# Traditional ecological knowledge and utilization of rice in Sukoharjo District, Central Java, Indonesia

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**Abstract.** *Kusuma LA, Damayanti K, Damayanti JT, Nisa J, Nurwulandari M, Nazar IA, Yap CK, Md. Naim D, Setyawan AD. 2023. Traditional ecological knowledge and utilization of rice in Sukoharjo District, Central Java, Indonesia. Intl J Bonorowo Wetlands 13:* 78-85. Rice (*Oryza sativa* L.) is one of Indonesia's staple foods and a source of income for some communities. Sukoharjo District is one of Central Java's most promising rice producing areas. In managing rice farming, the community incorporates local knowledge and discovers collective understanding about rice plants. The research was conducted to determine the existence of Traditional Ecological Knowledge (TEK) by the Javanese people of Sukoharjo District, Central Java, Indonesia in managing rice varieties and influencing factors, as well as to learn about the community's perception of rice plants; the research employs a qualitative and quantitative ethnobiological approach. The results showed that although agriculture in Sukoharjo District is included in semi-modern agriculture, the community has TEK, which includes various rice varieties and paddy fields. Farmers in Sukoharjo District use Inpari 32 and in small quantities also the IR 64 rice varieties to manage their paddy fields instead of other varieties. Rice is widely used in various traditions, such as *rasulan, bersih desa, kacar kucur* (weddings), *syukuran*, and *kenduren*. Many parts of the rice plant are also used, such as rice stems (straw), grain, husks, bran, and rice. A small part of the Sukoharjo community uses rice as an important role in cultural behavior and in maintaining the rice varieties' biodiversity well. In managing agriculture, some communities still use traditional techniques and adjustments to modern technology, such as using modern tools and human labor to plant seeds. The application of rice in every activity of the people of Sukoharjo District shows a complex relationship between humans and nature.

Keywords: Agriculture, ethnobiology, local wisdom, rice, rice fields

#### **INTRODUCTION**

Humans and culture are inextricably linked, therefore we might refer to ourselves as cultural creatures. Culture can be ideas, symbols, and values used as guidelines for human actions (Akaka and Vargo 2014). Humans have the ability to think, feel, and behave according to what they want to express. Seven elements of culture are universal: language, technology system, livelihood system, social organization, knowledge system, religion, and art (Rahman et al. 2023). Various tribes in Indonesia employ their people's knowledge systems as a cultural pattern. Cultural patterns can be found in the fisheries, cattle, and agriculture industries, particularly the farming system. Farming in rice fields is one of the farmer's actions that can be carried out as a ritual procedure or tradition within a community.

Agriculture is one of the most important things in supporting human life. The agricultural sector can provide livelihoods for the surrounding community. The agricultural sector plays an important role in the economies of developing countries (Tangermann 2005). This sector provides food and employment directly and components of GRDP (Gross Regional Domestic Product). Rice (*Oryza*  sativa L.) is one of primary food sources for some populations in Indonesia (Kim et al. 2020). Rice is also a source of income for some communities (Mew et al. 2003). Rice is a strategic commodity that receives the main treatment in agricultural development (Azzahra et al. 2023). According to the population census conducted by BPS (2019), the population growth rate of Indonesia from 2011 to 2017 was 8.22%, followed by an increase in rice consumption of 4.81% (BPS 2017). Suppose the rice increase consumption does not follow their production; it will cause increasing national rice demands (Hilalullaily et al. 2021). Therefore, it is necessary to increase rice production (supply side). The agricultural systems used in Indonesia are diverse, such as farming with modern, traditional techniques and a combination (Nurazaman et al. 2013). The community's thoughts and creativity inspired the traditional agricultural system, which contains positive values and local wisdom (Aras 2018).

Traditional Ecological Knowledge (TEK) is the knowledge possessed by indigenous or tribal communities about the relationship between humans and the surrounding natural environment (Efriani et al. 2020; Tynsong et al. 2020). TEK includes knowledge about plants, animals, and the environment, as well as traditional ways of utilizing and conserving natural resources. TEK also includes certain beliefs and rituals, such as before cutting down large trees for household purposes and building a house (Efriani et al. 2020). Factors that can influence TEK can be different from factors that influence the utilization of information technology. Several factors influencing TEK include interactions with the environment, cultural values, social factors such as policies, public opinion, cultural values, innovation and experimentation, and science and technology (Ludwig and Macnaghten 2020).

Sukoharjo District is one area with great potential as a rice producer in Central Java Province, Indonesia; it is one of the centers of rice production in this province (Prasetyo 2023). It is not surprising that Sukoharjo District is a granary in Central Java, Indonesia (Riyanto et al. 2023). This is supported by the irrigation system that meets the water needs in rice farming production supplied by the Bengawan Solo river flow (Rokhmah et al. 2022). This study aims to determine the existence of TEK (Traditional Ecological Knowledge) in Sukoharjo District in managing rice varieties, factors that influence rice management, and people's perceptions of rice plants.

## MATERIALS AND METHODS

#### Study area

This research was conducted in three villages of the Javanese community in Sukoharjo District, Central Java, Indonesia (Figure 1), namely Serut and Nguter in Nguter Sub-district, and Joho in Mojolaban Subdistrictfor one month in October 2023. Geographically, Sukoharjo District is located at  $110^{\circ}$  57' 33.70"E -  $110^{\circ}$  42' 6.79"E, and between 7° 32' 17.00" - 7° 49' 32.00"S. Sukoharjo District has an area of 46,666 km<sup>2</sup> or 1.43% of the area of Central

Java Province, Indonesia (Mukaroma et al. 2022). Topographically, Sukoharjo District consists of lowlands and hills. The lowland area is in the northern, while the hilly area is in the southern and eastern. Almost all residents of this district are Javanese and muslim, although other Indonesian ethnic groups can also be found, including Chinese and Arabs.

## **Data collection**

This study used qualitative and quantitative techniques with an ethnobotanical approach. Data was collected through questionnaires to 65 respondents in the Sukoharjo District. In addition, the research also used observation techniques, and semi-structured and structured interviews (Adeoye-Olatunde and Olenik 2021). The observation was to obtain general information about the condition of paddy fields, types of rice plant varieties, management, and local wisdom in using rice plants. Informants are selected through very appropriate snowball techniques based on initial references from informal leaders (Wijayaningtyas et al. 2017). Informants comprised men and women and were categorized by age, latest education, and village origin (Table 1). Structured interviews were conducted with randomly selected households.

#### Data analysis

Qualitative data collected in the field and obtained from interviews were then re-checked. The data was then categorized and filtered based on its relevance to the research objectives. The data was presented based on two points of view, namely the informant's and the researcher's. Then, the data is narrated using descriptive and evaluative research (Lubis et al. 2019). The quantitative data was also analyzed to calculate the percentage of respondents who answered about the origin of agricultural Traditional Ecological Knowledge (TEK) obtained in the Sukoharjo District.



Figure 1. Map of research locations in Sukoharjo District, Central Java Province, Indonesia, namely A. Serut, B. Nguter, and C. Joho

 Table 1. Characteristics of respondents

<b>Respondent Characteristics</b>	Number of Informants
Gender	
Male	49
Female	16
Age group (year)	
33-64	48
>65	17
Education	
No education	7
Elementary School	29
Junior High School	14
Senior High School	14
University	1
Village's origin	
Serut	29
Nguter	14
Joho	22
Total	65

#### **RESULTS AND DISCUSSION**

#### Source of the TEK on the rice

The Javanese people of Sukoharjo District obtained Traditional Ecological Knowledge (TEK) about varieties of rice types that were passed down from generation to generation from their ancestors. They resulted from a long process of cultural adaptation to local environmental conditions. Based on Table 2, of 65 respondents, the Javanese people of Sukoharjo District who participated in the study, as many as 44 respondents (67.7%) obtained TEK from ancestors, 4 respondents (6.2%) from relatives and friends, 2 respondents (3.1%) from farmer groups, and 15 respondents (23%) did not know the source of TEK obtained. There is no doubt that ancestors played an important role in spreading TEK. Learning capacity from ancestors is equivalent to 'vertical cultural transmission,' as socially derived knowledge is passed on from generation to generation or between generations (Hewlett 2021). Therefore, from the ancestors' learning about agriculture, there are many lessons about how to grow crops that create their own uniqueness in managing nature wisely and sustainably (Nawaz and Farooq 2021). This can be used as a reference for developing better agricultural technology in the future. Agricultural technology from ancestors, relatives or friends, and farmer groups can be developed through various knowledge, experiences, and direct practices in agriculture.

Of the 65 respondents of Sukoharjo District who participated in the study, as many as 35 (53.8%) used semimodern techniques, 25 respondents (38.5%) used modern techniques, and 5 respondents (7.7 %) used traditional techniques. Traditional agricultural techniques generally still use human power in moving them, while modern agricultural techniques can use more sophisticated tools and technological developments in managing agricultural land and its results (Dhanaraju et al. 2022). The application of agricultural techniques from traditional to modern is used to increase the yield of agricultural production by using more sophisticated modern agricultural tools. However, it does not rule out the possibility that some have begun to use modern agricultural techniques in managing their agricultural sector. Sukoharjo farmers are adapting and adjusting to the current agricultural technology.

## Traditional Ecological Knowledge (TEK) on rice fields

Moreover, TEK on 19 types of local rice (*O. sativa*) commonly cultivated by the Javanese people of Sukoharjo District in rice fields has been recorded (Table 3). The types of rice commonly found in Sukoharjo District consist of Inpari 5, Inpari 16, Inpari 23, Inpari 32, Inpari 33, Inpari 46, Inpari 50, IR 64, Membramo, Sunggal, Tri Sultan, C4, Ciherang, Mekongga, Cakrabuana, Situ Bagendit, Mentik Wangi, Rajalele Srinuk, and Si Denok. The 19 recorded rice species are categorized locally (folk taxonomy) and differentiated based on four criteria: seed shape, plant shape, rice size, and seed properties, those ecological characteristics needed to grow well on the land.

Table 2. Sources of Traditional Ecological Knowledge (TEK) of rice management cultivation in Sukoharjo District, Central Java, Indonesia

Sources of the TEK	Respondent	Percentage	Rice management system	Respondent	Percentage
Ancestors/parents	44	67.7%	Traditional	5	7,7%
Relatives and friends	4	6.2%	Modern	25	38,5%
Far's group	2	3.1%	Semi-modern	35	53,8%
Do not know/not answering	15	23%			
Total	65	100%		65	100%

 Table 3. Application of Traditional Ecological Knowledge (TEK) on diversity, rice fields and management by local people of Sukoharjo District, Central Java, Indonesia

Kind of TEK	Description
19 varieties of rice are used	Inpari 5, Inpari 16, Inpari 23, Inpari 32, Inpari 33, Inpari 46, Inpari 50, IR 64, Membramo, Sunggal,
	Tri Sultan, C4, Ciherang, Mekongga, Cakrabuana, Situ Bagendit, Mentik Wangi, Rajalele Srinuk, Si Denok
2 types of rice fields are applied	Rainfed (sawah tadah hujan) and irrigated land (sawah irigasi)
The traditional Javanese calendar <i>Pranata mangsa</i> , to determine the best time to plant crops	
system used in agricultural	

Most Sukoharjo District people prefer to plant Inpari 32, and in small quantities also the IR 64 rice variety. Inpari 32 is one type of Indonesian local rice commonly cultivated. The characteristics of the Inpari 32 rice variety are: inbred rice varieties, grown on irrigated land, medium grain shape, upright shape, the weight of 1000 is around 27 grams, and the rice produced is superior but less water (Rosalina and Nirwanto 2021). While, IR 64 comes from IRRI, Los Banos, Philippines, has several advantages compared to other types of rice, such as a shorter rice age, about 120 days HSS (Days After Sowing); have better resistance to pests and diseases (Gunawan et al. 2023); the yield is higher than some other varieties, such as Ciherang, with an average grain yield of 6.3 tons/ha and a fluffy rice texture when cooked (Joshi et al. 2020). Other types of rice are relatively rarely planted, related to harvest time, productivity, resistance to pests and diseases, organoleptic properties (taste, color, aroma, texture), etc.

The distinguishing factor between the 19 types of rice varieties in Sukoharjo is that each type of rice has a unique genetic combination, which can affect physical characteristics, productivity, and resistance to pests and diseases. Rice types can differ in grain shape and size, color, texture, and stalk length. Rice types can differ in yield or productivity (Sultana et al. 2022). Some rice types may produce more grain per hectare than others, for example, hybrid rice varieties. The harvest from these hybrid varieties can reach twice the amount of local rice. Rice types can also have differences in the quality of the rice, such as softness, chewiness, and aroma (Bergman 2019).

Based on research, Javanese people in Sukoharjo District use two types of rice fields, namely rainfed land and irrigated, one of the two types of rice fields can affect the planting period to harvest rice plants (Table 3). Rainfed rice fields are rice fields whose irrigation depends on rainfall (*sawah tadah hujan*) (Rini et al. 2021); this type can be found in areas higher than irrigation systems, irrigated rice fields or paddy fields (*sawah irigasi* or *sawah*). In comparison, irrigated rice fields have irrigation systems from many sources, such as springs or river dams (Massey et al. 2022). Irrigation on rice fields is intended to be able to meet the water needs of plants. Furthermore, both types of paddy fields can affect the planting period to harvest rice plants.

Most farmers in Sukoharjo District do not use special calculations from planting to harvesting. However, some farmers use *pranata mangsa* calculations to manage their rice plants. *Pranata mangsa* is a traditional Javanese agricultural calendar system used by farmers, fishermen, and hunters. System used by farmers to determine the best time to plant crops, especially rice. *Pranata mangsa* is based on the apparent circulation of the sun, which moves north and south every year at the equator (Sobirin 2018). If the sun is in the northern equator, it means the dry season (*musim kemarau* or *ketiga*); if it is in the southern equator, it is the rainy season (*musim hujan* or *rendeng*). In addition, if the sun is around the equator, there will be a transitional season (*musim pancaroba*). The transition season consists of two types: the transition to the rainy and dry seasons.

The *pranata mangsa* calculation system is not only used by farmers; fishermen and hunters also use *pranata mangsa* to reduce risk and prevent high production costs (Witasari 2015).

Subak in Bali and pranata mangsa in Java are two traditional systems used in agriculture in Indonesia. Although they have differences in origins, philosophy, and practices, both have significant relevance in managing agriculture and irrigation in their respective regions. The subak system in Bali regulates the management of rice field irrigation using the Pura Subak network and applies values of justice, openness, harmony, and togetherness. Pranata mangsa provides guidance in determining the timing of planting and harvesting based on observations of natural phenomena and seasons (Lestari et al. 2023). Pranata mangsa is still used by some farmers in Java today, although it has undergone some adaptations due to climate change and technological advances. Pranata mangsa are still relevant in today's climate change era. Pranata mangsa are based on real experience and rational observations of farmers in the past. Despite climate change, there is still a clear correlation between the natural phenomena that occur in pranata mangsa and current conditions. Pranata mangsa can provide valuable guidance in understanding weather patterns and growing seasons (Prahmana et al. 2021).

TEK is important as it can provide valuable insights into sustainable resource management and conservation practices. This knowledge can make farmers more careful in managing environmental changes, such as disruption of balance in rice fields (Iskandar and Iskandar 2018). Rice cultivation in Sukoharjo District is traditionally managed based on TEK, which includes knowledge of the local ecology, beliefs, and farmers' customs. TEK in rice varieties is a dynamic system to adapt to various ecological, socio-economic, and cultural changes. For example, Javanese farmers in Sukoharjo District use TEK to manage rice biodiversity and modernize rice cultivation practices. They know various varieties of rice plant types, how to manage them both irrigated and rainfed, and their habit of dry and rainy seasons. Therefore, Sukoharjo people harvested rice on average two to three times a year, with a planting-to-harvesting period of approximately 90-100 days.

## Tradition ceremony and utilization of rice

The Javanese people of Sukoharjo District utilize rice for several traditions and beliefs that are passed down from generation to generation; for example, they conduct *rasulan, syukuran, kacar kucur, kenduren* (incl. *slametan*), and *bersih desa* traditional ceremonies (Table 4). A small part of the community of Sukoharjo District has a belief related to rice plants, such as the existence of a fertility goddess in agriculture, namely *Dewi Sri*. This has its roots in old beliefs which have now been abandoned by the majority of Javanese people or Sundanese people (as *Nyi Pohaci*) because they converted to Islam, but are still believed by the majority of Balinese people who continue to adhere to the old beliefs, namely Hinduism. *Dewi Sri* is believed by the Balinese people to be the embodiment of God who creates prosperity and soil fertility, especially in the livelihoods of farmers and traders (Anggraini 2020). A small part of the Sukoharjo District community still maintains this myth that Dewi Sri is a goddess who nurtures rice plants. Another form of local wisdom found among the people of Sukoharjo District is the rasulan tradition. The rasulan tradition, sometimes also called bersih desa, an activity to clean the village from bad luck. is usually held annually by a group of people. The rasulan tradition was originally held by rice farmers as an expression of gratitude to Dewi Sri for the well-produced harvest (Latifah 2023). The ritual of worshiping Dewi Sri, who is believed to be the nurturer of rice plants, is also often practiced by farmers in Jatiluwih Village, Bali (Wiasti 2015). This ceremony is carried out in unison by events such as organizing shadow puppets or other art shows.

But along with the times, the *rasulan* tradition began to be abandoned by the community; the more modern society has advanced its thinking and practices, and they think it not practical to organize rasulan anymore. The people's lifestyle changes have resulted in their response to the rasulan tradition, such as the assumption that the tradition is old-fashioned or outdated. Some respondents even said that the rasulan tradition is a tradition that violates their religions. So, it is rare to find the rasulan tradition in Sukoharjo District anymore. However, according to some respondents, some community groups still strongly believe in this custom, so they still preserve this tradition. The development of the increasingly modern era has made rasulan experience a shift in meaning and belief. Previously, this tradition was a form of gratitude to Dewi Sri; now, rasulan is a form of community request to Allah God Almighty that they've given smoothness, safety, and ease in finding sustenance. It also expresses gratitude to Allah God Almighty for the bestowed harvest.

People's lives are very dependent on the existence of rice plants. Knowledge related to rice plant biology is important for the community to know how to carry out traditional ceremonies and fulfill their life needs, such as managing rice plants. Traditional ceremonies in the community will be passed down from generation to generation (Kistanto 2016). Traditional ceremonies found among the Javanese people of Sukoharjo District include utilizing several parts of rice to carry out traditions, such as rice in the *kacar kucur* tradition in the Javanese traditional wedding procession. In addition, rice is also used, which is processed into rice for traditional events such as *syukuran* (thanksgiving) events, as well as *kenduren* (incl. *slametan*) (salvation) rituals containing joint prayers, which are usually served *tumpeng* (the rice serving shaped into a cone and arranged together with the side dishes) from processed rice.

The locals of Sukoharjo District also use rice for their everyday requirements, both the rice stalk and the rice grain, as shown in Table 5. The rice produced by Sukoharjo District farmers is mainly consumed on a daily basis, with some sold. The same is true with grain, which they use for animal feed and sell to others. Farmers sell their agricultural products not just in grain but also in rice. Other components of the rice are typically used for natural fertilizer or compost, which farmers commonly obtain through straw processing. Furthermore, utilizing straw for compost is a chemical fertilizer substitute, which lowers farmers' production expenses when purchasing fertilizers. Most farmers have the habit of burning straws to eradicate the remains of the rice harvest. Burning straw directly in the field accelerates land preparation for the next planting period. Some farmers also sometimes handed over their straws to people with livestock for animal feed. In addition to the rice processing products, the community can also produce bran as animal feed.

**Table 5.**The utilization of rice plants by the local people ofSukoharjo District, Central Java, Indonesia

Part of the rice plant	Utility	Processed
Rice stalk (straw)	Livestock food	Directly consumed
	Source of nutrients for plants	Composted, burned
Grain-rice	1	
Husk	Growing media	Planting media mix
Rice bran	Animal feed	Mixed fodder for livestock
Rice grain	Food source	Cooked

Table 4. Utilization of rice as a means of traditional ceremonies in Sukoharjo District, Central Java, Indonesia

Traditions	Description
Rasulan	An activity held by farmers from ancient times that is still preserved today, usually held after the harvest period as a
	gratitude to Allah God Almighty
Bersih desa	A ceremony conducted by the community to ward off bad luck that contains salvation and offerings in addition to
	traditional performances or games.
	Rasulan and bersih desa have different philosophies, but the forms of activity are relatively the same, so they are
	considered the same event.
Kacar kucur	Wedding tradition in Javanese traditional marriage is carried out by the husband as a symbol of the husband's ability to
	fulfill household needs.
Syukuran	A celebration that contains a prayer event by serving tumpeng rice (the rice serving shaped into a cone and arranged
	together with the side dishes)
Kenduren	The activity of praying and eating together for an event
Slametan	The activity of praying for people who have died, accompanied by eating together, it is a form of kenduren.

Rice farming activities carried out by the community also produce several parts of the rice plant that can be utilized directly or indirectly for the community, such as rice. Other parts, such as waste produced by rice, certainly require processing to be utilized. The processing of rice waste aims to minimize environmental losses. It can also increase the farmers' income by reprocessing rice waste into something that has a selling value, such as husks, which are processed into husk charcoal (Rahmiati et al. 2019). A study conducted by Handayani et al. (2014) states that rice waste, such as husks, can also be processed into silica gel. This product can absorb excess moisture in the air by adding CH<sub>3</sub>COOH to the silica gel produced by rice husks; rice contains silica as much as 87%-97% dry weight after experiencing complete combustion. Rice waste has many potential benefits for the community, but some people have not processed rice waste efficiently. Most of them only process some parts of the waste from rice for animal feed, compost, or burn directly.

#### Management of the rice farming

Communities in Sukoharjo District generally manage rice farming using semi-modern methods, but few also use modern methods (Table 2). They use modern tools such as tractors and rice threshers to manage rice farming (Figure 2.A). Meanwhile, planting seedlings still use human labor to get more satisfactory results (Figure 2.B). According to some respondents, planting rice seeds using modern tools produces less than optimal results because the seeds are not neatly organized. Traditional rice management is considered more optimal, because farmers want to maintain traditional agriculture with guaranteed security and stability of the rice production (Maitra et al. 2021). In addition, almost all rice varieties get the same treatment in each rice planted. However, the Inpari 32 rice variety gets special treatment (Figure 2.C); only using a little water to survive in its initial growth phase. The initial phase of planting rice seeds does not require constant stagnant water, just wet and dry. This is useful when the oxidation process occurs in the root zone, so that the soil becomes fertile and plant roots can grow thickly (Li et al. 2019).

Rice cultivation management involves a number of challenges. These obstacles include fertilizer scarcity, difficult water flow, and pests and diseases that attack their plants. Pests that disturb rice plants will negatively impact the development of rice and the rice crop yield. In Sukoharjo District, in managing rice farming, most of them use deep-well water, irrigation channels, and reservoir water; the more difficulties they face in managing rice farming are pests. In some locations in Sukoharjo District where rice management farming still relies on rainwater, farmers find it difficult to manage rice plants because the season is difficult to predict due to climate change. In this case, the Inpari 32 rice variety has its advantages in rainfed locations; even this variety has difficulty in the rainy season because it will be hard to live if there is too much water flow.



**Figure 2.** A. Rice field plowing with tractors in Sukoharjo District, Central Java, Indonesia, B. Farmers growing rice seedlings, C. Inpari 32 rice variety, is about to be harvested in rice fields

The Sukoharjo community manages the rice crops mostly using chemical fertilizers. However, some farmers managing rice farming use a mixture of chemical and organic fertilizers in the form of straw from the rice harvested-waste that has been burned and made into compost in a ratio of 50:50. According to some respondents, managing rice plants using chemical fertilizers will yield more satisfactory results than using organic fertilizers because the rice produced is higher than when using organic fertilizers. Therefore, most farmers in Sukoharjo District prefer to use chemical fertilizers in managing rice farming. However, the continuous use of chemical fertilizers and not balanced with organic fertilizers can reduce the quality of rice field soil (Pahalvi et al. 2021). In addition, chemical fertilizers are easier to obtain than organic fertilizers. The people of Sukoharjo District usually use chemical fertilizers, such as urea, ZA, and NPK. These chemical fertilizers are obtained from government subsidies distributed through farmer groups in each village.

There is no difference in the planting media used for each rice variety in Sukoharjo District; all rice varieties in this district can grow on the same planting media. Land management before planting rice is done by plowing the land using a tractor (Figure 2.A), but some still use the traditional way using a hoe. After plowing, the land is left for a few days to be irrigated, and then rice seedlings are planted using traditional methods. After the seedlings are planted, they are left for 10 days with flooded watering and then given fertilizer to increase the pH and herbicide to eradicate weeds. Previously, rice seedlings had been prepared separately by planting rice sprouts in seedling beds measuring around 1-2 x 3-5 m<sup>2</sup>, covering 5% of the planting area. The rice sprouts are made from rice grains in buckets or sacks soaked/sprinkled with water and left moist for 2-3 days, then spread in seedling beds. Seedlings aged 2-3 weeks are ready to be planted in rice fields (Figure 2.B).

Based on this research, it can be concluded that although agriculture in Sukoharjo District is included in semi-modern agriculture, the community has TEK (Traditional Ecological Knowledge) which includes various varieties of rice and paddy fields. Javanese farmers in Sukoharjo District know 19 rice varieties, but prefer using Inpari 32 or in small quantities also the IR 64 rice varieties to manage their rice fields. Rice is widely used in various traditions, namely in rasulan, bersih desa, kacar kucur, syukuran, and kenduren. Many parts of the rice plant are also used, such as rice stems (straw), grain, husks, bran, and rice. A small part of the Sukoharjo community uses rice as an important part of cultural behavior, which is good for maintaining the biodiversity of rice varieties. The application of rice in every activity of the people of Sukoharjo District shows that there is a complex relationship between humans and nature.

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