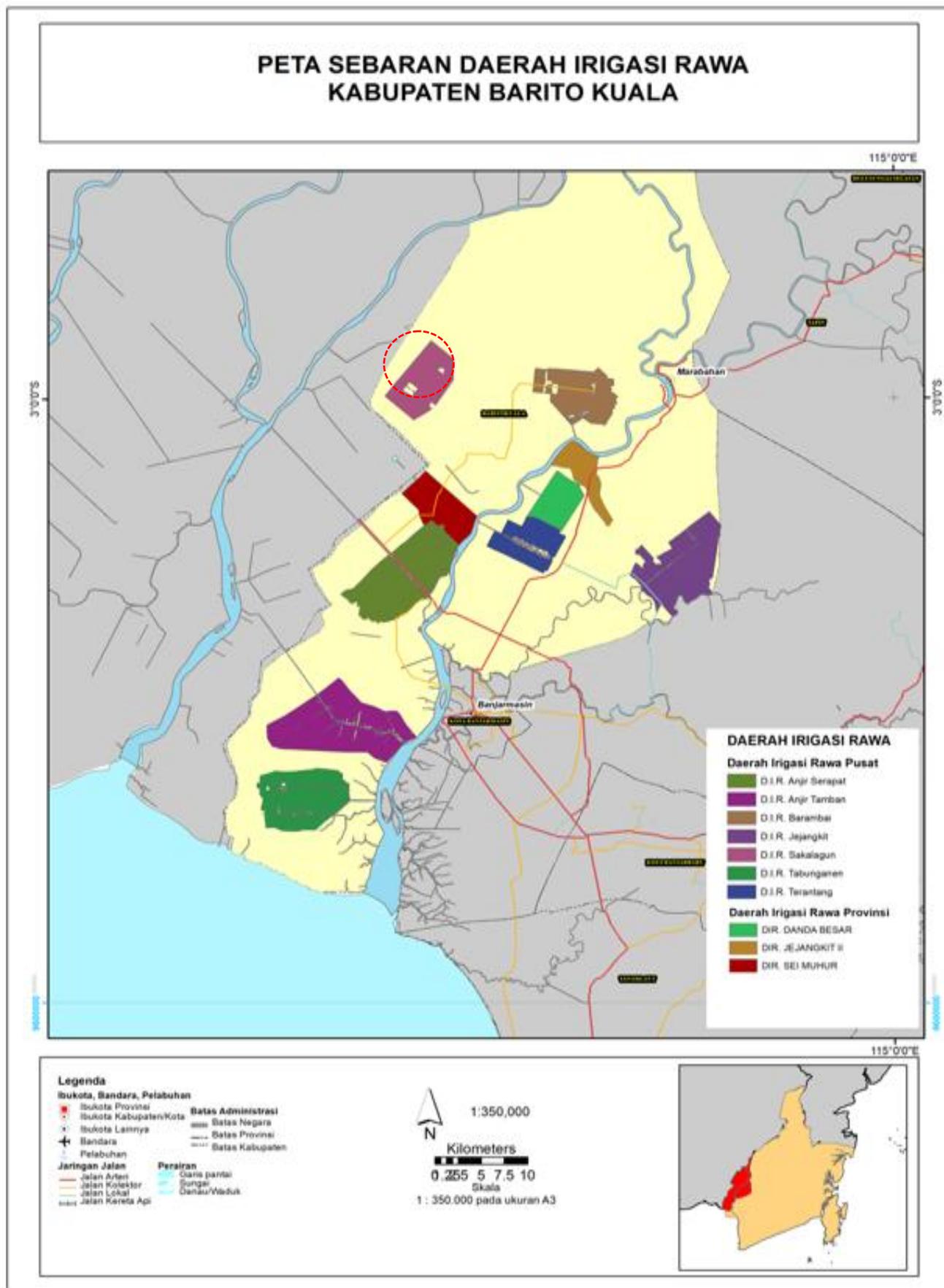


Fig. 2 Evaluated research locations

2.2. Area Suitability

The suitability of tidal marsh areas for agriculture development is varied according to the climate, hydrotopography, soil characteristics, and water

management system. The evaluation of area suitability in the unit area is mainly based on the physical aspect; however, the soil fertility is not all analyzed. The tidal marsh area suitability is presented in Table 1.

Table 1 Area suitability (Module- 04 OP Marsh Training of Water and Land Management, 2022; BPSDM Kementerian PUPR)

No.	Area unit	Area Suitability per-area unit type				
		Crop				
		Tidal marsh paddy	Pump irrigation paddy	Rained paddy	The second crop	Perennials and gardens
1.	Tides overflow land Pyrite soil and peat soil, channel water is salt (partly) during dry season	S1	-	-	S3*)	S3*)
2.	Depth of drainage potency is less than 60 cm	S3/N	S3/N	S3	S2	S3*)
3.	Depth of drainage potency is more than 60 cm The water channel is not salty during the dry season	S3/N	S3/N	S3	S2	S1
4.	Depth of drainage potency is less than 60 cm	-	S2	S2	S2	S3*)
5.	Depth of drainage potency is more than 60 cm	-	S2	S2	S2	S1
6.	Peat soil	N	N	N	S3/N	S2.S3*)
7.	Dry land, whiteness, and low fertility <i>Non-pyrite soil:</i> Channel water is not salty along the cropping season	N	N	N	S3/N	S3*)
8.	Depth of drainage potency is less than 60 cm	-	S1	S1	S3*)	S3*)
9.	Depth of drainage potency is more than 60 cm	-	S1	S1	S3*)	S2*)
10.	Channel water is salt (partly) during the cropping season	S3/N	S3/N	S2	S3*)	S2/S3)*)

Notes: S1 - very suitable; S2 - moderately suitable; S3 – limitedly suitable; N - not suitable.

2.3. The Assessment of Index Performance Based on the PUPR Ministry Letter No. 02/SE/M/2011

The swamp reclamation network performance assessment guidelines consist of criteria and indicators of the channel condition, building condition, protector embankment, and swamp reclamation network. Channel, water structure, complementary structure, and protector embankment are as the swamp reclamation network union that are functioned for regulating the water system or water management in the swamp area which are well functioned to be carried out the

maintenance activity to guard the network function of swamp reclamation and or rehabilitation activity for returning back the network function of swamp reclamation.

2.4. Parameters and Variables of E-PAKSI Performance Assessment

The tidal marsh irrigation system performance assessment consists of the performance assessment of the main and tertiary irrigation systems (Table 2).

Table 2 Parameters, variables, and components of the performance evaluation of the PAKSI tidal marsh network (Module E-PAKSI, Kementerian PUPR)

No.	Parameters and variables of the main irrigation system	Parameters and variables of the tertiary irrigation system
1.	The physical facility of the main network consists of: A. Channel: a. Wet perimeter; b. Berm; c. Embankment. B. Building: a. Gate building: - Floor/foundation; - Wall; - Wing; - Door. b. Supporting building:	The physical facility of the tertiary network consists of: A. Channel: a. Wet perimeter; b. Berm; c. Embankment. B. Building: a. Gate building: - Floor/foundation; - Wall; - Wing; - Door. c. Supporting building:

-	Benchmark, trash filter, hand rail, culvert, peilsall.	-	Benchmark, trash filter, hand rail, culvert, peilsall.
C.	Protector embankment:	C.	Production road/farm enterprise:
a.	Upstream;	a.	Road condition Production/farm enterprise.
b.	Center;		
c.	Downstream.		
D.	Office, residence, and warehouse:		
a.	Adequate office for observer/master;		
b.	Adequate residences for observer/master;		
c.	Adequate ware house (main building).		
2.	Crop productivity consists of:		Crop productivity consists of:
a)	Crop realization/IP;	a)	Crop realization/IP;
b)	Productivity of paddy;	b)	Productivity of paddy;
c)	Productivity of horticulture/perennial (dominant).	c)	Productivity of horticulture/perennial (dominant).
3.	The supporting facility consists of:		The OP condition of the tertiary network consists of:
a)	Equipment of OP;	a)	Cleaning:
b)	Transportation;	-	Channel;
c)	Office equipment Ranting/Observer/UPTD;	-	Berm.
d)	Communication tool.	b)	Supporting equipment of OP:
		-	Condition of OP supporting equipment.
4.	A personal organization consists of:		The personal organization of P3A consists of:
a)	Organization of OP arranged by the boundary of responsibility and clear duty:	a)	Technical executor/Ulu-ulu:
-	The arrangement of organization and main function.	-	Availability and skill.
b)	Personal:	b)	The head of block:
-	The understanding to OP.	-	Availability and skill.
5.	Documentation consists of:		Documentation consists of:
a)	The data book on irrigation area (DIR);	a)	Data book on irrigation area (DIR);
b)	Map and figures.	b)	Map and figures.
6.	The Water User Farmer Group (GP3A/IP3A) consists of:		The Water User Farmer Group (P3A) consists of:
a)	GP3A/IP3A has been legal entity;	a)	The status of legal entity;
b)	Institutional condition of GP3A/IP3A;	b)	Institutional condition of GP3A/IP3A;
c)	GP3A/IP3A meeting with ranting/observer;	c)	The activity of meetings;
d)	GP3A/IP3A actively follows the survey/network search;	d)	The activity of survey/network search;
e)	Participation of GP3A/IP3A in network and mitigation of natural disasters;	e)	Participation in the network improvement and mitigation of natural disasters;
f)	Participation of P3A in designing the planting arrangement.	f)	Member fee of OP for the tertiary irrigation system;
		g)	Functional and coordination ability in designing the planting arrangement;
		h)	Communication with the management institution of the main irrigation network.

2.5. Methodology

The data were collected by the manager through the walkthrough, interview, and direct (primary data) and indirect (secondary data) measurement in field from the IKSI-PAKSI document. The steps of the data collection were as follows:

1. *Step 1:* Studying the literature and inventory of IKSI DIR Terantang documents until 2022. From these

documents, the infrastructure reliability condition will be determined.

2. *Step 2:* Survey/reliability parameter measurement of water supply, irrigation management, management institution, and human resources.

3. *Step 3:* Verification of survey/measurement result data.

Fig. 3 presents the study flowchart.

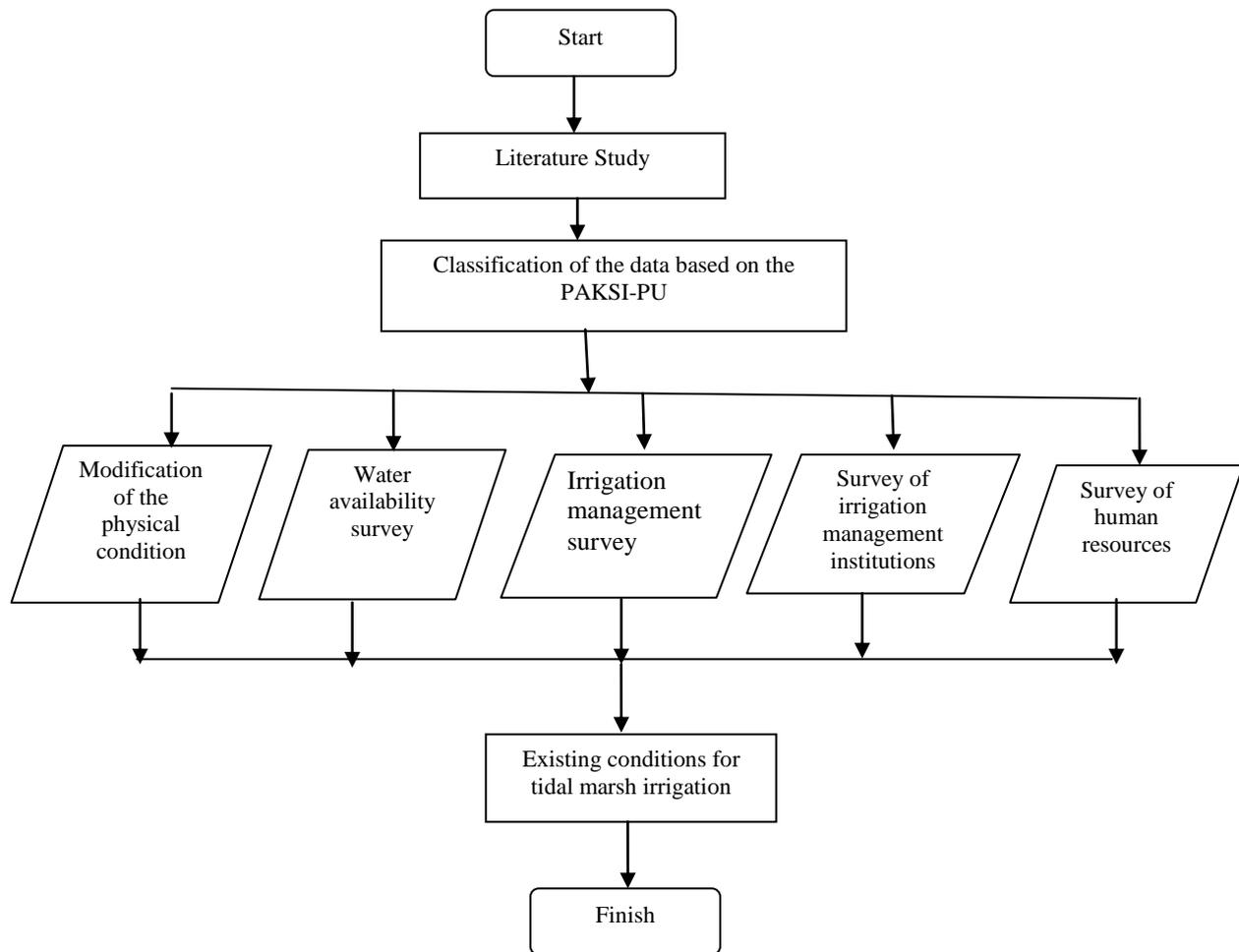


Fig. 3 Flowchart of the study (Own study)

3. Results and Discussion

3.1. Suitability of the PAKSI-PU Tidal Marsh Performance Assessment Model

This research focuses on the model development of structural equations that can be used for measuring the actual performance of tidal marsh irrigation areas that are referred to as five pillars of irrigation

modernization. The research stage is carried out by collecting the documents of the PAKSI DIR model performance assessment in the South Borneo Province, which is a tidal marsh irrigation area authorized by center and province, which carry out the performance assessment. The assessment of tidal marsh irrigation area performance generally due to the PAKSI method in the South Borneo Province is presented in Table 3.

Table 3 Performance assessment of the tidal marsh irrigation areas using the PAKSI method (Recapitulation of IKSI PAKSI data)

No	Name of DI	Perfor-	Pro-	Service	Perfor-	Pro-	Service	Perfor-	Pro-	Service
		mance	duc-	level	mance	duc-	level	mance	duc-	level
		index	tion		index	tion		index	tion	
			2020			2021			2022	
1	Anjir Tamban	45.81	8.00	bad	54.26	5.20	bad	26.54	6.13	bad
2	Anjir Serapat	45.11	4.00	bad	52.63	5.00	bad	55.82	6.13	bad
3	Tabungannen	62.00	5.00	less	44.71	3.00	bad	39.45	6.13	bad
4	Belanti	55.50	2.00	less	60.35	3.00	less	28.50	6.13	bad
5	Berambai	54.33	4.00	bed	70.06	1.05	good	77.62	6.13	good
6	Belawang	41.82	4.00	bed	66.84	2.00	less	61.03	6.13	less
7	Sakalagun	56.85	1.50	less	50.84	1.50	bad	52.90	6.13	bad
8	Terantang	70.45	5.00	good	68.21	5.00	less	67.83	6.13	less
9	Alalak Padang	0.00	0.00	-	48.69	3.88	bad	48.69	3.88	bad
10	Antasan Kyai	0.00	0.00	-	39.17	2.50	bad	39.17	2.50	bad
11	Antasan Tanipah	0.00	0.00	-	44.30	2.50	bad	44.30	2.50	bad
12	Danda Besar	0.00	0.00	-	48.39	4.00	bad	48.39	4.00	bad
13	Jejangkit II	0.00	0.00	-	56.95	4.00	less	56.95	4.00	less
14	Sei Bamban	0.00	0.00	-	58.79	2.50	less	58.79	2.50	less
15	Sei Tunjang	0.00	0.00	-	60.21	4.00	less	60.21	4.00	less
16	Aei Rasau	0.00	0.00	-	53.03	4.00	bad	53.03	4.00	bad
17	Sei Raya	0.00	0.00	-	61.39	4.00	less	61.39	4.00	less
18	Sawahana	0.00	0.00	-	50.89	4.00	bad	50.89	4.00	bad
19	Sei Kambat	0.00	0.00	-	59.18	2.50	less	59.18	2.50	less
20	Karya Jadi	0.00	0.00	-	57.90	2.50	less	57.90	2.50	less
21	Karya Makmur	0.00	0.00	-	62.08	2.50	less	62.08	2.50	less
22	Tamba Jaya	0.00	0.00	-	55.17	2.50	less	55.17	2.50	less
23	Karya Baru	0.00	0.00	-	51.26	2.50	bad	51.26	2.50	bad
24	Telan Besar	0.00	0.00	-	46.15	2.50	bad	46.15	2.50	bad
25	Bahukung	0.00	0.00	-	50.50	2.00	bad	50.50	2.00	bad
26	Palingkau	0.00	0.00	-	59.23	3.50	less	59.23	3.50	less
27	Sei Muhur	0.00	0.00	-	46.12	4.00	bad	46.12	4.00	bad
28	Ulu Benteng	0.00	0.00	-	58.05	4.00	less	58.05	4.00	less

Based on the recommendation of the document, if it is reviewed from the performance condition and classification which the criteria due to the excellent performance is from 80 until 100%, good performance is from 70 until 80%, less performance is from 55 until

70%, and bad performance is less than 55%, so there is about 93.6% of 70 unit of IKSI data is in the condition of less until bad; only 6.4% is in the good performance. Table 4 presents the recommendations for handling the tidal marsh network assets.

Table 4 Recommendations for handling tidal marsh network assets (Modul IKSI of OP Tidal Marsh Training, BPSDM, 2022)

No.	Conditions of network assets	Weight (%)	The functions of network assets	Weight (%)	Recommendation for handling
1.	Excellent	90-100	Excellent	90-100	Routine maintenance
2.	Good	80-<90	Good	80-<90	Periodic maintenance
3.	Moderate	60-<80	Moderate	60-<80	Periodic maintenance and improvement
4.	Bad	1-<60	Bad	1-<60	Replacement/rehabilitation
5.	Not functioned	0	Not functioned	0	Review design/rehabilitation

If there is compared with the production value that is produced from each tidal marsh irrigation area which the average of production by the 70 units sample of 31 tidal marsh irrigation areas above, so the average of production is about 3.7 ton/ha which this classification for production is as good category. This indicates that the result of performance assessment has not been close to the real condition in the field by the assumption that if an irrigation area is in the bad category from the service side, the production is certainly not good. Because of the development target, the performance of an irrigation area is agricultural production in accordance with the government target for supporting the national food self-sufficiency. Therefore, it is necessary to evaluate the suitability of variables that are used in the PAKSI-PU model and the coefficient that is used in the tidal marsh irrigation area.

The evaluation of determination coefficient is carried out for measuring the ability of model to explain the effect of independent variable simulant on

the dependent variable that can be indicated by the adjusted R-squared. The small determination coefficient means that the ability of independent variables to explain the dependent variable is very limited. If the value is close to 1 and far from 0, the independent variables can provide all the information that is needed for predicting the dependent variable.

Based on the determination coefficient test that has been carried out, the determination coefficient value (R-square) in the endogen variable of tidal marsh irrigation area performance is 0.8386. It indicates that all the independent variables simultaneously have an effect of about 83.86% on the dependent variables in the tidal marsh irrigation area performance. However, the rest of 16.14% is affected by the other variables that are not tested in this research.

As an illustration, the detailed existing conditions of Terantang tidal marsh irrigation area performance based on the PAKSI evaluation are presented in the tables below.

Table 5 Evaluation of the performance of Terantang irrigation area's main network (Document on PAKSI DIR Terantang, 2022)

Description	Final weight %	Part value %	Index	condition
			available %	Maximum 100%
1	2	3	4	5
I. Physical facility	30.89	100.00	68.63	45.00
1. Channel	20.69	100.00	86.19	24.00
1.1. Wet perimeter	12.54	100.00	87.11	14.40
1.2. Berm	1.42	100.00	89.04	1.60
1.3. Embankment	6.72	100.00	83.97	8.00
2. Building	10.20	100.00	63.75	16.00
2.1. Gate building	10.20	100.00	85.00	12.00
- Floor/Foundation	2.55	100.00	85.00	3.00
- Wall	2.55	100.00	85.00	3.00
- Wing	2.55	100.00	85.00	3.00
- Door	2.55	100.00	85.00	3.00
2.2. Supporting building	0.00	100.00	0.00	4.00
- trash filter, hand rail, culvert, peilscale, etc	0.00	100.00	0.00	4.00
3. Protector embankment	0.00	0.00	0.00	0.00
3.1. Upstream	0.00	0.00	0.00	0.00
3.2. Center	0.00	0.00	0.00	0.00
3.3. Downstream	0.00	0.00	0.00	0.00
4. Office, Residence, and Ware house.	0.00	100.00	0.00	5.00
4.1. Adequate office for :	0.00	100.00	0.00	2.00
- Observer/Master	0.00	100.00	0.00	2.00
4.2. Adequate residence for:	0.00	100.00	0.00	2.00
- Observer/Master	0.00	100.00	0.00	2.00
4.3. Adequate ware house:	0.00	100.00	0.00	1.00
- Main building	0.00	100.00	0.00	1.00

Description				Index	conditio	38.72	15.00
				%	Maximu		
1. Realization of crop area (e)				0.91	20.00	30.48	3.00
Physical facility	functional area (ha)	3,379.00	(a)				
	crop season	Realization of crop (ha)	(b)				
	- MT. I	497.00	(c)				
	- MT. II	1,563.00	(d)				
	crop area =total I,II	2,060.00	(e)				
	IP Maks (%)	200					
	Available cropping index yang ada = (b)/(a)x100 %	60.96					
Percentage of crop area realization = (d)/(c)x100 %	30.48						
2. Productivity of paddy (e)				4.89	100.00	81.57	6.00
Average productivity of paddy (ton / ha)	6.13	(a)					
Productivity of available paddy (ton / ha)	5.00	(b)					
Percentage of paddy productivity = (b)/(a)x100 %	81.57	(c)					
If available paddy > average productivity so paddy productivity percentage (c) is written 100 %.							
3. Protector embankment							
3. Productivity of Dominant Horticulture (c)				0.00	100.00	0.00	6.00
Productivity of average horticulture (ton / ha)	0.00	(a)					
Productivity of available horticulture (ton / ha)	0.00	(b)					
Percentage of horticulture productivity = (b)/(a)x100 %	0.00	(c)					
If productivity of available horticulture > average productivity so percentage of horticulture productivity (c) is written 100 %.							
III. SUPPORTING FACILITY				6.90	100.00	69.00	10.00
1. Equipment O&P.				3.80	40.00	95.00	4.00
2. Transportation				0.60	20.00	30.00	2.00
3. Office equipment: Ranting/Observer/UPTD				1.90	20.00	95.00	2.00
4. Communication tool				0.60	20.00	30.00	2.00
IV. PERSONAL ORGANIZATION				14.25	100.00	95.00	15.00
1. Organization of O&P has been arranged with the boundary of responsibility and clear duty							
1.1. Arrangement of organization and main function					100.00	95.00	5.00

Description	9.50	Final	Part value	Index	condition
		100.00	95.00	available	Maximum
I. Physical facility	4.75	100.00	95.00	5.00	
1. Channel	1.90	40.00	95.00	2.00	
1.1. Wet perimeter	2.85	60.00	95.00	3.00	
1.2. Berm					
VI. FARMER GROUP OF WATER USER (GP3A/IP3A)	3.00	100.00	30.00	10.00	
A. Total P3A = 0 unit					
B. Total GP3A = 0 unit					
C. Total IP3A = 0 unit					
Total b+c = 0 unit					
1. GP3A/IP3A has been legal entity 2	0.60	20.00	30.00	2.00	
2. Institution condition of GP3A/IP3A	0.60	20.00	30.00	2.00	
- Developed (100 %) 2					
- Moderate developed (60 %) 0					
- has not been developed (30 %) 1					
3. Meeting of GP3A/IP3A with Ranting/observer.	0.60	20.00	30.00	2.00	
- once in 1/2 month (100 %) 0					
- once a month (60 %) 1					
- not regulated (40 %) 0					
- has not been (0 %) 0					
4. GP3A/IP3A active follow the survey/network searching.	0.30	10.00	30.00	1.00	
- trash filter, hand rail, culvert, peilscall, etc	0.60	20.00	30.00	2.00	
	0.30	10.00	30.00	1.00	
TOTAL (1+2+3+4+5+6)	65.59			100.00	

Table 6 Evaluation of the performance of Terantang irrigation area's tertiary network (Document on the PAKSI Terantang irrigation area, 2022)

Description	Final weight %	Part Value	Index of	
			available	Max 100%
1	2	3	4	5
I. Physical Facility	18.00	100.00	72.00	25.00
1. Channel	9.36	100.00	85.11	11.00
1.1. Wet perimeter	5.18	54.55	86.25	6.00
1	1.65	18.18	82.43	2.00
1.2. Berm	2.54	27.27	84.61	3.00
1.3. Embankment	8.64	100.00	78.54	11.00
2. Building	5.13	100.00	73.27	7.00
2.1. Gate building	1.30	25.00	74.23	1.75
1	1.29	25.00	73.92	1.75
- Floor/Foundation	1.29	25.00	73.51	1.75
- Wall	1.25	25.00	71.41	1.75
- Wing	3.51	100.00	87.76	4.00
- Door				
2.2. Supporting building	3.51	100.00	87.76	4.00
- trash filter, hand rail, culvert, peiscall, etc				
3. production road / farm enterprise	0.00	100.00	0.00	3.00
3.1. production road/farm enterprise	0.00	100.00	0.00	3.00
II. CROP PRODUCTIVITY (last year)	5.41	100.00	36.06	15.00
1. Realization of crop area	0.51	20.00	3.43	3.00
Functional area (ha)	3,379.00	(a)		
Crop season	Realisasi	(b)		
- MT. I	424.50	(c)		
- MT. II	735.50	(d)		
		(e)		
Crop area =total I,II	1,160.00			
IP Max (%)	200			
Index of crop (IP)	34.33			
Prosentase of crop area realization = (d)/(c)x100 %	17.16			
2. Productivity of paddy	4.89	40.00	32.63	6.00
Average productivity of	6.13	(a)		
Produktivitas padi yang	5.00	(a)		
Percentage productivity of paddy = (b)/(a)x100 %	81.57	(b)		
		(c)		
If available apddy productivity > average productivity so the oercentage of paddy productivity (c) is written 100 %.				
3. Productivity of dominant horticulture	0.00	40.00	0.00	6.00
Average horticulture productivity (ton/ha)	0.00	(a)		
Available horticulture productivity (ton/ha)	0.00	(a)		
Percentage of horticulture productivity = (b)/(a)x100	0.00	(b)		
		(c)		
If available horticulture productivity > average productivity so productivity percentage of horticulture (c) is written 100 %.				
III. CONDITION OF OPERATION AND MAINTENANCE		10.00	95.00	20.00
1. Cleaning	14.25	100.00	95.00	15.00
- Channel	8.55	60.00	57.00	9.00
- Berm		40.00	38.00	6.00
2. Supporting equipment of OP	4.75	100.00	95.00	5.00
- Supporting equipment condition of OP	4.75	100.00	95.00	5.00
IV. PERSONAL ORGANIZATION	12.75	100.00	85.00	15.00
1. Technical executor/ Ulu-Ulu				
- Availability and Skill	6.80	100.00	85.00	8.00

2. Head of block						
- Availability and skill			5.95	100.00	85.00	7.00
V. DOCUMENTATION			4.55	100.00	91.00	5.00
1. DATA book of tertiary block			1.70	40.00	85.00	2.00
2. Map and figures			2.85	60.00	95.00	3.00
VI. FARMER GROUP OF WATER USER (P3A)			17.04	100.00	85.18	20.00
A. Total of P3A =	unit					
1. Status of legal entity		2	2.55	15.00	12.75	3.00
2. Institution condition			2.56	15.00	12.80	3.00
- Developed	(100 %	2				
- Moderate-Developed	(60 %)	0				
- has not been developed	(30 %)	1				
3. Activity of meetings			1.70	10.00	8.50	2.00
- once a month	(100 %	0				
- once in 3 months	(60 %)	1				
- once in 6 months	(40 %)	0				
- no meeting	(0 %)	0				
4. Activity of searching network.			2.56	15.00	12.79	3.00
5. Participation in network improvement and dan mitigation of natural disaster.			1.71	10.00	8.54	2.00
6. Member fee of OP for tertiary			1.70	10.00	8.49	2.00
7. functional and coordination availability in designing planting arrangement			2.56	15.00	12.80	3.00
8. Communication with manager institution of main irrigation network			1.70	10.00	8.51	2.00
TOTAL (1+2+3+4+5+6)			76.75			100.00

4. Conclusion

Assessment of the irrigation network performance index (IKSI) is needed to illustrate the current conditions for determining the priority of program and activity budget allocation. However, the performance of an irrigation area is an indication in the scheme to illustrate the management of irrigation system and based on the performance indexes of the irrigation facilities after the development and rehabilitation. It is hoped it can determine the design lifetime, so it can determine what action is needed to maintain the performance and by the end can predict how much cost is needed for maintaining the performance.

Based on the recommendation of the document, if it is reviewed from the performance condition and classification which the criteria due to the excellent performance is from 80 until 100%, good performance is from 70 until 80%, less performance is from 55 until 70%, and bad performance is less than 55%, so there is about 93.6% of 70 unit of IKSI data is in the condition of less until bad; only 6.4% is in the good performance.

If there is compared with the production value that is produced from each tidal marsh irrigation area which the average of production by the 70 units sample of 31 tidal marsh irrigation areas above, so the average of

production is about 3.7 ton/ha which this classification for production is as good category. This indicates that the performance assessment result has not been close to the real condition in the field by the assumption that if an irrigation area is in the bad category from the service side, the production is certainly not good.

References

- [1] HIDAYAT A. S., FAUZI M., and TRIMAIJON. Penilaian kinerja sarana dan prasarana Daerah Irigasi Rawa Reteh 1 (Rumbai Jaya) Kabupaten Indragiri Hilir (Studi Kasus: Blok B dan Blok J). *Jom FTEKNIK*, 2018, 5(2): 1-10. <https://jom.unri.ac.id/index.php/JOMFTEKNIK/article/view/21867>
- [2] AHYADI H., SUHARDJONO, LIMANTARA L. M., and JUWONO P. T. Performance index degradation model of surface irrigation system. *International Journal of Civil Engineering and Technology*, 2018, 9(11): 455–465. https://iaeme.com/Home/article_id/IJCET_09_11_045
- [3] MEDIAWAN Y., LIMANTARA L. M., SOETOPO W., and PRAYOGO T. B. Modification of the performance index of irrigation area with combination methods: AHP, PCA, SAW, correlation, and cluster analysis. *Technology Reports of Kansai University*, 2020, 62(4): 6589-6604. <https://www.kansaiuniversityreports.com/article/modification-of-the-performance-index-of-irrigation-area-with->

[combination-methods-ahp-pca-saw-correlation-and-cluster-analysis](#)

- [4] TAFARINI E. F. and YAZID M. Sustainable water management in tidal lowland agriculture: A research agenda. *Sriwijaya Journal of Environment*, 2018, 3(3): 102–107. <https://doi.org/10.22135/sje.2018.3.3.102-107>
- [5] NOOR H., SUHARDJONO, and PRAYOGO T. B. Evaluasi dan pengembangan jaringan irigasi rawa pasang surut terhadap pola operasi pintu air DIR Pematang Limau Kabupaten Seruyan. *Jurnal Teknik Pengairan*, 2018, 9(1): 12-28. <https://doi.org/10.21776/ub.pengairan.2018.009.01.2>
- [6] MUBTADI G. Water Balance and High Levels of Water Channel in Belanti I Tidal Irrigation Swamp Central Kalimantan Province. *American Journal of Engineering Research*, 2019, 8(9): 52-66. <http://www.ajer.org/papers/Vol-8-issue-9/F08095266.pdf>
- [7] SUPRIADI E., NURHAYATI, WIDODO S., and MARSUDI. *Kajian kerusakan jaringan rawa pasang surut (Studi Kasus Sekunder A Kanan dan Sekunder B Kanan Desa Rasau Raya II Kecamatan Rasay Jaya)*, 2017.
- [8] DINAR D. A. P., SARINO, YUONO A., and YUDHA A. K. Optimizing the irrigatin water needs of Lebak Semendawai Swamp in increasing agricultural production. *International Journal of Encironment, Agriculture and Biotechnology*, 2020, 5(1): 109-119. <https://dx.doi.org/10.22161/ijeab.51.17>
- [9] HAKUZIMANAA, J. and MASASI B. Performance evaluation of irrigation schemes in Rugeramigozi Marshland, Rwanda. *Water Conservation and Management*, 2020, 4(1): 15-19. <http://doi.org/10.26480/wcm.01.2020.15.19>
- [10] HIDAYAT F., RASYAD A., ZULKARNAIN, BUSTAMI A. L., and LIMANTARA L. M. Dependable discharge of Molek irrigation water requirement related to the participation perspective of irrigation management. *Journal of Southwest Jiaotong University*, 2022, 57(3): 300-310. <http://dx.doi.org/10.35741/issn.0258-2724.57.3.24>
- [11] DWIYANTAMA, Y. P. Analisa kinerja prasarana fisik daerah irigasi. *Jurnal Student Teknik Sipil*, 2020, 2(2): 125-129. <https://doi.org/10.37150/jsts.v2i2.753>
- [12] ABUZAR M., WHITFIELD D., and MCALLSTER A. Farm level assessment of irigation performance for dairy pastures in the Goulburn-Murray District of Australia by Combining Satellte-Based Measures with weather and water delivery information. *ISPRS International Journal of Geo-Information*, 2017, 6(8): 239. <https://doi.org/10.3390/ijgi6080239>

参考文:

- [1] HIDAYAT A. S., FAUZI M. 和 TRIMAIJON. 拉瓦雷特 1 (伦拜再也) 英德拉吉里尔摄政灌区设施和基础设施性能评估 (案例研究: 乙座和杰座)。乔姆·福泰尼克, 2018, 5(2): 1-10. <https://jom.unri.ac.id/index.php/JOMFTEKNIK/article/view/>

21867

- [2] AHYADI H., SUHARDJONO, LIMANTARA L.M. 和 JUWONO P.T. 地表灌溉系统性能指数退化模型。国际土木工程与技术杂志, 2018, 9(11): 455–465. https://iaeme.com/Home/article_id/IJCIET_09_11_045
- [3] MEDIAWAN Y., LIMANTARA L. M., SOETOPO W., 和 PRAYOGO T. B. 结合方法修正灌区绩效指标: 层次分析法、主成分分析、锯、相关和聚类分析。关西大学技术报告, 2020, 62(4): 6589-6604. <https://www.kansaiuniversityreports.com/article/modification-of-the-performance-index-of-irrigation-area-with-combination-methods-ahp-pca-saw-correlation-and-cluster-analysis>
- [4] TAFARINI E. F. 和 YAZID M. 潮汐低地农业的可持续水管理: 研究议程。三佛齐环境杂志, 2018 年, 3(3): 102–107。 <https://doi.org/10.22135/sje.2018.3.3.102-107>
- [5] NOOR H., SUHARDJONO 和 PRAYOGO T. B. 塞鲁延摄政目录巴马当利茂水闸运行模式的潮汐沼泽灌溉网络评估和开发。技术学报, 2018, 9(1): 12-28. <https://doi.org/10.21776/ub.pengairan.2018.009.01.2>
- [6] MUBTADI G. 贝兰蒂一世潮汐灌溉沼泽中加里曼丹省的水平衡和高水位水道。美国工程研究杂志, 2019, 8(9): 52-66. <http://www.ajer.org/papers/Vol-8-issue-9/F08095266.pdf>
- [7] SUPRIADI E., NURHAYATI, WIDODO S. 和 MARSUDI. 潮汐沼泽网络破坏研究 (二级案例研究卡南和二级案例研究乙迦南, 拉绍拉雅二世村, 拉赛再也区), 2017。
- [8] DINAR D. A. P., SARINO, YUONO A. 和 YUDHA A. K. 优化黎巴克塞门达维沼泽的灌溉用水需求以提高农业产量。国际环境、农业和生物技术杂志, 2020, 5(1): 109-119. <https://dx.doi.org/10.22161/ijeab.51.17>
- [9] HAKUZIMANAA, J. 和 MASASI B. 卢旺达鲁格拉米戈齐沼泽地灌溉计划的绩效评估。水资源保护与管理, 2020, 4(1): 15-19. <http://doi.org/10.26480/wcm.01.2020.15.19>
- [10] HIDAYAT F., RASYAD A., ZULKARNAIN, BUSTAMI A. L. 和 LIMANTARA L. M. 与灌溉管理参与视角相关的莫莱克灌溉需水量的可靠排放。西南交通大学学报, 2022, 57(3): 300-310. <http://dx.doi.org/10.35741/issn.0258-2724.57.3.24>
- [11] DWIYANTAMA, Y. P. 灌区有形基础设施绩效分析。土木工程学生杂志, 2020, 2(2): 125-129. <https://doi.org/10.37150/jsts.v2i2.753>
- [12] ABUZAR M., WHITFIELD D. 和 MCALLSTER A. 将基于卫星的方法与天气和输水信息相结合, 对澳大利亚古尔本-默里地区奶牛场的灌溉性能进行农场级评估。ISPRS 国际地理信息杂志, 2017 年, 6(8): 239. <https://doi.org/10.3390/ijgi6080239>