Security in food, renewable resources, and natural medicines

SFRN 2019

PROCEEDING

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3rd INTERNATIONAL CONFERENCE ON SECURITY IN FOOD, RENEWABLE RESOURCES, AND NATURAL MEDICINES 2019 (SFRN 2019)

Convention Hall Politeknik Pertanian Negeri Payakumbuh
INDONESIA

QUANTUM-LEAP OF AGRI-FOOD SYSTEM 4.0 AND DELIVERY OF SUSTAINABLE DEVELOPMENTS GOALS (SDGS)

September 25-26, 2019

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Welcome Message
Executive Chairman of The 3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019

Dear Honorable ladies and gentlemen,

Good Morning and Assalamu'alaikum wr.wb

On behalf of the SFRN 2019 organizing committee, I am really honoured and delighted to welcome all of you to the 3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019 at the State Polytechnic of Agriculture Payakumbuh, West Sumatra Indonesia

Our technical program is rich and varied with 8 keynote speeches and 4 invited talks and more than 170 technical papers split between 8 parallel oral sessions and 1 poster sessions. The speakers and participants came from 8 different countries, consist of Academicians, Scientists, Researchers, Practitioners, Professionals, and Government Officialsin multidiscipline branch of knowledge, who gathered here today to share and discuss new findings and applications of innovations for promoting Food Security, Renewable Energy, Sustainable Resources and HealthCare Free for All, in particular for those who in needs. As the chairman of conference 2019 SFRN, I know that the success of the conference depends ultimately on the how many people who have worked in planning and organizing both the technical program and supporting social arrangements. This year, the conference is jointly organized by the Payakumbuh State Agricultural Polytechnic and Andalas University. We also thank to the steering committee fortheir wise and brilliant advice on organizing the technical program; and also to the the Program Committee, both from the Payakumbuh State Agricultural Polytechnic and Andalas University , for their thorough and timely reviewing of the papersand to the Directorof Payakumbuh State Agricultural Polytechnic and the rector of Andalas University, and the Head of the Institute forResearch and Community Service of Andalas University, and Payakumbuh State Agricultural Polytechnic. Our recognition should go to the Organizing Committee members who have all worked really hard for the details of the important aspects of the conferenceprograms and social activities, and then we extend our gratitude to our students who bore the arduous burden for preparing this event.

We hope this event is also a good step in gaining strengthenn cooperation between our universities as we know that the State Agricultural Polytechnicof Payakumbuh is part of the Andalas University previously, of course the psychological relationship between the State Agricultural Polytechnicand the Andalas University is really close.

Finally on behalf of the committee, we apologize profusely for all the shortcomings and everything that is not properly in organizing this event and hopefully AES-Network contributes significantly to the research and technology for the good of humanity.

Thank you

Fithra Herdian, S.TP, MP

Message from Afro-Eurasia Scientific (AES) Network
3rdInternational Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019

Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

On behalf of the AES Network, I am honored and delighted to welcome you to the 3rdInternational Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019 at the Agricultural State Poly Technique of Payakumbuh, Indonesia. I believe we have chosen a venue that guarantees a successful technical conference amid the culture, delicacy and scenery of Payakumbuh, the city of "Rendang".

The AES-Network aims to Promote Livelihood Through Food Security, Promote Future Smart and Green Mobility by Using Renewable Energy, Promote Prosperity by Equally Managing and Distributing the Sustainable Resources and Promoting Enjoyable Long-Life by using Natural Medicines With Free Health Care For All. The AES-Network was established in 2018 and already have memberships from 12 countries. Our members consist of Academicians, Scientists, Researchers, practitioners, professionals, and government officials from multidiscipline branch of knowledge, who gathered and contributed their expertise to share and discuss new findings and applications of innovations for promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care for All.In particular, the network aims to alleviate the condition of those who in dire needs. In the future, we also expect to provide technical demonstrations, and numerous opportunities for informal networking for Promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care for All. In this opportunity, we invited you to become our members and join our efforts for a better life to all of mankind.

As a team, we acknowledge the existence of mutual interest among university and college educators, researchers, activists, business sector, entrepreneurs, policy

makers, and all society members. We must promote the need to strengthen cooperation for establishing Security in Food, Renewable Resources, and Natural Medicines in Africa, Europe, and Asia.

The AES-Network believe, a firm foundation for mutual collaboration with the spirit of equality and partnership and thereby contribute towards sustainable development in these three regions.

Therefore, through networking, friendships, and joint efforts, the capacity of our network can be enhanced to address major challenges in securing the Food, Renewable Resources, and Natural Medicines in Africa, Europa, and Asia.Our Network goals areto increase the awareness of educators, researchers, scientific community, business sector, entrepreneurs, and policy makers in Africa, Europa, and Asia, that the future of a better world, lies within their responsibilities, and to improve the networking, mobility and mutual collaboration of scientific community, business sector, entrepreneurs, and policy makers in Africa, Europe, and Asia to energize the delivery of Sustainable Development Goals.

Finally, I hope that, by registering our network, you will be provideda common platform and support the exchange of knowledge, while at the same time, we offer constructive dialogue across and within the various interest and stakeholder groups, including the intended beneficiaries, and arrived at the best solutions to our terminal goal, Promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care based on scientific evidence in Africa, Europa, and Asianregion.

Thank You for Joining us!

President
Assoc. Prof. Dr. Eng. Muhammad Makky

Welcome Message
Head of Institute for Research and Community Service
Universitas Andalas

Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

It is with great pleasure that I welcome the participants of the SFRN 2019 in Payakumbuh, the city of "Rendang", the prime of Indonesian delicacy.

In this esteem event, we share the knowledges, and imparted it to the people. The quest for knowledge has been from the beginning of time but knowledge only becomes valuable when it is disseminated and applied to benefit humankind. It is hoped that this conference will become a platform to gather and disseminate the latest knowledge which can be adopted for securing the food, resources, and health for mankind, in Asian, European and African region.

Academicians, Scientist, Researchers and practitioners from multidiscipline branch of knowledge who gathered here today will be able to share and discuss new findings and applications of innovations for ensuring food security, in particular for those who reside in developing countries. It is envisaged that the intellectual discourse will result in future collaborations between universities, research institutions and industry both locally and internationally. In particular it is expected that focus will be given to issues on environmental and sustainability. Therefore, we urge to all participants, to establish a scientific network that will voice the needs

Researchers in the multi sectoral aspects related to the benefit of mankind have been progressing worldwide. Food is a basic right, while energy drive the world. Human need a lot of resources so the civilization can be flourished. But human is not immune, and thus, ones need to take care of their health regularly. Modern Agri-food systems is the foundations of a decent life, a sound education and the achievement of

the Sustainable Development Goals. Over the past decade, we have witnessed a chain reaction that threatens the very foundations of life for millions of the world's people. Rising energy prices drove up the cost of food and ate away the savings that people otherwise would have spent on health care or education. Unsustainable plantation management induced forest fire and posed haze hazard to the whole Sumatra island and our neighboring countries.

The human cost of the food and energy crisis has been enormous. Millions of families have been pushed into poverty and hunger. Thousands more suffering from the collateral effects. Over the past year, food insecurity led to political unrest in some 30 countries. Yet because the underlying problems persist, we will continue to experience such crises, again and again -- unless we act now. That is why we are here today.

We must make significant changes to feed ourselves, and most especially, to safeguard the poorest and most vulnerable. We must ensure safety nets for those who cannot afford food, or energy, nor even a health service. We must transform agricultural development, markets and how resources is distributed. We must do so based on a thorough understanding of the issues. That is the only possible way we can meet the Goals of Sustainable Development.

Thank You,

Assoc. Prof. Dr.-Ing. Uyung Gatot S. Dinata,MT.

Opening Ceremony
Rector of Andalas University

Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

I welcome the opportunity to address you at this important event.

It gives me great pleasure in welcoming you to this 3rdConference on "Security in Food, Renewable resources, and Natural Medicines (SFRN)" 2019. I am delighted that so many have accepted our invitation. I am particularly happy that we have in this room, dedicated individuals from so many stakeholder groups — including our most respected and distinguished guest "The ministry of Agriculture of the Republic of Indonesia". We also welcome the mayor of Payakumbuh and the Regent of Lima Puluh Kota. We extend our welcome to the civil society, the private sector, international organizations; the science community; and others dedicated to help create an environment in which people can escape food insecurity. Imagine what we can do together if we make the security for all as an our top priority, and pull in the same direction. We can make a difference in the lives of millions.

Food is a basic right. Food security are the foundations of a decent life, a sound education and the achievement of the Sustainable Development Goals Access to medicines - a fundamental element of the right to health. Health is a fundamental human right, indispensable for the exercise of many other rights in particular the right to development, and necessary for living a life in dignity. Moreover, human rights principles and language are being used to support resource access claims as rights-based approaches empower individuals and groups to gain or maintain access to natural resources

Much progress has been made during the last decades but much more needs to be done. Millions of people are Insecure worldwide, meaning that they either starve or they do not know from where their next meal, health care or resources will come.

Much of the progress on security has occurred at the expense of our environment. With business as usual, we foresee that the production improvements during the next decade will be less than the last one, while the environmental degradation will continue, and health will deteriorate significantly. Without available resources to seek, mankind will become endanger species in a very short time.

Solutions to the security problems need to be designed and implemented within a new and rapidly changing environment. Globalization and sweeping technological changes offer new opportunities for solving these problems. A number driving forces or trends must be taken into account in developing appropriate action. Some of the action needed, such as appropriate technology for small farms, is not new but it must be cast in the new and changing global and national environment, taking into account new opportunities and risks. I hope that by providing a forum for knowledge exchange, this conference will help identify the action to be taken. Furthermore, this conference will help to provide constructive dialogue across and within the various interest and stakeholder groups, including the intended beneficiaries, and arrive at the best solutions.

In conclusion, even if those responsible give high priority to achieving sustainable security for all and back it up with action, the world may not achieve the goal by 2030. But we will be much closer than with business as usual. I urge all of us to provide the strongest support for this event, to enable securing the food for all in the closest time possible. It is my sincere optimism that through the accomplishment of the objectives of this event, we will come to an important step nearer to secure the food for all.

Finally, I would like to thank the organizing committee who have spent their utmost efforts to prepare and manage this event successfully. Let me conclude my remarks by wishing our guests happiness, good luck and great success in the conference.

May I announce now the opening of the "3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019" in Payakumbuh.

Thank you.

Rector,
Prof. Tafdil Husni, SE, MBA, PhD

Welcome Message
Director of Politeknik Pertanian Negeri Payakumbuh

Dear Honorable ladies and gentlemen,

Good Morning and Assalamu'alaikumwr.wb

I congratulate to all participants on the invitation and participate at our beloved campus Payakumbuh StateAgricultural Polytechnic. I feel really honoured to welcome all of you at our event, the 3rd International Conference on Security in Food, Renewable Resources, and Natural Medicines (SFRN) 2019 at thePayakumbuh State Agricultural Polytechnic, Indonesia.

Food security is a very important aspect in a country's sovereignty. Food also determines the future direction of a nation. Many social and political fluctuation can also occur if food security is disrupted. Food availability that is smaller than its needs can create economic instability. This critical food condition can even endanger economic and national stability. In the current situation, there are many challenges in exteriorize food security, such as climate change, population, limited natural resources and other challenges both locally, regionally and globally.

Renewable resources are also our starting point to start sustainable development. Research on renewable resources is also very important as the solution in meeting the principles of sustainable development. As we know that Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainability is the foundation for today’s leading global framework for international cooperation - the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs)

The discovery of treatment based on local culture also contributes greatly to the good of humanity. Unfortunately, there are still many treatments that have not been carried out by scientific research. So, through this conferencewe hope it can be a trigger to increase in traditional plant-based treatments that not go through complex

chemical processes, so that the effectiveness of the pillars can be further suppressed and also contribute to the community's economy.

Finally, I would like to express my gratitude to all people who involved in organizing this event and to all ofstakeholders who have helped to make this event go on succesfully. Please accept my apologize for any shortage, Assalamu'alaikumwr.wb.

Thank you

Ir. Elvin Hasman, MP

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Water Resources Potency for Supporting Location-Specific Agricultural Policies and Innovations

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Abstract. Water is one of the crucial factors in the development of significant crop cultivation strategy's commodities, especially rice, corn, and soybean (Pajale). Optimum and adequate water conditions will very well support plant growth and development. The potential availability of water resources supports the increase in Pajale productivity for several potential locations all over Jambi Province. Through surveys conducted in some stages, continuously and systematically, the identification of water resources in two districts (Sarolangun and Tebo) in the Province of Jambi reached a potential commodities area of 2.691 ha (2018). Secondary and primary data are used to overlay the service area and further analysis. Potential water resources mainly come from watersheds, swamps, and other water sources. Types of agricultural machinery and water facility buildings are complementary supporting facilities. Thus, water services can be carried out optimally. Result analyses indicated that some broad areas of paddy, corn and soybean commodities services and potential use of water resources located in some districts such as batangasai, air hitam, limun, pelawan, pauh, tebo ulu, central tebo, and tebo Ilir

Keywords: water resources, agricultural areas, cereal crops, Jambi.

INTRODUCTION

Water is an essential element for plants to grow (Subagyono, et al. 2004). Plants will utilize the availability of water for the formation of plants, cells, tissues, and organs. The source of water for plants can come from rainwater/irrigation and soil groundwater. The groundwater availability is very closely related to the source and availability of natural water circumstances nearby (Alwi. 2014). The presence of soil water contains around plant root zone (as micro-level) and the availability of water resources that are close to plantations areas (as macro-level); both must be considered well according to each plant requirement (Kementan. 2017; Supriadi, et al. 2018).

In some areas, crop production centers are still constrained by water availability (Estiningtyas. 2012). Some methods need to be done for increasing water accessibility by involving alterations in water harvest buildings, the use of agricultural automatic, and manual equipment (Kementerian Pertanian, 2015). Water in agriculture that is most commonly used is irrigation water, reservoirs, and deep

wells. All of these methods require excellent facilities and infrastructure (Umar, et al. 2017).

Another constraint related to the availability of water for plants are related to planting seasonal differences as called: a dry season and wet season. Thus, during the dry season, the cropping land areas become lack of water while in the wet season, the planting land area becomes excess water or flooding. In account of this, it is imperative to build and utilize location-specific water harvest buildings in accordance with crop commodities, land characteristics as well as existing water sources types (Sudharto. 2009; PSP. 2017).

Optimization of water resources management is focused on irrigation water supply, both in the form of surface water and groundwater. Increased land-use change and climate variation have a direct impact on reducing the level of water availability that will affect the sustainability of its agricultural commodities (Soeparno, et al. 2013; Pujiharti, Y. 2017). Therefore, the efficiency of water utilization and distribution is a critical factor in the management of water resources. In this regard, this paper aims to identify water resources for the development of water harvest infrastructure or irrigation buildings as well as identification of catchment area (DTA) in which likewise target area/coverage areas that potential to be agricultural areas in Sarolangun and Tebo Regency, Jambi Province.

METHODOLOGY

Activities are mostly carried out through field surveys and secondary data studies from various relevant sources. The stages of the activity were carried out in coordination with the local agriculture office, the public works department, the village administration, and some local traditional leaders. The survey was conducted in 2017 and 2018 in Sarolangun and Tebo Region, Jambi Province. The total area for the target area has been determined in general by the Ministry of Agriculture, so what is done next is the location survey (Ground validating).

Some identified information includes: (a) **Location identity**: (1) Province, (2) District, (3) Sub-District, (4) Village, (5) Village ID, (6) Hamlet, (7) Name of Farmer Group, (8) Address of the Farmer Group, (9) Chair of the Farmer Group. (b) **Existing Condition**: (1) land Type, (2) land parcel number, (3) Coordination of land and longitude parcels, (4) Existing cropping index, (5) Cropping index target, (6) Increase in crop index, (7) Average productivity of existing rice, (8) types of existing buildings, (9) Closest water resources, (10) distance of water sources to land. (c) **Recommendations**: (1) Recommended types of water harvested buildings, (2) Channel widths, (3) Channel lengths, (4) Channel height, (5) Service area, (7) Budget estimates, (8) Photos. The data was compiled and prepared for future water resource development plans.

RESULT AND DISCUSSION

Water resources identification and characterization based on determining the type of water harvested infrastructure criteria (Table 1). Using its criteria, planning the development for water harvested infrastructure and renovation water structures have been carried out in Sarolangun, and Tebo regencies. Its shown that from the survey area, cultivated land for crop covered 2.691 ha. Subsequently, result and discussion of both water resources survey on identification and inventory in both regencies in Jambi Province presented below:

Table 1. Criteria for Determining the Type of Water Harvest Infrastructure (PSP. 2017)

No.	Parameters (the type of water resources)	Condition	Infrastructure type
1.	River Flow	Water minimum debit >50 l/s, river-wide <18 m, river depth <1.5 m, elevation differences between the source of water and cultivation areas <2 m, distance from the river to cultivation areas <2 m	Trench Dam
2.	River flow, Irrigation system, Lake	Water minimum debit >25 l/s, river-wide >18 m, river depth >1.5 m, elevation differences between the source of water and cultivation areas >2 m, distance from the river to cultivation areas <100 m	Water consumptions from the river (water pump application)
3.	Rainwater, drainage tunnel, intermittent river (waterless when dry season) (Umar et al. 2017)	The topography around rough hilly land which is a catchment area (DTA), close to intermittent drainage channels or rivers	Trench Dam
4.	Rainwater, drainage tunnel, intermittent river, tideless river	The topography is flat, close to	Long Storage

	up and downstream (Saputro, et al. 2016)	drainage channels, intermittent rivers, or river tides	
5.	Groundwater	Deepness of soil water surface <20 m	Shallow well

Sarolangun regency

Batangasai is a sub-district of main rice production centers in Sarolangun Regency, Jambi Province. The potential for land expansion and rice production is still wide open. However, several efforts are needed ranging from improving water resources infrastructure, enlightening cultivation technologies, and adopting Good Agricultural Practices (GAP) (Kementerian Pertanian, 2015). Batangasai district is located between 2° 20' to 2° 45' South and between 102 ° 05 'to 102 ° 20' East. The sited range between ± 287 - 451 m above sea level, with an area of 858 Km². The number of villages in Batangasai District is 23 villages. Several water resources in the Batangasai, such as Batangasai River (main water source/river), Kasiro River, Baung River, Bemban River, and Keradak River, are water sources for irrigating paddy fields. The survey was conducted in the villages of Kasiro, Kasiro Ilir, Datuk Nan Duo, and Padang Jering. Batangasai. It has good water resources, but the condition of water infrastructure to ensure the availability of water for plant still needs to be made, repaired, and renovated due to longstanding and damaged usage.

Currently, only a small portion of rice fields in Batangasai have good irrigation. Some areas of paddy affected flooding during the rainy season and dry during the long dry season (Haryono, and Las, I. 2009). Whereas, water management from existing water sources is accessible from raindrop and is only planted once a year. It vastly can increase planting times to twice or even three times a year due to the availability of abundant water resources from several rivers. i.e., by damming the flow of the Kasiro river, which is medium size river can improve paddy fields to reach more than 500 ha coverage areas and enhance planting index within a year (Wahyunto and Widiastuti. 2014; Saputro, et al. 2016). Other areas can be developed by pipelines and reservoirs that are located above existing rice fields (Table 2).

Rice productivity in these areas is about 5-6 tons/ha with varieties that are generally planted is Ciherang. Its rice productivity can be higher through optimal utilization of water resources, GAP application, and the use of new superior rice varieties (Adri, et al. 2013). Furthermore, it is expected that the most extensive rice cultivation in Sarolangun Regency will be even more extensive with high production.

Table 2. Identification for Water Resources Infrastructure Type in Sarolangun Regency

No	Name of Farmer Group	Address	Type of water harvested	Coverage areas (Ha)	Planting Indeks			Existing rice productivity (ton/ha)	Other supporting data
					Existing	Target	increasing		
1	Sari Murni	Teluk Mancur, Bathin VIII. LS :	Reservoir	11	-	200	200	3,70	p=20, l=20, t=2.5

No	Name of Farmer Group	Address	Type of water harvested	Coverage areas (Ha)	Planting Indeks			Existing rice productivity (ton/ha)	Other supporting data
					Existing	Target	increasing		
		2° 16' 54" BT : 102° 36' 48"							
2	Serumpun Jaya II	Bangun Jayo, Bathin VIII. LS : 2° 11' 37" BT : 102° 29' 46"	Trench dam and long storage	21	100	200	100	3,70	Dam L=6, t=3 ;LS p=400 , l=2, t=2
3	Karya Bakti	Sukajadi Bathin VIII. LS : 2° 16' 12" BT : 102° 15' 32"	Trench Dam	21	100	200	100	3,70	L= 5, t= 3
4	Gapoktan Serumpun	Ladang Panjang, Sarolangun. LS : 2° 15' 38" BT : 102° 44' 52"	Long Storage	50	-	200	200	4,10	p=300 , l=2, t=2
5	Gapoktan Maju Jaya	Baru, Air Hitam. LS : 2° 1' 40" BT : 102° 44' 47"	Reservoir and long storage	20	100	200	100	4,00	p=20, l=20, t=2.5, LS p=500 , l=2, t=2
6	P3A Sungai Singkarang	Semurung, Air Hitam. LS : 2° 0' 32" BT : 102° 43' 7"	Long Storage	69	100	200	100	5,40	p=150 l=2 t=1,5
7	Kelompok Tani Sidodadi/Maju Jaya	Pematang Kabau, Air Hitam. LS : 1° 58' 28" BT : 102° 43' 35"	Trench Dam	137	100	200	100	5,70	p=6, t= 4
8	Gapoktan Payo Lebar	Jernih, Air Hitam. LS : 2° 59' 54" BT : 102° 42' 35"	Trench Dam andlong storage	103	100	200	100	5,60	Dam p=6, t= 4. LS p=200 l=2 t=22
9	Gapoktan Karya Bersama	Lubuk Jering, Air Hitam. LS : 1° 57' 58" BT : 102° 39' 6"	Re-construct Trench Dam and long storage	121	100	200	100	5,70	Dam L=6, t=4 ;LS p=1000, l=2, t=2
10	Usaha Baru	Pauh, Pauh. LS : 2° 7' 56" BT : 102° 49' 22"	Reservoir	51	100	200	100	3,30	p=20, l=20, t=2.5
11	Tambaksari	Mentawak Baru, Air	Reservoir and long	70	100	200	100	5,60	p=20, l=20,

No	Name of Farmer Group	Address	Type of water harvested	Coverage areas (Ha)	Planting Indeks			Existing rice productivity (ton/ha)	Other supporting data
					Existing	Target	increasing		
		Hitam. LS : 2°00' 48" BT : 102° 35' 28"	storage						t=2. LS P=200, l=2, t=2
12	Margo Mulyo II	Mentawak Ulu, Air Hitam. LS : 2°05' 27" BT : 102° 36' 51"	Trench Dam and Long Storage	59	100	200	100	5,60	p=3, l=4, t=5. LS P=200, l=2, t=2
13	Gapoktan Sinar Bulan	Mersip, Limun. LS : 2°40' 02" BT : 102° 32' 34"	Long Storage	164	100	200	100	4,90	LS P=500, l=2, t=2
14	P3A Tebat Tuo	Sarolangun Kembang, Sarolangun. LS : 2°17' 03" BT : 102° 44' 26.5"	Pipeline and Long Storage	85	100	200	100	4,10	pipeline 3 row. LS P=300, l=2, t=2
15	Gapoktan Harapan Baru	Lubuk Sayak, Pelawan. LS : 2°35' 56" BT : 102° 40' 33"	Long Storage	80	100	200	100	4,00	LS P=300, l=2, t=2
16	Gapoktan Sungai Batu	Penegah, Pelawan. LS : 2°20' 32" BT : 102° 38' 12"	Pipeline and Long Storage	80	100	200	100	4,00	Two pipeline. LS P=380, l=2, t=2
17	Gapoktan Maju Mandiri	Lubuk Resam Ilir, Cermin nan Gedang, LS : 2°20' 37" BT : 102° 37' 34"	Long Storage	80	100	200	100	4,96	LS P=380, l=2, t=2
18	Gapoktan Danau Kering	Pasar pelawan, Pelawan. LS : 2°22' 44" BT : 102° 15' 61"	Long Storage	80	100	200	100	4,00	LS P=580, l=2, t=2
19	Gapoktan Bukit	Bukit, Pelawan. LS : 2°21' 14" BT : 102° 12' 23"	Long Storage	125	100	200	100	4,50	LS P=380, l=2, t=2
20	Gapoktan Sumber Makmur	Pulau Pandan, Limun. LS : 2°23' 28" BT : 102°	Long Storage	100	100	200	100	4,90	LS P=500, l=2, t=2

No	Name of Farmer Group	Address	Type of water harvested	Coverage areas (Ha)	Planting Indeks			Existing rice productivity (ton/ha)	Other supporting data
					Existing	Target	increasing		
		40' 33"							
21	Gapoktan Sumber Daya	Muara Limun, Limun. LS : 2°23' 93" BT : 102° 40' 198"	Long Storage	89	100	200	100	4,90	LS P=400 , l=2, t=2
22	Gapoktan Ketari Indah	Napal Melintang, Limun. LS : 2°25' 54" BT : 102° 17' 05"	Long Storage	75	100	200	100	4,90	LS P=450 , l=2, t=2
	Entire Areas			**1.691**					

Tebo Regency

Tebo Regency is located in the western part of Jambi Province precisely placed between coordinates 0º 52 '32 "- 01º 54' 50" South and 101º 48 '57 "- 102º 49' 17" East, Tebo Regency has a tropical climate with the region located at an altitude between 50-1000 meters above sea level. The area of Tebo Regency is 646,100 Ha or 11.86% of the total area of Jambi Province, which consists of 12 districts, 107 villages, and five villages. Based on the physiographic area is including the Bukit Barisan Tropical Climate Zone I, the humidity level is approximately between 56% - 85%, the average temperature of 25.8º - 28.7º C, with an average rainfall of 300 mm per year. Generally, Tebo Regency has a wet tropical climate with a few small variations of rainfall and almost evenly each year; thus slight difference occurs between the dry season (February-August) and the rainy season (September-January) (Badan Penelitian dan Pengembangan Pertanian. (2011).

Physiographical for Tebo Regency is located in the northern part of the South Sumatra Basin. Geomorphologically, it is grouped into two morphological units, namely steep hills, undulating hills, and flat plains. The morphology of the steep hills includes the Bukit Tiga Puluh mountainous areas, the hillside in this place can reach 60 ° with sharp peaks and altitudes between 100 meters to 850 meters above sea level. Some of the rivers contained in these areas are Ketalo River, Sumay River, Pengabuan River, and Melani River, which straight and long direction appearance affected by Permo Carbon rock below. Corrugated hills are the largest morphological unit. This unit is a transverse belt from the Southeast Northwest. The hillside ranges from 5 ° to 20 ° with a height between 50 meters to 200 meters above sea level. This morphological unit is composed of middle to late tertiary sedimentary rocks. The terrain morphology is composed of alluvial and swamp deposits, occupies the northeastern part and Southwest part in which the area around by Batanghari River. Batang Tebo river slope in this area is low, forming meanders and oxbow shaped lakes, indicating that lateral erosion and re-deposition are still fragmented.

Generally, water resources in Tebo are included in Batanghari irrigation regions (DI), which concealed by the national authority with an area of 18,936

hectares. Whereas, in Tebo regency's has 9,350 hactarage irrigation systems. This irrigarion sistem has develop by some water resovoir sistems includes controlling water system through dams in Tebo Ulu sub-district; b. the development of Sumai dam in Sumai District; c. the development of the Muara Kilis water reservoir in Tebo Middle Ilir District; d. the development of the Mangilang dam in the Tebo Ilir District; e. construction of water reservoirs in Rimbo Ilir District; and f. construction of water reservoirs in Central Tebo District. Meanwhile, the existing irrigation condition for water resources originating from the Pagar Puding dam-in the Village of Pagar Puding and in the Empelu hamlet dam- is in poor condition and needs to be improved. So that irrigation services can be optimal, and the expansion of paddy fields can increase significantly (Umar, et al. 2017).

In the Tebo area, because most of its rain-fed rice fields, has only IP 100 and can be increased to IP 200 or twice planting area expose more than 2,000 ha (Table 3). However, the land must be supported by infrastructure in the form of adequate water resource buildings ranging from reservoirs, water pumps, piping, long storage, and repair/construction of dams (Djamhari, S. 2009; Erythrina. 2010; Supriadi, et al. 2018).

Table 3. Identification for Water Resources Infrastructure Type in Tebo Regency

No	Name of Farmer Group	Address	Type of water harvested	Coverage areas (Ha)	Planting Index			Existing rice productivity (ton/ha)	Other supporting data
					Existing	Target	Increasing		
1	Maju Bersama	Desa Kandang Kec. Tebo Tengah LS : 01'27'20" BT : 102'.29'.25"	Trench Dam	150	100	200	100	5,4	left 100 m right 100 M p=4,l=2 t=2,5
2	Maju Bersama	Desa Kandang Tebo Tengah LS : 01'27'18" BT : 102'.29'.31"	water pumps and pipeline	50	100	200	100	5,4	Pipe long 800 m
3	Sungai Udang	Desa Mangun Jayo Tebo Tengah LS : 01'29'48" BT : 102'.27'.11"	Trench Dam	80	100	200	100	4,8	p=5,l=3 t= 2,5
4	Maju Bersama	Desa Mangun Jayo Tebo Tengah LS : 01'29'48"	Long Storage	100	100	200	100	3,0	P=300 m, l=2 m t=1,5 m

No	Name of Farmer Group	Address	Type of water harvested	Coverage areas (Ha)	Planting Index			Existing rice productivity (ton/ha)	Other supporting data
					Existing	Target	Increasing		
		BT : 102'.27'.11"							
5	Tuah Sepakat	Kel. Pulau Temiang Kec. Tebo Ulu LS : 01'13'8" BT : 102'14'14"	Reservoir	110	100	200	100	5,1	P=80,l=60 t=3 m
6	Tuah Sepakat	Kel. Pulau Temiang Kec. Tebo Ulu LS : 01'13'7" BT : 102'14'23"	Long Storage	25	100	200	100	5,1	P=80 m,l=3 m t=1,5 m
7	Maju Bersama	Kel. Sungai Bengkal Kec. Tebo Ilir LS : 01'31'36" BT : 102'.41'.40"	Trench Dam	50	100	200	100	4,8	P=5,l=3 t=3 m
8	Maju Bersama	Kel. Sungai Bengkal Kec. Tebo Ilir LS : 01'31'36" BT : 102'.41'.40"	Long Storage	25	100	200	100	4,6	P=80 m,l=3 m t=1,5 m
9	Sungai Mengkuang	Kel. Sungai Bengkal Kec. Tebo Ilir LS : 01'31'.537" BT : 102'.43'879"	Long Storage	25	100	200	100	4,8	p=30,l=3 t= 2
11	Perit I	Desa Muara Kilis Kec. Tebo Tengah LS : 01'30'.23" BT : 102'.37'.04"	water pumps and pipeline	50	100	200	100	4,9	Pipe long 400 m
12	Sumber Rezeki seberang	Desa Teluk Langkap Kec. Sumay LS : 01'.32'.70" BT : 102'26'62"	Trench Dam	25	100	200	100	5,3	P=4 m,l=3 m t=2,5 m
13	Lancang Kuning	Desa Pintas Kec. Muara Tabir LS :	Long Storage	50	100	200	100	5,1	P=40 m,l=3 m t=2,5 m

No	Name of Farmer Group	Address	Type of water harvested	Coverage areas (Ha)	Planting Index			Existing rice productivity (ton/ha)	Other supporting data
					Existing	Target	Increasing		
		01'41'13.25" BT : 102'38'42"							
14	Berkat Usaha	Desa Embacang Gedang Kec. Muara Tabir LS : 01'41'13" BT : 102'38'42"	Trench Dam	60	100	200	100	5,1	P=4 m,l=3 m t=2,5 m
15	Maju Bersama	Desa Jambu Kec. Tebo Ulu LS : 01'14'46" BT : 102'16'58"	Trench Dam	80	100	200	100	5,2	P=4 m,l=3 m t=2,5 m
16	Tunas Muda	Desa Malako Intan Kec. Tebo Ulu LS : 01'10'.88" BT : 102'12'28"	Trench Dam	80	100	200	100	4,9	P=4 m,l=3 m t=2,5 m
17	Sinar Harapan	Desa Semabu Kec. Tebo Tengah LS : 01'28'.43" BT : 102'29'27"	Long Storage	250	100	200	100	5,0	P=40 m,l=3 m t=2,5 m
18	Harapan Jaya	Desa Teluk Kasai Rambahan LS : 01'18'.96" BT : 102'19'120"	Reservoir	40	100	200	100	4,8	P=80,l=60 t=3 m
19	Danau Panjang	Desa Teluk Kasai Rambahan LS : 01'18'.62" BT : 102'19'227"	Reservoir	50	100	200	100	4,8	P=80,l=60 t=3 m
	Entire Areas			**1.300**					

CONCLUSION

There is an area in Sarolangun and Tebo Regency, Jambi Province, that has good potential for the development of agricultural areas with an area of more than

2.691 ha. Besides, some areas can be increased to twice planting time, which was previously planted once with the improvement of water resource facilities.

The outcomes of water resources identification and water construction recommendation can be followed up by the relevant agencies. It is due to improving facilities, procurement of goods, and making facilities to achieve the service area and increase the productivity of crop commodities, especially rice, corn, and soybean commodities'.

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