ISSN : 1412-8837
e-ISSN : 2579-9959
JURNAL AGRISEP
Kajian Masalah Sosial Ekonomi Pertanian dan Agribisnis

DOI: 10.31186/jagrisep.22.01.1-14

FARMERS' KNOWLEDGE ON REASONS NOT TO USE RICE STRAW IN PADDY FIELDS (CASE IN MANDIKAPAU BARAT VILLAGE, BANJAR REGENCY, SOUTH KALIMANTAN)

Pengetahuan Petani Tentang Alasan Tidak Memanfaatkan Jerami Padi Pada Lanskap Sawah (Kasus di Desa Mandikapau Barat, Kabupaten Banjar, Kalimantan Selatan)

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ABSTRACT

This study aims to determine the reasons for not using rice straw in the rice field landscape of Mandikapau Barat Village, Banjar Regency. Landscape ecology data extracted from Google Maps. Types, rice production, farmer profiles, and knowledge of rice straw utilization were identified through interviews. The relationship between profile and reasons for not using rice straw was determined by bivariate analysis. Results showed that fragments' shape is generally elongated (70%) and others hexagonal (30%). The corridor in dry rice fields is 40-50 cm narrow, while in wet rice fields, the embankment width is about 60-80 cm. The average ownership of rainfed rice fields was about ±3,917.6 m^2. From nine rice field fragments observed, the average area was ±14,788.4 m^2. The most widely grown local rice varieties are Siam Pandak Laut and Siam Cantik. The local rice production rate reached ±2.6 Ton Ha^{-1}, while rice straw production

was ±3.6 Ton Ha^{-1}. Most respondents are women (76%), smallholders (80%), and aged 40-50 years (48%). Most respondents (84%) stated rice straw could not be used and had been passed down from generation to generation (64%). There was a relationship between gender and knowledge of straw utilization (p=0.036<0.050) and reasons for not using rice straw (p=0.021<0.050).

***Keywords** : farmers, knowledge, rice field landscape, rice straw*

ABSTRAK

Penelitian ini bertujuan menggali pengetahuan petani lokal terkait alasan tidak dimanfaatkannya jerami padi pada lanskap sawah oleh petani lokal di Desa Mandikapau Barat Kabupaten Banjar. Data ekologi lanskap sawah digali dari Google Maps. Jenis, produksi padi, profil petani serta pengetahuan pemanfaatan jerami padi diketahui melalui wawancara. Hubungan profil dengan alasan tidak memanfaatkan jerami padi diketahui menggunakan analisis bivariate. Hasil penelitian menunjukkan bentuk fragmen umumnya memanjang (70%) dan sisanya (30%) hexagonal. Koridor pada sawah kering berupa pematang dengan lebar 40-50 cm, sedangkan sawah tipe basah lebar pematang sekitar 60-80 cm. Rata-rata kepemilikan sawah tadah hujan di Desa Mandikapau Barat seluas ±3.917,6 m^2. Padi lokal yang banyak ditanam adalah varietas Siam Pandak Laut dan Siam Cantik. Tingkat produksi padi lokal mencapai 1,18 – 4,2 Ton Ha^{-1} dengan rata-rata ±2,6 Ton Ha^{-1} dan produksi jerami padi ±3,6 Ton Ha^{-1}. Gender dari responden kebanyakan perempuan (76%) dan sebagai petani penggarap (80%). Umur responden terbanyak berusia 40-50 tahun (48%) dan paling sedikit diatas 50 tahun (24%). Sebagian besar responden (84%) menyatakan jerami padi tidak bisa dimanfaatkan dan menyatakan praktik tersebut sudah berlangsung turun-menurun (64%). Terdapat hubungan antara gender dengan pengetahuan pemanfaatan jerami (p=0,036<0,050) dan alasan tidak adanya pemanfaatan jerami padi (p=0,021<0,050).

***Kata Kunci**: jerami padi, lanskap sawah, pengetahuan, petani*

INTRODUCTION

Rice straw is one of the agricultural wastes in the rice field landscape and until now its utilization has not been maximized and is seen as waste or residue from a business activity that has no economic value (Mahmood & Gheewala, 2020). Rice straw is often left scattered in the field after harvest or even burned in intensive rice cultivation systems (Maneepitak et al., 2019). Rice straw even becomes unused waste and produces greenhouse gas emissions (Sulistyaningsih, 2019). Generally, 36 – 62% of rice straw in Indonesia is burned or returned to the ground as compost, then 31 – 39% is used for animal feed, while the remaining (7 – 16%) is used for industrial purposes (Rochani, 2020).

Rice straw management in paddy fields is a complex problem and cannot be solved optimally. Rice straw is usually left to decompose on its own or even

burned in the open so that it becomes a problem for the environment (Sulistyaningsih, 2019). Burn rice straw habit of farmers with the aim that their fields can be processed quickly also contributes to pollution and reduces the organic matter content of rice fields (Murnita & Taher, 2021). It is known that inefficient straw disposal, utilization and management practices have resulted in wasted resources and generated emissions (Tripathi et al., 2009). CH4 emissions from global rice fields varied from 18.3 ± 0.1 Tg CH4/yr and it could be reduced optimizing irrigation practice (Zhang et al., 2016).

As part of mitigating climate change, it is important to manage and conserve hay-free practices so that people can adapt to climate change and improve their health status (Suci, 2020). The application of this system in addition to reducing pollution emissions will also reduce farmers' dependence on chemical fertilizers, chemical pesticides and other synthetic materials (Safitri, 2018). But on the other hand, the practice of processing rice straw without burning faces obstacles from the ignorance or reluctance of farmers to use rice straw. In this case, knowledge and culture from generation to generation are the main factors in the absence of rice straw processing efforts. It is estimated that the potential of rice straw from rice fields in this village is about ± 7 ton per hectare annually from the total existing 50 hectares of rainfed rice fields. Global production of rice straw is estimated to be around 650 - 975 million ton annually. The rice straw has a market value, because from about 1 - 1.5 kg of rice straw can be produced from 1 kilogram of rice (Diep et al., 2015).

One of the efforts to reduce greenhouse gas emissions from the rice field landscape is through local wisdom, for example, the practice of managing rice straw without burning it (Bardono, 2018), thus supporting low-emission agricultural cultivation (Safitri, 2018). The practice of straw processing without burning land is easily found in rainfed and tidal rice fields that grow high-stem and long-lived rice, such as the Siam and Pandak varieties. Mandikapau Barat Village in Karang Intan District, Banjar Regency, South Kalimantan Province is one place that still practices this, where the rice straw stalks are left in the fields without processing or are allowed to wither before the next planting period. This practice has finally led Mandikapau Barat village to win the Main Climate Village Program award - Ministry of Environment and Forestry of the Republic of Indonesia in 2021 (Klik Kalimantan, 2021).

Regarding the decomposition of rice straw, a strategy is needed so that farmers can take appropriate action on ecosystem services and calculate their economic value (Bullock & Ding, 2018). The messages need to be designed to promote knowledge of group action and responsibility in a way that generates awareness and commitment to each other. It is hoped that this will help farmers not to burn rice straw and use it in a more effective way (Sereenonchai & Arunrat, 2022). This will facilitate horizontal communication between professionals and policy makers (Hysing, 2021).

So far, it is not known why local farmers in Mandikapau Barat Village choose not to use rice straw after harvesting. In fact, it is important information to know so that rice straw can be used optimally and low emission agricultural practices can be continued. In fact, if this is implemented, it is estimated to be an efficient rice straw waste management solution (Santivañez et al., 2016) in order to support the sustainability of low-emission agricultural cultivation (Karyaningsih, 2012) and avoid the negative impact of waste pollution on human health (WHO & CBD, 2015). Thus, the objectives of this study are: 1) to identify the ecological aspects of the landscape (patch, edge, matrix and corridor) in rainfed rice fields, 2) to obtain information on the type and production of local rice planted, and 3) to collect farmer profile and the reasons for not using rice straw in the rice field landscape in Mandikapau Barat Village, Banjar Regency.

RESEARCH METHOD

This research was conducted in Mandikapau Barat Village, Karang Intan District, Banjar Regency of South Kalimantan, Indonesia. Geographically and astronomically, this village is located at latitude 114°44'25.9" East Longitude 3°26'52.0" South Latitude as shown in Figure 1 below. The study lasted for three months, starting from June to August 2022. Based on data from the Climate Village Program of West Mandikapau Village in 2022, it is known that the total area of West Mandikapau Village is 900 Ha, the altitude/elevation is about 500 meters above sea level with the topography of the area including medium plains. The total population of this village is recorded at 1,749 people consisting of 558 heads of families (KK). Based on livelihood, the majority of the residents of West Mandikapau Village (81.7%) are farmers, 7.8% employees, and 4.1% traders. The rest (<2%) work as drivers, laborers, civil servants, private sector, breeders, building sellers, and midwives/nurses.

Figure 1.
Map of research location in Mandikapau Barat Village, Banjar Regency, South Kalimantan
(Source : Primary Data 2022)

There are three types of data observed in this study, including 1) the ecology of the rice field landscape, 2) the type and production of local rice, 3) the profile of farmers and knowledge of rice straw management. The landscape parameters measured include: Fragments, edges, and corridors using the Google Maps application (Kadarsah & Huda, 2021). Rice characters were determined based on seed morphology and plant height, while rice production was calculated based on interview data. Farmers' profiles and knowledge of rice straw management were identified through structured interviews using the snowball sampling method. The relationship between gender and status of rice field owners with utilization knowledge and the reasons for not using rice straw was known through bivariate correlation analysis in statistical data processing (GNU PSPP 1.2.0-g0fb4db).

RESULT AND DISCUSSION

Rice Field Landscape Ecology

The results of observations regarding the status of rice fields show that the rice fields in Mandikapau Barat Village are rainfed types with the characteristics: 1) the water system is very dependent on rain, 2) without permanent irrigation buildings and rice planting will start when it enters the rainy season. Low emission agricultural cultivation practiced in this village can be seen in Table 1 below which includes the following activities: 1) the area of rice fields that apply the cropping pattern with an implementation rate of 13%; 2) the use of organic fertilizers for rice productivity with an implementation rate of 5.2 % and ; 3) not burning straw in the fields with the implementation rate reaching 100%. Most of the rice fields are cultivated by sharecroppers with a total of about 80% of the farmers and work in the fields with an average area of ± 3,917.6 square meters.

Table 1. Assessment of Low Emission Agricultural Cultivation in Mandikapau Barat Village

Component	Type of Activity	Implementing Family	Num of Activities	Value	Level of Implementation
Low GHG emission agricultural cultivation	Area of application of cropping pattern (%)	50	50	13.0	Low (<25%)
	Use of organic fertilizer (%)	20	20	5.2	Low (<25%)
	Not burning straw in the fields (%)	386	70	100	High (>75%)

Source : Primary Data Processed, 2022

Mandikapau Barat Village is currently one of 8 villages throughout Indonesia that are without poverty and hunger status. One of these achievements is supported by the presence of the agricultural sector contributing significantly to sustainable development goals or SDGs (Yonavilbia, 2021). It is known that the area of wetlands (rice fields and swamps) in Mandikapau Barat Village is 145 hectares or about 17% of the total land area in Mandikapau Barat Village. This area is much narrower when compared to the area of wetlands in Tabanio Village, Tanah Laut Regency, South Kalimantan which reaches 1,639 hectares or covers 69.6 percent of the total area (Kadarsah & Krisdianto, 2018)

In general, there are two types of rice fields based on the boundary, namely: rice fields with the edge of Tamiyang lake (Figure 2a) and rice fields with rubber plantation borders (Figure 2b). Rice fields with edges on Lake Tamiyang have the character of wetlands or are prone to flooding and some parts of the rice fields are made into fish breeding ponds. In order to adapt to these conditions, the size of the embankment is enlarged to a width of about ±60-70 cm. In contrast to rice fields with rubber plantation edges, their characters tend to be dry. So that in order to adapt to these conditions, farmers make kemalir (water channels) as a water supply and the size of the embankment is narrower (about ±40-50 cm).

Figure 2.
Rice fields with the edge of Lake Tamiyang (a) and rice fields with rubber plantation edges (b)
(Source : Private Collection, 2022)

From nine fragments (patches) of rice fields landscape the average area of the fragments is ±14,788.4 m2. The most common form of Fragments found is an elongated pattern (70%) and the rest are hexagonal (30%). The form of the corridor (corridor) in the dry type of rice field Fragments is a rice field bund with a width of between 40-50 cm. The size of the rice field bunds as corridors in wet type rice fields is wider (50 – 80 cm), because it is used to transport fish seeds from the nursery using carts. The results of measuring the area and shape of the

Fragments as well as the rice field corridor in Mandikapau Barat Village are shown in Table 2.

Table 2. Area and Fragments Shape and Rice Fields Corridors Measurement in Mandikapau Barat Village (from Observations Using Google Maps)

Rice Field Sample	Area (m^2)	Type	Form	Corridor	Coordinate
Fragment 1	16,404	Wet	Elongate	River and Road	-3.46383490397593, 114.96181588863519
Fragment 2	26,89	Basah	Hexsagonal	River and Road	-3.47124566611090, 114.96451955531086
Fragment 3	7,053	Dry	Hexagonal	River and Road	-3.464547067877352, 114.98615961763875
Fragment 4	12,464	Dry	Hexagonal	Walkway	-3.4655001886678125, 114.99046188089356
Fragment 5	31,281	Dry	Elongate	Walkway	-3.467310044599659, 114.9943886349064
Fragment 6	23,63	Dry	Elongate	Walkway	-3.4618911756074415, 114.99652367327415
Fragment 7	8,436	Dry	Elongate	Walkway	-3.4602205299355666, 114.99634128306218
Fragment 8	16,742	Dry	Elongate	Walkway	-3.4572861835650337, 114.99587994311489
Fragment 9	4,984	Dry	Elongate	Walkway	-3.4620411052404503, 114.98838048672421
Average area (m2)	14,788.4				

Source : Primary Data Processed, 2022

The landscape structure can be divided into four types, namely: 1) patch: a homogeneous area that can be distinguished from the surrounding area, 2) matrix: the dominant Fragmentt, 3) corridor: elongated Fragments, and 4) edge: the boundary between Fragments. different or between Fragments and matrix (Prasetyo, 2017). This study show fragments of dry-type rice fields adjacent to rubber plantations and wet-type rice fields adjacent to fish nursery ponds and lakes. The corridors that are commonly encountered are rice fields with a width of 40-50 cm for dry rice fields and wet rice fields having wider bunds (60-80 cm). This is different from the results of research (Janiawati, 2014) on the subak and subak abian systems in Bali where rice fields are divided into separate Fragments with different plot sizes. The fragments are dominated by rice fields that have just been planted with rice, so the matrix of the landscape is plots of rice fields that have just been planted with rice. The corridor in the subak rice field system

is an irrigation channel that functions to connect one plot to another. The integration of the values of Subak Abian Catu is a very important thing to do considering the need for efforts to preserve the values of local wisdom that we have and have a high enough meaning as cultural heritage (Mantaka et al., 2017).

Types and Local Rice Production

There are two local varieties of rice (Oryza sativa sp.) which are widely planted by farmers in West Mandikapau Village, namely: Siam Cantik (Figure 3a) and Pandak Laut (Figure 3b). Based on color, the lemma and palea of the Siam Pandak Laut variety are straw yellow, while the Siam Cantik variety is golden yellow on a straw yellow background. Types of local rice generally have rice stems that vary in size. The average stem height of the Pandak Laut variety is ±145 cm, while the Siam Cantik variety is ±160 cm. In order to easily cut the tall rice stalks and without having to cut them completely, farmers use a traditional tool called a ranggaman or ketam or ani-ani (Figure 3c).

Figure 3.
The Siam Pandak Laut (a) and the Siam Cantik variety (b) are Local Rice Types Grown by Farmers, Along With Local Rice Harvesting Methods Using The Ranggaman or Ketam or Ani-Ani (c)
(Source : Primary Data Processed, 2022)

The local rice productivity calculation parameters in Mandikapau Barat Village are shown in the Table 3. It is known that the average area of cultivated rice fields is about ±3.917.6 m^2. The average yield of local rice in paddy fields is ± 1,164.4 liters in one growing season. The level of local rice production reaches 1.18 – 4.2 tons per hectare with an average production of ±2.6 tons per hectare. Based on the multiplier of 1.4, it is estimated that the amount of rice straw obtained at harvest is ±3.6 tons per hectare.

Table 3. Estimation of arable area, harvest yield, rice production and rice straw production in the rice field landscape in Mandikapau Barat Village

Rice Field Location	Cultivated area (m^2)	Yield (Liters)	Rice Production (Ton Ha^{-1})	Straw Production (Ton Ha^{-1})
Lakeside	2,023	520	2.18	3.052
Lakeside	4,335	600	1.18	1.652
Lakeside	4,335	600	1.18	1.652
Rubber garden edge	8,670	2,800	3.01	4.214
Rubber garden edge	2,312	800	2.94	4.116
Rubber garden edge	4,913	2,000	3.46	4.844
Rubber garden edge	2,890	560	1.65	2.31
Rubber garden edge	2,023	1,000	4.2	5.88
Rubber garden edge	3,757	1,600	3.62	5.068
Average	3,917.6	1,164.4	2.6	3.6

Source : Primary Data Processed, 2022

These two types of local rice have different morphological characters, especially the character of rice seeds. It is known that the rice seed is a rice fruit covered by lemma and palea (Rembang et al., 2018). These four local rice varieties based on grain measurements are classified into medium form (Wulandari et al., 2013). The level of local rice production (Siam and Pandak varieties) obtained from the results of this study is about 2 tons per hectare. This result is relatively low when compared to the results study of (Merang et al., 2019) in Setulang Village, Malinau Regency, East Kalimantan, which calculated local rice production with the following results: Red sticky rice (3.5 tons per hectare), black glutinous rice (3.4 tons per hectare), and Pui rice 2.7 tons per Hectare.

Farmer Profile and Reasons For Rice Straw Utilization

Figure 4 shows the profile of respondents (farmers) who gave their opinions regarding the management of rice straw in the rice field landscape in Mandikapau Barat Village. Based on gender (Figure 4a), the majority of respondents were women (76%) and the rest (24%) were men. Based on ownership status (Figure 4b), most of the farmers who grow rice are smallholders (80%), and a few (20%) own rice fields. Based on age (Figure 4c), most respondents are between 40 and 50 years old (48%), the rest (28%) are under 40 years old and at least (24%) are over 50 years old. This study did not find the presence of the younger generation (<30 years) who are engaged in the profession as farmers.

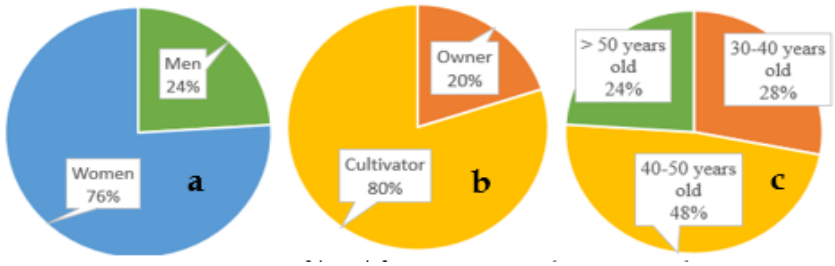

Figure 4.
Local Farmer Opinions Regarding Rice Straw Management by Gender (A), by Ownership Status (b) and by Age (c)
(Source : Primary Data Processed, 2022)

Figure 5 shows the opinion of local farmers about the use of rice straw. The results of the interview showed that most respondents (84%) stated that rice straw could not be used so that it was left alone until the next planting season, and the rest (16%) stated that rice straw could be used, for example as cattle feed or made into compost. There are at least two reasons put forward why rice straw is not used by farmers in Mandikapau Barat Village. The first opinion (Figure 5a) stated that the practice of leaving rice straw (unprocessed) had been going on for a long time in the form of a hereditary tradition (64%) and the rest (36%) stated that they did not have sufficient knowledge to process rice straw (Figure 5b).

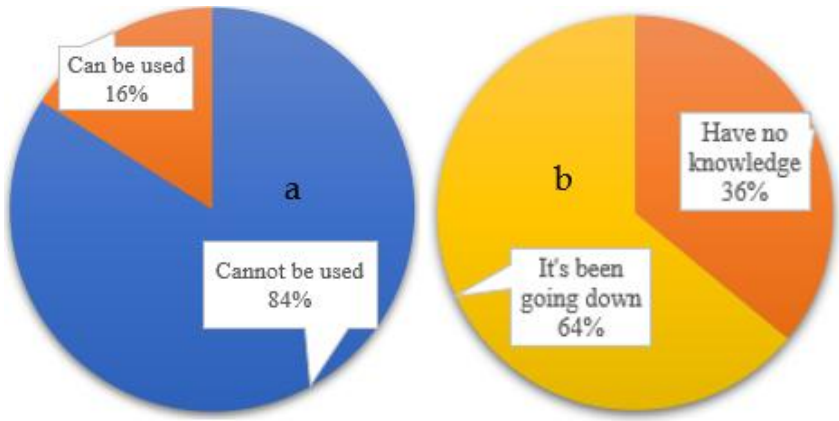

Figure 5.
Farmers' Opinions in Mandikapau Barat Village Regarding The Use of Rice Straw (A) and The Reasons Farmers Do Not Use Rice Straw in The Rice Field Landscape (b). (Source : Primary Data Processed, 2022).

The results of the bivariate correlation analysis to find the relationship between gender and rice field ownership status with knowledge of straw utilization and reasons for not using rice straw are shown in Table 4. It is known

that there is a correlation between gender and knowledge of straw utilization in paddy fields (p=0.036<0.050). This will guide the best use of rice straw by male and female farmers through training seminars on various ways of utilizing rice waste (Vera, 2018). There is also a correlation between gender with reasons for not using rice straw (p = 0.021<0.050). It was noted that rice field ownership status was not correlated with the two factors being compared.

Table 4. Correlation Analysis On Gender And Ownership Status With Utilization Knowledge and The Reasons For Not Using Rice Straw In Mandikapau Barat Village

		Straw utilization	Why not use
Gender	Pearson Correlation	-0.42	0.46
	Sig. (2-tailed)	0.036*	0.021*
	N	25	25
Ownership status	Pearson Correlation	0.25	0.20
	Sig. (2-tailed)	0.228	0.328
	N	25	25

*Correlation is significant at the 0.05 level (2-tailed).
Source : Primary Data Processed, 2022

CONCLUSION AND SUGGESTION

Conclusion

From ecological aspects of the rice field landscape its found that the average area of rice field fragments in Mandikapau Barat village was ±14,788.4 m^2. The fragments shape is generally elongated (70%) and others hexagonal (30%). Meanwhile, the corridor in dry rice fields is 40-50 cm narrow, and in wet rice fields the embankment width is about 60-80 cm. The most widely grown local rice comes from the Siam Pandak Laut variety with the characteristics: straw yellow lemma and palea and an average stem height of ±145 cm. The second is Siam Cantik with characteristics : golden yellow lemma and palea on a straw yellow background and an average stem height of ± 160 cm. Local rice production level reaches ±2.6 Ton Ha^{-1} and rice straw production reaches ±3.6 Ton Ha^{-1}. Most of the respondents were women (76%) and had the status of smallholders (80%). The highest respondent's age (48%) is 40-50 years old and the lowest (24%) is over 50 years old. Most respondents (84%) stated that rice straw could not be used on the grounds that it had been passed down (64%). There is a relationship between gender and knowledge of straw utilization (p=0.036<0.050) and reasons for not using rice straw (p=0.021<0.050). It can be concluded that tradition and lack of knowledge are the reasons farmers in Mandikapau Barat Village do not use rice straw in the rice field landscape.

Suggestion

Although the results of this study are very complex, it is necessary to extract more relevant information, especially regarding the role of the younger generation in low-emission agricultural cultivation and how to optimize farmers' knowledge to improve rice straw management efforts in paddy fields.

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