

**THE FLOW AND ROLE OF AGRICULTURAL EXTENSION WORKERS  
IN COMMUNICATION INNOVATION OF INTEGRATED CROPPING  
CALENDAR INFORMATION SYSTEM IN SIAK AND KEPULAUAN  
MERANTI REGENCY OF RIAU PROVINCE**

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**ABSTRACT**

Climate change issue may affect food crops sector because climate change may impact sustainably and productivity of its sector. Strategy should be designed for tackling the issue. One of them is through innovation of Integrated Cropping Calendar Information System (ICCIS). This innovation has not been fully aware by farmers. Survey found farmers have not applied or even have not been aware of it. Research should be conducted to examine the issue concerning the process of diffusion of the innovation. This study was conducted using a survey method of 44 agricultural extension workers and in-depth interview with 9 farmers. Data collection was carried out using descriptive explanatory survey research methods. The respond as its research methods conducted in Siak and Kepulauan Meranti Regency from April to September 2019. Result showed three methods how the information about the innovation is delivered, namely online, directly delivered and combination between the two. The research also suggested the insignificant role of agricultural extension workers in facilitation, socialization, and education about the innovation in low and moderate category. Socialization and education activities are rarely done to introduce and guide farmers to access ICCIS through three media, namely SMS, android applications and websites.

**Keywords:** Climate change, Communication inovation, Cropping Calender, Role of agricultural extension workers

**INTRODUCTION**

Climate change not occurs only locally (Runtunuwu *et al* 2012), and regionally (Syahbuddin *et al* 2015) but also globally (Runtunuwu and Kondoh 2008 in Agriculture Research and Development Agency [ARDA] {Balitbangtan} 2013). Climate change, decades ago, was

difficult to be predict because of technological limitation. Because of the limitation, the impact of climate change, such as El Nino and La Nina, is difficult to be prevented.

According to Agriculture Research and Development Agency (2013) and Surmaini *et al* (2011) Climate anomaly, mainly the increase of its intensity, frequency and its fluctuation, has noticeable impact to the production of paddy and non-staple food corps (*palawija*) because these crops are susceptible to climate change. If climate change cannot be predicted or adapted, several problems may arise such as land and water resource degradation, soil fertility decline, flood, drought, plant diseases, crop failures, (Waongo *et al* 2015; Balitbang 2013; Santosa *et al* 2011), the attack of plant-disturbing organism (PDO) (ARDA 2013; Salampessy *et al* 2018) and permanent land conservation (Rahmawaty dan Rauf 2014).

Those impacts should be managed by certain strategies. One of them is through the innovation of Integrated Cropping Calendar Information System (ICCIS). ICCIS is a tool or guidance providing tabular and spatial information about season prediction, planting date (*awal tanam*), cropping pattern (*pola tanam*), potential planting sites, flood-and-drought-prone areas, potentially attack PDO, recommendation about varieties of rice and non-staple food crops reflecting its geographical variation, and recommendation about fertilizer dosage and requirement based on variability prediction and climate change (Balitbangtan 2013). This IT System could guide Agricultural Extension Workers and farmers up to sub-district (*Kecamatan*) to manage cultivation of their food crops.

According to Aziz (2019) information about ICCIS to farmer chiefs and several members of farmer groups was initially disseminated without knowledge of other farmers or farmer groups. Because of the good response, the dissemination of information was followed up by mini demonstration to draw more farmers' interest. The same pattern was also noticed in other region of Riau province, the location of the research. At this point, Agricultural Extension Workers and farmers' awareness of ICCIS had just entered initial stage since only several Agricultural Extension Workers and chief of farmer groups aware of this innovation.

The development of information and communication technology has contributed to development of agricultural information system, especially for the purpose of communicating innovation to wider public (Mulyandari 2011). According to Leeuwis (2009) development of communication technology plays key role in accelerating the development of agricultural sector. Furthermore, the exchange of information and knowledge between researchers, extension workers and farmers become necessity to agricultural development. Information technology are useful for disseminating information about agricultural innovations in up-to-date, timely, and effective fashion. It suggests that ICCIS has an important role in the dissemination of information to

extension workers and farmers in dealing with climate change and on how paddy and non-staple food crops are cultivated.

Research is conducted because ICCIS cannot be communicated well. The extension workers cannot successfully convey the information about ICCIS. Meanwhile, the farmers cannot successfully gain the information. There is lack of communication and coordination between those two. It is reflected from farmers' unawareness of ICCIS. The extension workers should act as innovators who introduce and apply the innovation to such social system, namely farmer groups they foster.

ICCIS can be fully implemented if farmers fully approve recommendations and get tangible benefits from the ICCIS. Furthermore, farmers, extension workers and users have important role in giving feedback for the improvement in the future as an effort to deal with climate change in agriculture sector (Runtunuwu et al 2012). The importance of ICCIS lies in the impact of climate change in the location of this research, Riau Province. According to 2013-2017 statistics, total area of paddy field is about 127,992 Ha, but of the 8,140 Ha are affected by flood, drought and damaged by PDO (Directorate General for Agricultural facilities and infrastructure {*DITJEN PSP*}, 2015). The data shows that climate change has affected the cultivation of paddy, resulting in crop failure and decrease in crops production because paddy and non-staple relies on rainfall on water (rainfed), meaning water supply determines the success in paddy and non-staple crops cultivation. The data reflects the importance of adopting suggestions about ICCIS to address the impact of climate change.

In regard to the explanations, this research aims to (1) analyze communication flow related to Integrated Cropping Calendar Information System (ICCIS) and to (2) analyze the role of extension workers in the communication of Integrated Cropping Calendar Information System (ICCIS) in Siak dan Kepulauan Meranti regency.

## **METHODOLOGY**

Research conducting in Siak and Kepulauan Meranti of Riau province used quantitative approach and supported by qualitative data. The respondents consisted of 44 agricultural extension workers. 25 of them were from Siak regency and the rest are from Kepulauan Meranti Regency. This research was conducted in April-August 2019. Quantitative data were analyzed descriptively and qualitative data were collected through in-depth interviews with 9 instructors, 6 farmers and 1 Riau Assessment Institute for Agricultural Technology (AIAT).

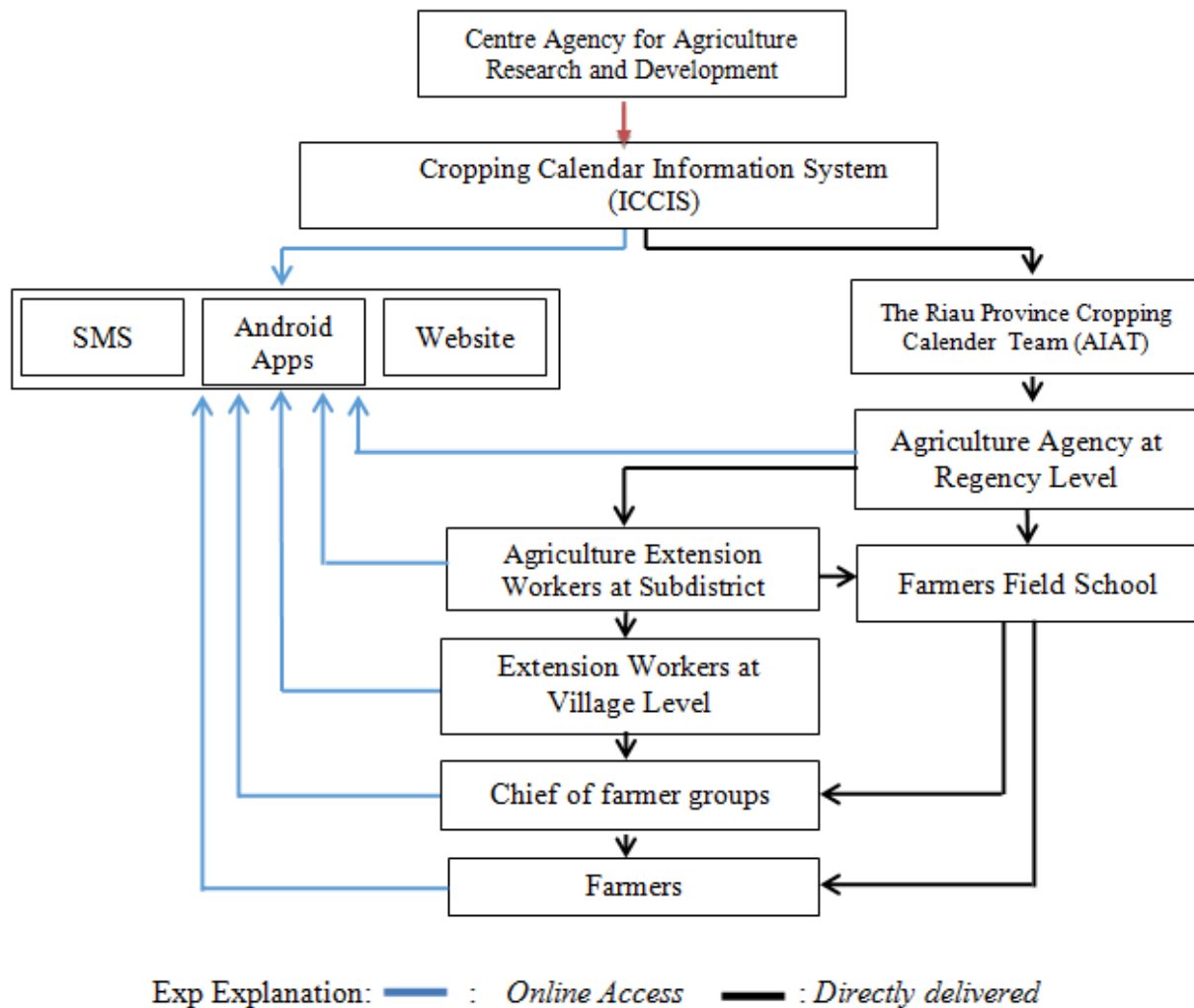
## **RESULTS AND DISCUSSION**

### **Communication flow of the innovation of Integrated Cropping Calendar Information System (ICCIS)**

Integrated Cropping Calendar Information System (ICCIS) is designed to increase the production of paddy and non-staple crops to support the attainment of food self-sufficiency, especially in Riau Province. The information about Integrated Cropping Calendar Information System has been disseminated to the most extension workers representative of Riau regencies. The activity is carried out gradually every year as held in Siak in 2017 and Kepulauan Meranti in 2018. This innovation is still fairly new.

*“Two more to go. In 2019, we have plan to disseminate the information in four regency , Kampar, Kuantan singingi, rokan hilir dan rokan hulu. Since we’ve done in Kampar and Kuantan singingi, the remaining two are Rokan Hulu dan Indragiri Hilir. ” (BPTP/AAAT).*

The innovation of Integrated Cropping Calendar Information System (ICCIS) falls into centralized diffusion system category. It means the information centered on researchers (R & D or Riau AIAT) is passed on to the extension agents to be disseminated to farmers. Figure 1 shows the communication flow of Integrated Cropping Calendar Information System (ICCIS). At this point, the information can be accessed in two ways, online and directly delivered (Balitbangtan 2013). Moreover, the information about Integrated Cropping Calendar Information System (ICCIS) can be delivered by the combination between those two. This flow chart is an adaptation of the Balitbangtan and adapted to field conditions.



**Fig. 1: Communication flow of the innovation of Integrated Cropping Calendar Information System (ICCIS)**

**1. Access information from internet, SMS and Android Apps (online)**

The information about the innovation can be accessed by agriculture agency officers from regency level, agriculture extension workers at regency level, extension workers at village and farmers through text messaging, android applications or websites by themselves. This method is more practical since the information about the innovation are fully accessible and up to date.

**2. Directly Deliver the Information**

In this method, the information about the innovation are not delivered through text messaging, android application, or accessed from website, but directly delivered to farmers in several stages as follows:

- a) The Riau Province Cropping Calender Team (AIAT) came to the location of the research to examine the actual situation of the location and examine the authenticity of the documentary proof. Their finding were reported to agricultural agency at regency level to be followed up in form of education program of Integrated Cropping Calendar Information System (ICCIS) fitting the actual situation of the location. The program were attended by officers of agricultural service from the regency acting as facilitator and extensions workers in charge of food crops and related parties acting as participants. Every agricultural extension workers at regency level and related parties received education and information about the ICCIS and the information were later conveyed to the village extension workers at village level. These extension workers got guidebook about ICCIS and on how to disseminate information about ICCIS to farmers and farmers group.
- b) Agricultural extension workers at regency level conducted field school under the theme of climate change. On this occasion, the extension workers provided information about the ICCIS to the participants.
- c) Agricultural extension workers at village level gave feedback to the chiefs of farmer groups about planting date as recommended in ICCIS during the meeting on the determination of planting date. The recommendation were considered by the farmer groups and the decisions were announced to other farmers.
- d) The chief of the farmer groups and farmers could directly ask to extension workers in charge of food crops about the recommended planting date, availability of varieties, fertilizer and agricultural machinery. The ICCIS recommendation are the source of information for extension workers to their questions.
- e) AIAT and the agriculture service conducted activities to disseminate information about the latest agricultural innovations, held mini demonstration or other programs such as the introduction and plant trials of, for example, IP 200 variety, the latest varieties, fertilizers, agricultural machinery and monitor the condition of paddy and non-staple crops cultivation whose result were reported to farmer groups. During the activity, ICCIS recommendations were offered to farmers groups, for example, recommendation about recent superior variety, plant trial of IP 200 in April, availability of Agricultural machinery and *Jajar Legowo* planting systems (a planting system where every two rows of seedling are separated by empty row)

### ***3. Combination between the two Strategies***

The information of ICCIS are delivered in two ways. The information are taken from internet and delivered directly to farmers. These strategies are applied in three ways as follows:

- a) Agricultural extension workers at regency level in charge of food crops accessed information about ICCIS through online media. The information were then delivered to the extension workers at village level to chief of farmer groups or farmers.
- b) Agricultural extension workers at village level in charge of food crops accessed information about ICCIS through online media. The information were then delivered to the chief of farmer groups expected to pass on to farmers.
- c) Agricultural extension workers at village level in charge of food crops accessed information about ICCIS through online media and use it as reading and information sources for giving feedback and answering farmers' question about problems they face during cultivation.

This strategy are commonly employed by extension workers to convey the recommendations about ICCIS because chief of farmer groups and farmers almost never access the information from internet. The strategy was adopted by giving recommendation to the chief of farmer groups during the meeting about the determination of planting date. The recommendation will be taken into account and most of the time the recommendation are in accordance with the decision of the meeting.

In spite of the clear benefit of the innovation, not all farmers directly apply the innovation. Observation and interview to extension workers and farmers were conducted to figure out how fast they adopt the innovation. The result suggested most farmers are late majority, early majority and innovators. The innovators are generally the chief of farmer groups who are willing to apply some innovation such as having a plant trial during dry season, growing new varieties or applying other recommendation. The early majorities are farmers who join farmers group or who are actively involved in agricultural society. Meanwhile, the late majorities are farmers who adopt the innovation after certain innovation are successfully implemented by other farmers such as *Jajar Legowo* planting systems or certain varieties are successfully cultivated by other farmers such as Inpari 40, Inpari 46, or Batang Piaman.

### **The Role of Agricultural Extension Workers**

Agricultural extension workers played important role in introducing innovation or influencing beneficiaries through certain methods and techniques so that the beneficiaries have awareness and self-will to adopt the innovation. Leeuwis (2009) stated extension workers are communication specialists who have special responsibility to guide and induce innovation processes. According to Rogers (2003) extension workers are change agents obligated to

influence prospective beneficiaries' decision-making process of adopting innovation. The role of extension workers in this study is focused into three roles, namely facilitation, dissemination of information and education.

**Table 1: The Dissemination of Information about Integrated Cropping Calendar Information System**

No	Disseminating information about ICCIS (times)	Extension Workers	Percentage (%)
1	0-3	36	81.8
2	4-8	6	13.6
3	9-12	2	2

Table 1 shows 36 extension workers have delivered information about the ICCIS innovation for 0-3 times. 6 extension workers conveyed the information between 4-8, while 2 extension workers did the same things between 9-12 times. 36 extension workers could be included in low category because they just disseminate the information for 0-3 times. The extension workers who disseminate the information for 9-12 times are senior workers who are familiar with ICCIS since 2013. However their role in facilitation, dissemination of information, and education fall into low and moderate category since they deliver information about the recommendation indirectly.

**Facilitation**

Extension workers facilitated the discussion about ICCIS held and attended by extensions workers or agriculture service officers of Siak Regency and Kepulauan Meranti Regency by providing accommodation, sound systems, and other proper facilities. In spite of their readiness, the role of the extension in facilitating the implementation of program fall into moderate (45.5%) dan low (38.6%) category (Table 2).

**Table 2: The Role of Agricultural Extension Workers**

Category	Siak Regency		Kepulauan Meranti Regency		Total	
	N	%	N	%	N	%
<b>Facilitation</b>						
Low	11	44	6	31.6	17	38.6
Moderate	10	40	10	52.6	20	45.5
High	4	16	3	15.8	7	15.9
<b>Dissemination of Information</b>						
Low	11	44	6	31.6	17	38.6



Moderate	10	40	9	47.4	19	43.2
High	4	16	4	21.1	8	18.2
<b>Education</b>						
Low	10	40	7	36.8	17	38.6
Moderate	13	52	10	52.6	23	52.3
High	2	8	2	10.6	4	9.1

Their role in providing access and assisting farmers to access ICCIS media is relatively low. Farmers do not understand how to use technology and they rarely use their mobile phones to search for agricultural information and install applications giving information about cultivation.

*"Besides information about ICCIS, we also suggested them to update information about weather, download MCGA (BMKG) application, or any other application about weather. But not farmers who have androids can access it"*(Extension workers 2).

Farmers are particularly helpful by the willingness of the extension workers to find information farmers needs. The extension workers would also help farmers who need the answer to production facilities such as seeds, fertilizers, remedy for pest control and disease, The Meranti Regency is currently got assistance from the agriculture agency and extension workers in repairing floodgates and waterways, both primary and secondary, in cooperation with other farmers.

*"Sometimes they already know about the varieties they want to grow in the future. The extension workers just need to filter it. When a farmer, for example, asked "sir, I want to plant this variety, it looks good on the internet, what you think?" extension workers play their role to give consideration, it is whether certified seeds or only ads that might be good there, but not necessarily good here"*(Extension workers 2).

### **Dissemination of Information**

Mardikanto (2010) stated in order to introduce, explain, educate, help them to be aware, to be willing to and to able to apply the suggested technology, the adoption of innovation should be communicated continuously. However, this concept has not yet been fully applied to the communication of ICCIS. Table 2 shows the role of extension workers in dissemination of information about ICCIS fall into moderate (43.2%) and low (38.6%) category. Extension workers in Siak Regency generally have already disseminated the information about the innovation. Some of them conveyed the information they got from agriculture service and

offered recommendations concerning production facilities. However, the information was not conveyed to all farmer groups and only to representative of some farmers group during the Field School and other agriculture activities.

Extension workers assumed farmers are more interested in the more tangible innovation such as innovation in agricultural machinery or innovation in new planting pattern such as *jajar legowo* than innovation in form of information. That is why the information about ICCIS are conveyed separately and combined with other program such as mini demonstration *jajar legowo* planting system. During the demonstration, recommendation on planting date, appropriate varieties and fertilization were offered as part of the dissemination of information about ICCIS.

*“About ICCIS, we have already convey it to farmers, but farmers are ordinary people. They might accept but not applying. Why? Because they already have predicted themselves. Later might be like this. They get it from last year’s experience. It’s not so much different from ICCIS. They, for example, predict the planting date is this month, the cropping calendar might mark the date in the same month. It is not so much different. The difference might be just the month or something. That is the only difference.”* (Extension workers 5).

Some extension workers only offer few recommendation about ICCIS for example about planting date. They got the information from ICCS, MCGA (BMKG), the agriculture services and related stakeholders. Their recommendation are taken into account during the deliberation on the determination of planting date. However, they cannot force farmers to apply it, the decision is determined by farmers through these deliberations.

During the dissemination of information about ICCS, extension workers and officers from agriculture agency not only offered recommendation but also answer farmers’ questions about varieties, fertilizers, pest attacks, availability of machineries and pest control. Extension workers assumed that this method prove beneficial for farmers because some farmers have not had awareness of finding information about agriculture technology by themselves.

On behalf of government, information about ICCIS was also disseminated to extension workers and farmers. Unfortunately, not all farmers get the information because the program are not routinely held. Some farmers even did not remember that the program was ever held.

Extension workers also often convey information about threats and impact of climate change, or local potency (water resources, climate, potential for increasing productivity) The activity was routinely held before planting season and after harvest. During the activity, for example, extension workers and farmers repaired irrigation channels and flood gates to prevent saltwater flooding from the sea or river.

## **Education**

The role of extension workers in educational activities falls into low (38.6%) and moderate (52.3%) category. Their role are relatively low in activities involving their effort to teach farmers about how to utilize the innovation. Field observation showed a lot of farmers rarely or even never hear about ICCIS. The extension workers only provides information or give recommendation or access the the information about ICCIS innovation for farmers, or give recommendation concerning the innovation, or just provide them access information, without ever directly demonstrate to the farmers.

Education about ICCIS have already been given though mini-demonstration, namely about jajar legowo planting patterns. In Bungaraya and Sabak Auh Sub-district, the education was given through trial planting of several of new varieties. After the education is given, almost all farmers adopted the planting pattern, but not the new varieties. They preferred to plant the old varieties.

During deliberation, Extension workers and farmers often discussed about assistance from government and determination of planting date. They rarely discuss about ICCIS recommendation. According to some extension workers, farmers have their own decisions about cultivating paddy or non-staple crops. The extension workers are willing to help and address farmers' weaknesses and acting as a connecting bridge in the activities held by agriculture services, especially when dealing with problems related to repairing irrigation channels, water gates, water pumps and other assistance.

## **CONCLUSION**

- 1) A lot farmers are not aware of ICCIS innovations. The problems lie in the communication process, especially the flow of communication at agriculture service and extension workers level. Information about ICCIS and are still rarely delivered to farmers and farmers also did not get the education about the ICCIS a lot. The flow of communication of ICCIS innovation is can be divided into three, namely online access, directly delivered and the combination between those two. Most of the information about ICCIS recommendation are offered by extension workers using the third method.
- 2) The role of instructors in introducing ICCIS innovation is relatively low and moderate. The innovations are not widely known and used by farmers. The information about the innovation should be conveyed to farmers and they also need to be taught and guided about how to access the information at least through three medias text messages, android application, and websites.

## REFERENCES

- 1) Aziz, Abdul. 2019. Implementation of integrated cropping calendar information system (ICCIS) to improve farmer's knowledge and to adapt the climate change. *Journal of Innovative Scientific Information & Services Network*. 16(3): 3226- 3233.
- 2) Badan Penelitian dan Pengembangan Pertanian. 2013. Kalender Tanam Terpadu: Penelitian, Pengkajian dan Penerapan. Jakarta: IAARD Press.
- 3) Direktorat Jenderal Prasarana dan Sarana Pertanian. 2015. Rencana Uji Coba Implementasi Asuransi Pertanian 2015.
- 4) Leeuwis C. 2009. Komunikasi untuk Inovasi Pedesaan, Berpikir kembali tentang Penyuluhan Pertanian. Bernadetta Esti Sumarah, penerjemah. Yogyakarta: Kanisius. Terjemahan dari: Communication for Rural Innovation, Rethinking Agricultural Extension.
- 5) Mardikanto T. 2010. Komunikasi Pembangunan. Surakarta: UNS Press.
- 6) Mulyandari RSH. 2011. Perilaku Petani dalam Memanfaatkan Teknologi Informasi. *Jurnal Perpustakaan Pertanian*. 20(1):22-34.
- 7) Rahmawaty, Rauf A. 2014. Analisis Perubahan Fungsi Lahan Sebagai Upaya Mitigasi Perubahan Iklim dengan Aplikasi Sistem Informasi Geografis di Sumatera Utara. Prosiding Seminar Nasional Mitigasi dan Perubahan Iklim Menuju Tata Kelola Hutan dan Lahan Lestari. Jakarta, November 18-19 2014.
- 8) Roger EM. 2003. Diffusion of Innovations. New York: The Free Press.
- 9) Runtuwun E, Syahbuddin H, Ramadhani F, Pramudia A, Setyorini D, Sari K, Apriyana Y, Susanti E, Haryono, Setyanto P et al. 2012. Sistem informasi Kalender Tanam Terpadu: Status Terkini dan Tantangan Kedepan. *Jurnal Sumberdaya Lahan*. 6(2):67-78. doi: 10.2018/jsdl.v6i2.6391.g5694.
- 10) Salampessy YLA. 2018. Makna dan Kapasitas Beradaptasi Petani Padi Sawah Terhadap Perubahan Iklim. Bogor: Institut Pertanian Bogor.
- 11) Santosa NGI, Adnyana MG, Dinata KKI. 2011. Dampak Alih Fungsi Lahan Sawah Terhadap Ketahanan Pangan Beras. Di dalam Santosa NGI, Adnyana MG, Dinata KKI. *Prosiding Seminar Nasional Budidaya Pertanian Bengkulu*, Bengkulu, July 2014.7.
- 12) Surmaini E, Runtuwun E, Las I. 2011. Upaya Sektor Pertanian dalam Menghadapi Perubahan Iklim. *Jurnal Litbang Pertanian*. 30(1): 1-7.
- 13) Waongo M, Laux P, Kunstmann H. 2015. Adaptation to Climate Change: The Impacts of Optimized Planting Dates on Attainable Maize Yields Under Rainfed Conditions in Burkina Faso. *Journal Elsevier*. 205(2015). doi:10.1016/j.agrformet.2015.02.006.