

# Visualization of paddy in Panel 65 of the Karmawibhangga section of Borobudur Temple

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**Abstract.** Anggorojati A, Widayat R, Budi S. 2023. Visualization of paddy in Panel 65 of the Karmawibhangga Section of Borobudur Temple. *Biodiversitas* 24: 990-1003. Borobudur Temple is a building whose reliefs depict the Buddhist scriptures in the form of pictures, reliefs, and statues. Each relief contains a certain message and interpretation that not all visitors can understand the storyline when they observe, especially only at a glance. The Karmawibhangga relief is found at the Borobudur Temple's lowest section. The lowest relief represents the hustle and bustle of worldly life, consisting of 160 panels, all of which have different images from one panel to another. Based on the existing literature results, an iconographic approach, reliefs in the form of paddy, is used to analyze the interpretation of the Karmawibhangga relief 65 on paddy to make it easier for people who desire to acquire information about it to symbolize prosperity. Paddy is depicted with plump grains, ready to harvest and being guarded by several people from rats. This study can be used as a reference in the future regarding the visualization description of paddy in the Karmawibhangga relief for future researchers.

**Keywords:** Borobudur, Karmawibhangga, paddy, Panel 65, relief

## INTRODUCTION

Borobudur Temple is a magnificent building of Buddhist heritage which is one of the prides of the Indonesian nation. Borobudur Temple is essential evidence of ancient Javanese cultural history because the reliefs of Borobudur Temple are timeless scenes of "the historical embodiment of ancient Javanese culture and customs" which are re-enacted (Bernet-Kempers 1976). The Borobudur Temple building contains many symbols that have very deep meanings. One example of art relief that can be used as a feature or depiction of culture is carving in reliefs (Istari 2012).

Reliefs are images carved on the body of the temple. The reliefs that adorn Borobudur Temple consist of decorative and story reliefs. Decorative reliefs are ornaments that only beautify temple buildings, while narrative reliefs have a specific history in the form of human figures, animals, or gods (Munandar 2018). According to Stutterheim, Borobudur Temple is divided into three spiritual levels: *kamadhatu*, *rupadhatu*, and *arupadhatu* (Santiko 2012). There are story reliefs at the *kamadhatu* and *Arundhati* levels. At the *kamadhatu* level, there is the Karmawibhangga Relief which contains the law of cause and effect with a total of 160 panels (Soekmono 1976). Karmawibanga has various types of reliefs depicting human nature and behavior in which each panel are multiple elements contained and generally grouped into the central object of the panel and supporting objects

One depiction in the reliefs of Borobudur Temple that is often discussed is flora or plants. The reliefs of this temple have been discussed by previous researchers such as Cammerloher (1931), Steinmann (1934), van den Brink (1931), and Galestin (1936), although they did not discuss all the types of plants in the reliefs. According to Cammerloher (1931), the relief images of plants carved at Borobudur Temple do not contain schematic or fantastic images because their depictions are very accurate. He believes the plants carved on the reliefs are related to Buddhist teachings and describe daily human life. Cammerloher's (1931) opinion was supported by Steinmann (1934), who identified the types of plants found in the reliefs of Borobudur Temple's medicinal and cultivated plants. But none of these researchers have explained the relationship between paddy relief in Panel no. 65 (Panel 65) of Karmawibhangga with culture or beliefs in Java, which will be observed in this research.

Another study discussing the types of fauna and their origins depicted in the reliefs carved on the walls of the Borobudur Temple is Suropto and Listia (2001). Their results of setting the 7<sup>th</sup> century AD, the Javanese environment well visualized on the relief carvings on the walls of Borobudur Temple, but the environmental setting of the island of Java before the Dutch colonialization period was not well described. For this reason, this research also seeks to provide an overview of the Javanese environmental setting in utilizing plants.

Many depictions of sculpted reliefs are detailed and highly valued works of art, especially the reliefs at

Borobudur Temple. That can be observed from the details of the sculptures, which can depict humans, buildings, plants, animals, and other objects so that the carved shapes can be understood by ordinary people even before they comprehend the original story of each panel.

Panel 65 is the only one out of 160 panels showing a picture of paddy in the panel group Karmawibhangga clearly. Panel 65 has one central object, a sculpture in the form of interconnected images of paddy and rats. Those images were supported by four objects on the corners and sides that surround the central object in the form; of sculptured images of dogs; humans watching and discussing; humans who are partying and having fun; and humans poor men guarding the safe. Panel 65 is part of the Karmawibhangga story, with the main figure being the paddy, which is depicted with plump ears or fruit ready to be harvested (Setyawan et al. 2017).

Paddy is one of the most important cultivated plants in civilization. These plants included in the *Oryza* genus had become the staple food of the Indonesian people before the name Indonesia itself was formed. Paddy is the primary commodity and main ingredient in fulfilling food in Indonesia and Southeast Asia. Many cultures are related to paddy, one of which is in the Borobudur Temple, founded in the 8-9 centuries AD in the 65 chapters of Karmawibhangga.

This study aims to find information related to the relationship between the paddy depicted in Panel 65 of Karmawibhangga and the usage of paddy in the 8<sup>th</sup> -9<sup>th</sup> centuries AD by the people of Mataram, in particular, Java in general. In addition, this study will reveal an overview of the usage of paddy in Java and the relationship between paddy and culture and beliefs in the 8<sup>th</sup> -10<sup>th</sup> centuries AD. Those findings related to culture and religion as reflected in Panel 65 at Borobudur Temple.

## MATERIALS AND METHODS

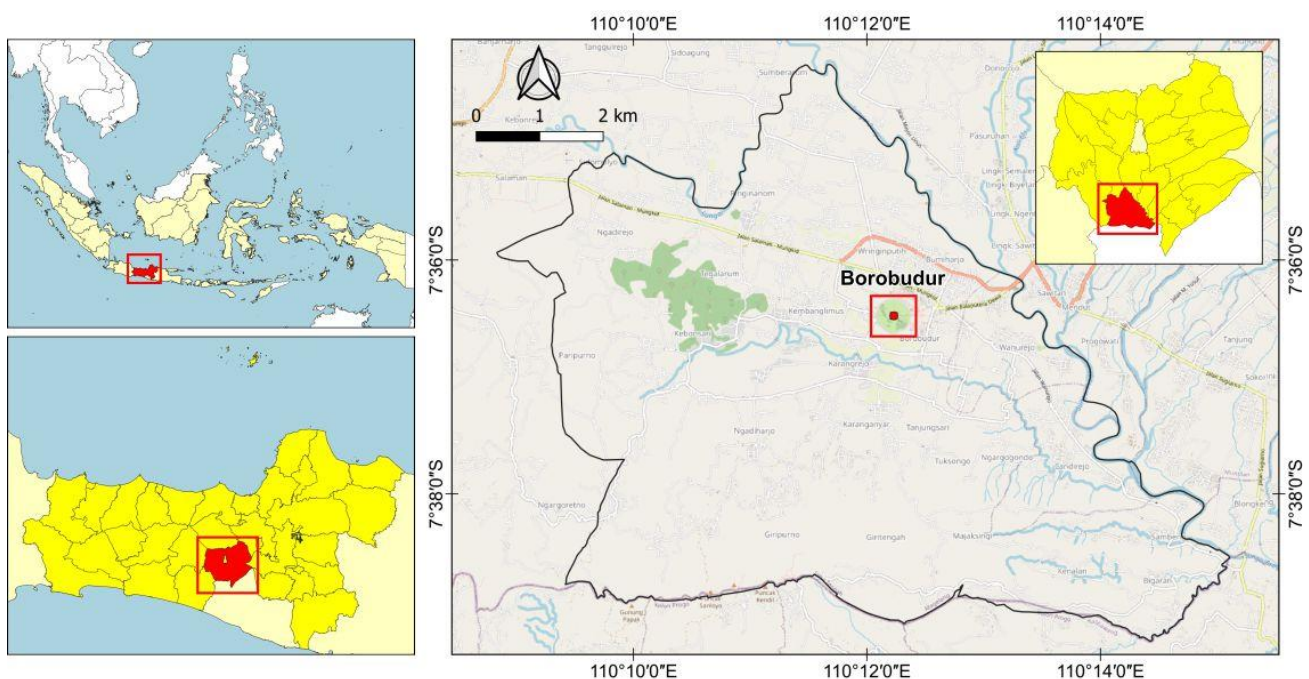
### Study area

Spatially, this research was conducted at Borobudur Temple, located in the village of Borobudur, Borobudur Sub-district, Magelang District, Central Java Province, Indonesia (Figure 1). Astronomically, it is located at 07036'30.49" South Latitude and 110012'10.34" East Longitude and an altitude of 265 m above sea level (Borobudur and D n.d.). Geographically, Borobudur Temple is surrounded by several landscapes, namely Mount Merapi and Merbabu in the eastern part, Mount Sindoro and Sumbing in the northern part, and the Menorah Hills in the southern part, and flanked by two rivers, namely the Progo and Elo (Dian et al. 2010).

Borobudur Temple was built in the 8<sup>th</sup> -9<sup>th</sup> century AD. King Indra, who ordered the temple construction, ruled from around 782 AD until just before 824 AD. After that, Borobudur was constructed by king Samaratunga, Indra's successor, who ruled between 824-832 AD. Conceptually the problem under study is to visualize the Karmawibhangga reliefs in the paddy plant image section and describe the relationship between the paddy reliefs alongside Javanese history and culture in the 8<sup>th</sup>-10<sup>th</sup> centuries AD.

### Research method

The data collected in this study employs a literature study relating to the Borobudur Temple and the Karmawibhangga Relief. The data collection process was also carried out through observation and documentation of the Karmawibhangga Relief paddy at Borobudur Temple.



**Figure 1.** Location of Borobudur Temple at 07036'30.49" South Latitude and 110012'10.34". Source: <https://www.google.co.id/maps/>

Generally, descriptive-qualitative research systematically describes the facts of the nature of an object. In this study, a factual search was carried out on the Karmawibhangga reliefs of Borobudur Temple. Later, the visualization story of the collected data is analyzed with a process of identification, categorization, and interpretation to promote new understandings. Such as what plants are found, their characteristics, their role in the story, and the meaning it represents. Data analysis was carried out inductively, namely that the data that had been collected was compiled and analyzed together with the data being collected (Soetopo 2006). In this study, the results of reference searches were collected, compiled, and analyzed altogether.

This study employs an iconographic approach in analyzing the images carved on the Karmawibhangga reliefs at Borobudur Temple. According to Panofsky (1955) and van Leeuwen (2001), iconography is a study that focuses on the configuration of images in work to find out hidden meanings. Iconography is usually understood as the study of signs with references whose objects cover various disciplines of thinking. Iconography has a subject of study related to the human side (subject matter) or the meaning of a work of art as something that sometimes contradicts the form of the work, namely the formal side. The iconographic approach has three layers of pictorial meaning: representational, iconographic symbolism, and iconological symbolism (van Leeuwen 2001).

Panofsky (1955) explained that interpreting art objects and images underwent three stages to examine the meanings above: (i) the *Pre-iconographic Stage*. This stage identifies through things already known, the nature of which is factual and expressional understanding, including material that represents particular everyday objects, the relationships that occur in objects, and their assistance. At this stage, the research described the visual characteristics of the paddy in the Karmawibhangga reliefs of Borobudur Temple. The second stage is (ii) the *Iconographic stage*. This stage is to identify secondary meanings by observing the relationship between the motifs of a work of art and the themes, concepts, or ordinary meanings of the events depicted by an image. Later known as carriers of secondary meaning, motives are referred to as images. At this stage, a series of images were analyzed, focusing on events related to the imagery of the Karmawibhangga relief. The final stage is (iii) the *Iconological Interpretation Stage*. At this stage, it is necessary to understand the meaning and role of the most essential and basic paddy plant depicted in the Karmawibhangga relief. This intrinsic meaning can be understood by revealing the characteristics depicted and their relation to the story at that time. In this study, the interpretation was carried out considering the paddy visualization related to the role of the stories in the reliefs.

This study also used relief sketches of Karmawibhangga Panel 65 to assist in interpreting the images so that it is easier and clearer to observe them. The drawing was made using the original photograph of Panel 65 of the Borobudur Temple, obtained from the Borobudur Temple consecration hall. Unfortunately, researchers do not use original photos of our results because the Karmawibhangga section of Borobudur Temple has been

covered with earth, so they cannot directly access Panel 65. However, the Borobudur consecration hall has archived photos of every panel in the Karmawibhangga section of Borobudur Temple. Therefore, a photo of the consecration hall is sketched using the tracing technique so that the sketch can produce an image most similar to the original photo and get the details of each object in Panel 65 of Karmawibhangga. Furthermore, with the support of the original photo and various other literacies, this sketch is interpreted to get a picture of the paddy in Panel 65 of Karmawibhangga, Borobudur Temple.

## RESULTS AND DISCUSSION

### Karmawibhangga relief

Borobudur Temple is in the form of a multi-story stupa consisting of 10 pyramid levels. The lower six terraces are square, while the top three levels are oval terraces, and a large stupa is placed above it (Soekmono 1976). The total height of Borobudur is 42 meters, including its chattra, or 31 meters without chattra, with a layout of 123 x 123 sq. meters. Borobudur is a remarkable Buddhist monument due to its size, sculpture, and decorative richness (Soekmono 1976). The total number of Buddha statues is 504, 1460 narrative panels, and 1212 decorative reliefs covering the facades of walls and balustrades, and are arranged as follows: (i) Karmawibhangga (160 panels) depicted on the wall of Hidden Lower Part. (ii) Lalitawistara (120 panels), on the main wall of the First Gallery, and *Jataka / Awadana* (120 panels), on the main wall of the First Gallery. (iii) Gandawyuha (128 panels) on the main wall of the Second Gallery. (iv) Gandawyuha (88 panels) on the main wall of the Third Gallery, (v) Gandawyuha (84 panels) on the main wall of the Fourth Wall.

This Karmawibhangga relief is depicted at the base of the temple, consisting of 160 of the 1,460 panels found at Borobudur. The relief is located on the lowest level, called Kamadhatu. This series of reliefs is not visible because a broad pedestal covers it, considered a procession path. The Karmawibhangga relief groove follows a clockwise or pradaksina direction. Panels 1-20 are the eastern part of the temple base, panels 21-62 are the southern part, panels 63-102 are the western part, panels 103-143 are the northern part, and panels 144-160 are the eastern part (Ashari 2010).

Karmawibhangga consists of two words, namely "*karma*," which means "*action*" or "*deed*," and *vibhanga*, which means "*wave*" or "*flow*." Therefore, Karmawibhangga signifies the flow of human life. It is believed to be one of the Buddhist teachings related to the Law of Cause and Effect - a destiny determined by one's actions (*karma*) (Santiko 2016). The Law of Karma, or the Cause and Effect, applied to everyone, be it kings, nobles, priests, or commoners. Since it is crucial for people to obey the Law of Karma, the sculptors of Borobudur (*śilpin*) depict the episodes so they can understand the doctrine easily. As a result, these stone panels reveal amazing episodes of early life in Java from the 8<sup>th</sup> -9<sup>th</sup> centuries AD. (Ruiz et al. 2015).

### Paddy on the Karmawibhangga relief

Borobudur reliefs are rich in human anatomical forms, plant and animal figures, and environmental components such as water, clouds, and rocks. In addition, the images of trees or plants in the reliefs have been carved. Specifically, they may relate to human life (Hermawan et al. 2016). Plant diversity usually benefits the community as a cultural value and importance. For example, the reliefs of Borobudur Temple depict the daily life of the ancient Javanese people. Therefore, identification and analysis of plant figures were carried out, which could provide important information about the relationship between plants and the surrounding community at that time.

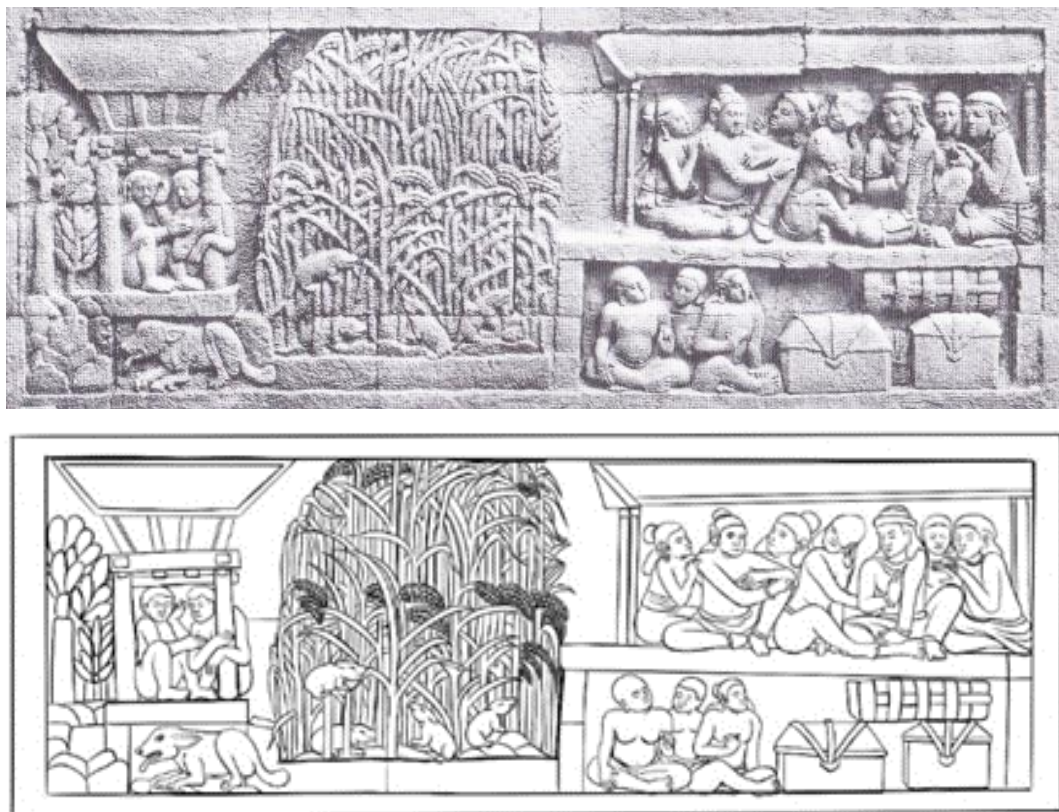
Several previous studies have observed figures of plants and animals appearing in the reliefs of Borobudur (Rusdianto et al. 2020). Plants in the Karmawibhangga relief can be applied as objects in the building as an impression, situation, or background (wild forest, beautiful garden, village park, riverbank, etc.). However, plants as symbols are usually unreal, imaginative, and not based on existing living species.

The flora reliefs depicted in relief No.65 are flora in the form of clumps and are not tall. The leaves are long, stemless, and shaped like a ribbon. The fruit is clustered and in the form of grains. This floral type is usually planted with a paddy plantation system (Setyawan et al. 2017). Setyawan and Kasatriyanto (2019) also explained that the

paddy in the Karmawibhangga section represents paddy fields and settlements (Figures 2 and 3).

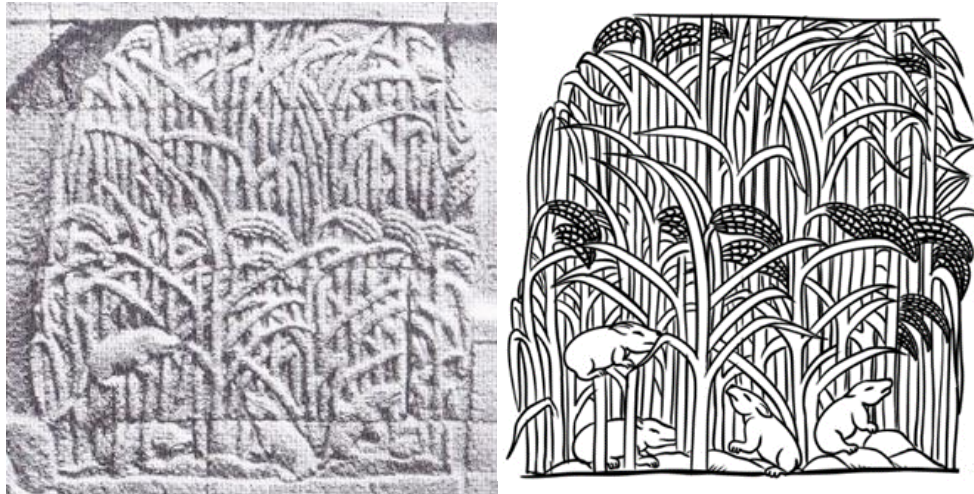
The paddy in relief No. 65 is depicted with grains or fruit already plump and ready to be harvested. Four rats are depicted gnawing at paddy (paddy grains) from the ground up. The existence of these rat pests does not seem to be neglected by the local inhabitants. Moreover, the two people were seen sitting under a hut with a dog. Observing from the context of this description, the two people do not seem to be guarding a field that rats are attacking. Instead, the two people are depicted guarding a building as a house on stilts with a dog. The form of the stilt house is identified as a paddy barn full of crops. Rats appear to be pests of paddy that attack not only paddy fields but also paddy barns (Setyawan et al. 2017) (Figure 3).

Borobudur Conservation Center (2020) reveals that the expressions in the reliefs of Borobudur Temple have a close relationship with the community. That is proved in several relief panels that show daily activities with their environment, which are still visible around the temple. One lies in Karmawibhangga series 65, which describes paddy with its paddy barn. Paddy is one of the staple foods of the Javanese people until now. Furthermore, to ensure that there is no shortage of paddy supply, various efforts to protect against pests need to be carried out. As observed in the relief, rats attack the paddy, while two people and a dog guard the paddy barn.



**Figure 2.** Panel 65 shows paddy. Source: Department of Culture Affairs of Borobudur Temple





**Figure 3.** Paddy in Panel 65 parts of Karmawibhangga Borobudur Temple. Source: Borobudur Temple Conservation Center and personal sketch

Metusala et al. (2020) explain that the relief in the form of paddy can symbolize prosperity. In Javanese society, paddy (paddy grains) occupies a high position, even to the point that there is a story about the goddess of prosperity assigned to care for the paddy by herself. Furthermore, to observe how paddy is described in Karmawibhangga, one only needs to observe Panel 65 in the Karmawibhangga section because Panel 65 is the only panel that clearly describes paddy.

The panels engraved in the reliefs at Borobudur depict various elements, be it the richness of flora, fauna, attitudes, or actions of humans and buildings, all of which have meaning and are interconnected. Karmawibhangga, a group of reliefs depicting the Law of Cause and Effect or "karma," also has various reliefs depicting human nature and actions. In each panel, multiple elements are contained and generally grouped into the central object of the panel and its supporting.

Panel 65 of Karmawibhangga reliefs shows reliefs of flora depicted in clumps, not tall, having long leaves, stemless, shaped like ribbons, the fruits are clustered, and grain-shaped. These floral types are usually planted in a paddy field system (Setyawan et al. 2017). The Borobudur Conservation Center (2020) presents that the expressions in the reliefs of Borobudur Temple have a close relationship with the community, one of which is the paddy plant with its paddy barn in Panel 65. This paddy plant is depicted with grains or fruit that are filled and ready to be harvested. Later, the paddy that is ready to be harvested will turn into paddy grain (rice), which is the staple food of the Javanese people to this day.

Metusala et al. (2020) explained that paddy in Javanese has a high position described as "*Dewi Sri*," overshadowing every grain of paddy planted and symbolizing prosperity. The Borobudur Conservation Center (2019) states that the ancient Javanese people at the time when the Borobudur Temple was built were a society whose economy was based on agriculture, both the wet and dry paddy field systems. Fitriadi (2018) explains that wetland agriculture is

widely used for agricultural purposes, which requires always filling, having high water content, and good soil characteristics. Meanwhile, dryland farming is a type of agriculture carried out on dry land with low water content and even tends to be extreme where the land is arid and does not have a definite water source, such as rivers, lakes, or irrigation canals. At this time, the type of grain widely developed by the community was wild paddy.

Wetlands are generally very productive and have biodiversity and even non-biodiversity, so it is not surprising that they are considered a potential life support system (Ruswaningsih and Reski 2021). Generally, a wetland is widely used for agricultural purposes requiring a high water content and fertile soil characteristics. Almost all existing wetlands are managed in agricultural or plantation areas (Rahmi 2015).

Wetland agriculture has the characteristics of having a high water content, part or all of the area being inundated by water, and land that tends to be sedentary. Still, some are seasonal wetlands, have a hardness level of soft soil contours that is also unstable, are fertile agricultural area, and has a shallow groundwater table. Many plants and plants lead to aquatic plants or mangroves and collate at 300 meters above sea level. Several locations can be defined as wetland agriculture: paddy fields, peatlands, swamps, brackish areas, and mangrove forests. The most widely planted and cultivated plant in a wetland is the paddy plant which requires land that always has a constant water content to grow and provide abundant yields.

Prasetyo (2007) explains that the area of paddy fields in Indonesia is divided into four main types: irrigated paddy fields, rainfed paddy fields, tidal paddy fields, and leak paddy fields, with a total area of 8.1 million ha. Most national paddy production comprises irrigated paddy fields (67.5%) and rainfed paddy fields (27.5%). Of the two paddy fields, 43% are on Java island. Paddy field irrigation is an agricultural system with regular irrigation, not depending on rainfall, because the irrigation can be obtained from rivers, reservoirs, or dams. Paddy fields that

use the paddy irrigation system can get several benefits, such as facilitating the management of soil media before planting. Also, setting the temperature or soil temperature can take place as desired; suspended plants are easier to overcome, prevent and increase the soil media fertility more quickly, and facilitate the process of soil leaching. In one year, paddy fields can be harvested three to four times.

Rainfed paddy fields are agricultural businesses that fully use rain as a water source. This agricultural business has been developed in many countries globally to provide food. The productivity level of rainfed agriculture is generally low due to degraded soil conditions, high evaporation, drought, floods, and minimal water management. However, this rainfed farming business has the potential to be more productive by managing rainwater and soil moisture more effectively. Rainfed paddy fields are left untreated during the dry season because water is scarce or nonexistent. This type of paddy field is only harvested once a year with a higher intensity of labor use because farmers have to do embroidery more frequently than irrigating paddy fields due to an unstable water supply.

Setyawan et al. (2017) explains that paddy is one of civilization's most important cultivated plants. Paddy is also used to refer to several types of the same genus, commonly referred to as wild paddy. Paddy is included in the grain tribe or Poaceae family group. Decorative paddy motifs are sculpted on Panel 65 of Karmawibhangga reliefs at Borobudur Temple, which are generally carved in their entirety, including the stems, leaves, and grains in detail. Paddy stalks are described as small upright with leaves arranged in loosely alternating intervals, with the ends of the stalks filled with grains of paddy.

Based on the narrative description above, it is estimated that the paddy planted during the Syailendra Kingdom, as depicted in the relief of Karmawibhangga Panel 65, is an Asian *Oryza sativa* paddy type with the main sub-species, namely *japonica*. Huang et al. (2012) explained that paddy farming began in Central-South China along the Yangtze river, spreading to Korea and Japan via the southern and northeast trade routes. The spread of *japonica* paddy cultivation began with the migration of the Austronesian culture to Taiwan around 3500 to 2000 BC. The Nanguanli site in Taiwan in 2800 BC produced abundant carbonized residues of paddy and millet under waterlogged conditions indicating intensive wetland paddy cultivation and dryland millet cultivation. Austronesian began with settlers from Taiwan moving south to Luzon in the Philippines, bringing paddy cultivation technology with them. From Luzon, they move across the Southeast Asian Islands to the south and west, Kalimantan, Sulawesi, Java, Sumatra, and the Malay Peninsula.

Figure 4 presents the visualization of the *japonica* paddy corresponding to the description in the relief of Karmawibhangga Panel 65 in the form of small upright

paddy stems with leaves arranged in alternating gaps with pipe ends filled with paddy grains. This paddy has a fluffier paddy texture with low amylose content. This paddy is also resistant to several disease races, such as blast and *tungro*. These two diseases are popular that often damage paddy fields in Indonesia. However, this paddy is weak against the brown stem and bacterial leaf blight or crackle.

Planting *japonica* paddy begins with preparing the land. First, the land is cleared of various weeds, such as grass, shrubs, and other things that might interfere with the development of these plants. After dissipating weeds, the next step is to provide water flow to the land, which aims to loosen the soil so that it is easy to plow using traditional tools. Then, the *japonica* paddy seeds are sown in the planting area by soaking the seeds for approximately 24 hours until the seeds sprout. Next, keep the land wet for sowing this paddy and muddy and have been given fertilizer. Previously, plant paddy seeds by spreading the seeds evenly on the seeding area. The seeds that have been sown are then planted in paddy fields with a depth of about 1-1.5 cm and a spacing of 15 cm x 30 cm x 50 cm. Next, weeding the land to protect it from weeds is carried out when planting is three weeks old and then carried out routinely every three weeks by pulling weeds by hand. Next, fertilize regularly and ready to be harvested at the age of around 105 days.

Another source said that the paddy plant motif in the Karmawibhangga relief Panel 65 is a grain plant with a type of millet (*jewawut* in Javanese). Heyne (1987) explained that millet is a type of cereal with small seeds (millet). That has the Latin name *Setaria italica* (Figure 5), which was once a staple food for people in East and Southeast Asia and is more commonly known by the name Foxtail millet. Millet has physical characteristics such as grass that can reach a height of 150-175 cm with upright stems, single leaves, alternate, in the form of lines or ribbons, tapering at the ends. Its also protruding central leaf veins with midribs 10-25 cm long, bald, slightly hairy, tongue (ligula) short and frayed. The seeds are small with various colors ranging from black, purple, and red to brownish orange.

Several records from China show that millet was cultivated around 5,000 BC. At that time, millet was the only grain cultivated in China, spreading westward to reach Europe. It is suspected that millet had spread in Indonesia 3,000 years ago and was brought by the Chinese when they migrated. Millet grows in semi-arid areas with a growth period of about three to four months, is less resistant to inundation, and is prone to long periods of the dry season. In tropical areas, this plant can grow to a height of 2,000 meters above sea level. This millet can grow well in various soil types, from sandy to dense clay. The process of managing millet is the same as that of processing paddy into paddy grain and rice. Sometimes the grains are ground into flour before being consumed.



**Figure 4.** Types of *japonica* paddy (*Oryza sativa* L. var. *japonica*). Source: Ministry of Agriculture, Balibangtan



**Figure 5.** Millet plant [*Setaria italica* (L.) P. Beauv.]. Source: Photograph by AA

Based on the description above, it can be seen that the Karwibhangga relief Panel 65 depicts flora, namely paddy with the main type of *japonica* because this type of paddy grows in an area with an altitude of 300 masl close to the height in the Borobudur Temple area, which is 265 masl. In addition, during the 10<sup>th</sup> century AD of the Syailendra Kingdom, a simple paddy field irrigation system was also known, which meant that paddy was planted in paddy fields with irrigation so that they could produce good yields. On the other hand, the millet plant has its place in the relief of Karmawibhangga panel 123. The source of the inscription states that the word "skul," a possible daily food, is paddy, although in West Java, "skul" refers to millet. Nastiti (1982) writes "*skul plenary*," which can be interpreted as perfect paddy complete with side dishes and vegetables. Then there is the term "*skul dandanan*," which means paddy cooked in a boiler. Therefore, we can conclude that Panel 65 discusses paddy processed into paddy grain or rice as a staple food during that period.

That means the agricultural sector occupies a major position in the economy of Java in the 10th century AD or, more specifically, Ancient Mataram. The Mataram kingdom in Central Java was believed to be very dependent on the economics of paddy farming. This happened because Ancient Mataram did not have a harbor like the Majapahit or Srivijaya kingdoms but had fertile land. The Canggal inscription interpreted by Arrazaq and Rochmat (2020) explained that Java Island is an island that produces paddy, as well as Oemar and Suud. (1994). The Canggal inscription is one of the Ancient Mataram Kingdom's relics, so Panel 65 of the Karmawibhangga group emphasized that the people of the Ancient Mataram Kingdom had a livelihood in agriculture.

Agricultural facilities in the form of irrigating paddy fields and agricultural land during the Ancient (Old) Mataram Kingdom were mentioned in inscriptions. One inscription that mentions the means of irrigating paddy fields is the Harinjing Inscription (726 Saka). The inscription contains the construction of a river channel named Harinjing in Culanggi Village by Bhagawanta Dhari (Trigangga et al. 2015). Meanwhile, the inscriptions that

mention the type of agricultural land are the Kamalagi and the Kwak I Inscriptions. The Kamalagi inscription mentions agricultural land in the form of gardens. At the same time, the Mulak I inscription mentions agricultural land in the form of paddy fields. Agricultural activities require tools that are used to assist the agricultural production process. Therefore, the existence of agricultural tools is recorded in those inscriptions.

#### **Paddy in the Ancient Mataram Kingdom (9-10th century) in Java**

Hindu-Buddhist culture in the archipelago began around the 4<sup>th</sup> century AD and developed concurrently with several kingdoms generally centered on Java island. Central Java and East Java are locations where many relics of Hindu-Buddhist culture are found. The Hindu-Buddhist culture accepted in western Java was not as much in central and eastern Java and only on the edges (Munandar 2019). The influence of Hindu-Buddhist culture gave birth to several Hindu-Buddhist-style kingdoms in the archipelago, one of which is the ancient Mataram kingdom. Based on the inscriptions found, the Ancient Mataram Kingdom developed around the 8-10 century AD.

Poesponegoro and Notosusanto (1990) explain that the Hindu Mataram Kingdom was originally located in Central Java, the area around Kedu and Prambanan. The Sanjaya dynasty, the Syailendra dynasty, and the Isana dynasty were dynasties that once ruled the Hindu Mataram Kingdom. In the Central Javanese period, the Mataram Kingdom was led by the Sanjaya Dynasty and the Syailendra Dynasty. In the East Java period, it was led by the Isana Dynasty. Furthermore, the Hindu Mataram Kingdom of Central Java was ruled by two dynasties: the Sanjaya Dynasty as Hindus and the Syailendra Dynasty as Buddhists. Although the two dynasties finally united due to a marriage between Rakai Pikatan and Princess Samaratunga, Pramodawardhani, who later governed the Mataram Hindu Kingdom of Central Java, was re-controlled by the Sanjaya dynasty with the last king, Raja Wawa. During the reign of King Wawa, at the beginning of the 10<sup>th</sup> century AD, the Mataram Kingdom of Central Java

suffered a setback and was moved to East Java by Mpu Sindok (Depdikbud 1997).

The ancient Mataram Kingdom is known from the Canggal inscription dated back to 732 AD, written in Pallava letters and Sanskrit, found in the courtyard of the temple on Mount Wukir in Salam District, Magelang City. The contents commemorate the erection of a Linga, namely the symbol of Shiva on a hill in the Kunjarakunja area by King Sanjaya. The area is on a glorious island rich in agricultural products, especially paddy and gold, namely Yawadwipa. The agricultural sector occupies a major position in the economic sector and is the backbone of society and the country's life. The Canggal inscription illustrates that Java Island is an island that produces paddy (Oemar et al. 1994). The Canggal inscription is a relic of the Ancient Mataram Kingdom, suggesting the people made a living in agriculture.

The Javanese community at that time was a society whose economy was based on agriculture, both wet and dry paddy fields. Paddy farming is an important factor, as seen from several reliefs at Borobudur. Several inscriptions inform the paddy field management system, from land preparation to planting and harvesting. Several terms in paddy field management can still be found today, including *amaluku*, *atanam*, *amatun*, *ahani*, and *anutu*. Even though the inscriptions containing these terms date from the beginning of the 9<sup>th</sup> century AD, it does not mean that in the 11<sup>th</sup> century AD, people were not familiar with these terms. The reliefs of Borobudur are an example of a time when farmers are plowing the fields (*amaluku*). The shape of the *luku* is like the one used by Javanese farmers today, which two cows pull. This relief indirectly illustrates that the ancient Javanese raised cattle to cultivate agricultural land.

Communities involved in agricultural activities are called *hulu* and *hulu wras*. *Hulu* is an official supervising irrigation or agricultural irrigation, an important facility. Officers related to agricultural activities, namely *Hulu wras*. *Hulu wras* are agricultural officials whose job is to take care of paddy. The people of the Ancient Mataram Kingdom had carried out the division of tasks in agricultural activities. Agricultural facilities in the form of irrigation and agricultural land during the Ancient Mataram Kingdom were mentioned in the inscription. This inscription mentions the type of agricultural land in the Inscription of Kwak I. Wurjantoro (2018) explains that in the Mulak I Inscription, the agricultural land at that time was in the form of paddy fields. Agricultural activities require tools that can be used to assist the production process, which is recorded in the inscriptions. The following is a quote from the Kwak I Inscription (800 Saka) in lines 8-9, namely,

"(8) *mpañ mas mā 4 bras pāda 1 wsi °ikat 10 halu halu 4 wsi nya °ikat 4 waduñ 1 rimwas 1 / tara tarah 1 tampiln*. (9) *n 1 kris 1 tatah 1 lanḍuk 1 lings 4 dāñ 1 taray 1 padamaran 1 mu°añ caru tuluñ tawur sātthikarājasa kāma °ā...*" or

"(8) 4 *māsa* gold paddy money one pada, 10 iron bundles, 10, 4 paddy pounders [*halu-halu*], 4 iron bundles, an ax [*waduñ*], an axe [*rimwas*] / a pickaxe

[*tara tarah*] a view. (9) a Keris, a chisel [*tatah*], a hoe [*lanḍuk*], 4 crowbars, a cooking utensil [*dāñ*], a copper bowl [*taray*], a lamp [*padamaran*] and caru 3 red flowers as a token of love [*tuluñ tawur sātthikarājasa kāma °ā...*]"

The agricultural tools in the Kwak I Inscription are paddy pounders, axes, hoes, and crowbars. Those tools are used as a means to cultivate agricultural land. Most of the agricultural tools used by the people of the Ancient Mataram Kingdom were made of metal. The agricultural commodity the community plants is paddy which is processed into paddy grain/rice. The Kwak I inscription mentions paddy the size of one *pāda* (*pāda* is a measure for determining the amount of rice weight by using a bamboo container that is often used by Javanese people in certain areas) (Arrazaq and Rochmat 2020). The trading commodity in the form of paddy can be seen in the relief below.

The relief above represents a paddy field consisting of various grains, with some rats eating the crops. On the left side of the relief is depicted a granary building used to store crops. Under the granary, two people were sitting, and below them was a guarding dog (Krom 1927. 85). Therefore, possibly that paddy was one of the trading commodities in the society of the Ancient Mataram Kingdom.

### The concept of paddy in the adherents of ancient Buddhism

Buddhism appeared around 500 BC. At that time, especially in India, very large Hindu kingdoms developed, one of which was the Mauryan dynasty. This dynasty has a very famous king, namely King Ashoka. The emergence of Buddhist beliefs cannot be separated from the character Siddhartha Gautama. Siddhartha is the son of King Suddhodana of the Kapilawastu Kingdom. Siddhartha Gautama taught Buddha's teachings, so he is better known as Gautama Buddha. The Buddhist scriptures are the Tripitaka, which means three baskets. This book consists of: (i) Vinayapitaka, which contains the rules of life, (ii) Suttapitaka, which contains the main points or the basis for giving lessons; and (iii) Abhidharma-pitaka which contains religious philosophy. Every Buddhist follower is required to carry out the Tridharma (three services): (i) I take refuge in Buddha, (ii) I am protective of the Dharma, (iii) I take refuge in the Sangha

Four main places are considered sacred by Buddhists who have a relationship with Siddhartha, namely Lumbini Park, Bodh Gaya, Benares, and Kusinagara. Lumbini Park is in the Kapilawastu area, the birthplace of Siddhartha. Bodh Gaya is the place where Siddhartha received great enlightenment. Benares is where Siddhartha first delivered his teachings, and Kusinagara is where Siddhartha died.

The exact spreading of the Hindu-Buddhist religion into Indonesia is not yet known. But in 400 AD, it was confirmed that Hindu-Buddhism had developed in Indonesia. Buddhism has entered Indonesia since the days of the Sriwijaya and Majapahit kingdoms. The process of spreading Buddhism in Indonesia began through trade by sea. This can be observed in the notes of a scholar from



China named I-Tsing when he traveled to India and the Archipelago. However, the values of Buddhism began to fade after the collapse of the Sriwijaya and Majapahit kingdoms. That is also evidenced by the discovery of inscriptions on *Yupa* in East Kalimantan that show the Kutai kingdom in East Kalimantan has developed. Therefore, the existence of a kingdom in 400 AD means that Hindu Buddhism entered Indonesia before that year.

Paddy is one of the most important cultivated plants that originated in India or Indochina around 1,500 BC. The worship of Dewi Sri or Dewi Padi was already underway before the influence of Hindu Buddhism came to the archipelago, precisely since the arrival of paddy cultivation in Asia in prehistoric times. This belief persisted in the form of social and religious change. Dewi Sri is believed to be the goddess of fertility, the goddess of caring for plants, and the goddess of paddy. Dewi Sri is also believed to be depicted that governs life, wealth, and prosperity. On the other hand, it is also believed to protect against things that cause poverty, such as pests that often cause paddy crop failure and other factors that hinder fertility (Shadily 1984).

Dewi Sri is also known as *Ardhra*, which means she always gives the impression of being fresh and alive, like a plant. Sri's other names are *kairisin*, which means always pouring manure (cage), *bhuti*, which means always expected to bestow prosperity, and *jwalantin*, which always shines brightly. In this regard, Sri was later worshiped in various circles of agrarian society, including among Javanese people.

Dewi Sri was more popular than Lakshmi during the ancient Central Javanese period. There is an assumption that there was a cult of Vishnu and the magic of Sri during the ancient Central Javanese period. Barong Temple, located in southern Prambanan Temple (not far from the Baka Palace), Lumbini Park, is a temple that is assumed to be a place of worship for Vishnu and his magical Sri. In this regard, the possibility in the Old Central Javanese period was the worship of Vishnu in various roles cannot be denied.

This assumption is based on the existence of a series of places of Vishnu and his avatars. Apart from Vishnu as a form of Trimurti, there are also depictions of Vishnu as Rama, Krishna, Narasingha, and Wamana, whose depictions are found not far from around Barong Temple (Budiarto et al. 2021).

Sri is also called by the name Sridewi which is the personification of the female *dharmapāla*, so she is considered a protective goddess, especially by the Dalai Lama in Old Buddhism. Sridewi is also known as *Singhawaktrā*, *Makarawakrtā*, apart from one of the goddesses of *Dākinī* (goddess of the four seasons). Sridewi is illustrated in a fearsome, blue form, with a vehicle in the form of a white or blue horse. The usual outfits are *daṇḍa*, *kāpala*, *candra*, *gadā*, *kangkala*, *khadga*, *khatwangga*, *mayūrapattra*, *nāga*, *nakula*, *trinaya*, *triśirah* (sometimes), and *wajra* (half) (Liebert 1976). Several statues (stones and bronze) were found in Indonesia, one of which is the Dewi Sri statue from Barong Temple, Yogyakarta (Figure 6). Those stone statues were held at Yogyakarta Sonobudoyo Museum and National Museum (Pramastuti 2005). The

first statue, Dewi Sri, is depicted sitting in the Priyanka position on the *Padmāsana*. He has four hands; the right hand lies in front in a *waramūdra* manner, and the front left hand is placed in the lap with an open palm. The back right hand holds a *kamandalu* (jug), and the back left hand holds a sprig of paddy.

Dewi Sri's position as a goddess is indicated by the presence of a *sirascakra* (halo). He is illustrated wearing *jatamakuta*, *kundala*, *hara*, *channawira*, *keyura*, *kankana* and *urudamaj*. The presence of the paddy element probably caused Dewi Sri to be named the paddy goddess. The emergence of Sri's role as the paddy goddess only appeared later, as mentioned in the Scriptures dating from the 15-16 centuries AD. While findings of the name Sri have been found on rings with the inscription Cri dating from 7-9 AD, combined with the Om spell, it forms the image of Santa. This conception may be the development of the idea that Sri is considered to be related to plant fertility by the designations *kairisin* and *kadama*, son of Sri, which means paddy mud; this creates the myth that Sri is the ruler of paddy (The Book of the Gods and Goddesses of the Classical era, published by BPCB Central Java).

Many mythical stories about paddy in Java or Bali are associated with Dewi Sri. One of the popular myths is Wawacan Sulanjana, where Dewi is given *kholdi* fruit, addicted to, and died by Batara Narada so that Batara Guru does not marry Dewi Sri. Dewi Sri's body was taken care of by Aki Bagawat and buried in Banyu Suci. Dewi Sri's grave then grows paddy and other plants. Therefore, Semar and his children were ordered to bring all plants to be planted in Pakuan, which Prabu Siliwangi ruled. Thus, Pakuan became a fertile, prosperous country with the *jinawi*. Moreover, Dampu Awang wanted to buy paddy, but King Siliwangi refused because Batara Guru entrusted the paddy. So Dampu Awang allied with the paddy pests to attack Pakuan, but thanks to Sulanjana, the son of Batara Guru, the paddy was protected.



**Figure 6.** Dewi Sri, collection of Sonobudoyo Museum. Source: Fontein 1990 (<http://kebudayaan.kemdikbud.go.id/bpcb/jateng/dewi-sri/>)

Nastiti (2020) explains that rituals or ceremonies are carried out to honor Dewi Sri for people who support agrarian culture, especially Javanese and Balinese people, to maintain soil fertility and get an abundant harvest. The tradition of honoring Dewi Sri, who is considered the Goddess of Paddy and cares for and protects paddy, is still ongoing. Ceremonies associated with planting paddy until harvest in each region has a different tradition of carrying out ceremonies in honor of Dewi Sri.

In cultivating agricultural land, the Javanese people perform many ritual ceremonies as a tribute to Dewi Sri. This ceremony has many variations, but it is almost the same, only with certain variations that distinguish it. The ceremony starts with sowing seeds, treatment time, and the cycles afterward until the plants are harvested. That is because farmers believe that Dewi Sri, in the form of paddy seeds planted in the ground, meets Lord Vishnu in the form of water. Therefore, the first ceremony, namely the seed-sowing ceremony, is usually performed by men. Furthermore, people who want to sow seeds take 9 grains of paddy, one grain planted in the middle and the other eight planted in the compass's eight directions (Nastiti 2020).

The next ceremony will be held when *tandur* (planting paddy in Java) is held. For this ceremony, offerings are prepared in white pulp, stone plantains, betel and whiting, and flowers. The offerings are brought to the paddy fields and placed near the nursery. The leader of the ceremony then reads a prayer while burning incense. The offerings are then divided into several parts and placed in the corners of the paddy fields as offerings for the guardians of the paddy fields. The remaining offerings are distributed to field workers (Tabloid Desa 2016). Next, the ceremony is held when the paddy begins to bear fruit which in Javanese terms is *meteng* (pregnancy), in the form of white porridge or eggs placed in *tulakan*. Finally, the offerings are placed near *lego-lego* or *legundi* leaves which are burned to drive away evil spirits or disease. The *wiwitan* ceremony is carried out before the harvest as a form of gratitude to Dewi Sri and the earth, as *Sedulur Sikep* and Dewi Sri have grown and cared for the paddy until it is harvested. "*Wiwitan*" means "*wiwi*" and is "to start," so start cutting the paddy before the harvest is held. *Sedulur sikep* is meant for Javanese people to regard the earth as their relative that must be respected and preserved for life.

The *wiwitan* (started planting paddy in Javanese custom) ceremony is carried out as an offering to Dewi Sri as a form of community gratitude for the harvest that has been given. The ceremony is led by *Mbah Kaum* (the oldest person) in the village, who will do the harvest. Following, read a prayer while burning incense and burning a bundle of straw that has been prepared. Next, water in the jug is poured into the corners of the paddy fields that are ready to be harvested while continuing to recite the prayer. After that, cut the paddy as a symbol that the paddy is ready to be harvested. Farmers who will harvest distribute the food that

has been prepared to residents after the ceremony is over. Every resident may follow the *wiwitan* tradition without exception and eat the food that has been prepared. The food served is savory paddy, free-range chicken, *urap*, salted fish, tofu, tempeh, peanut brittle, eggs, etc., and snacks wrapped in banana leaves or teak leaves (Ashari 2016).

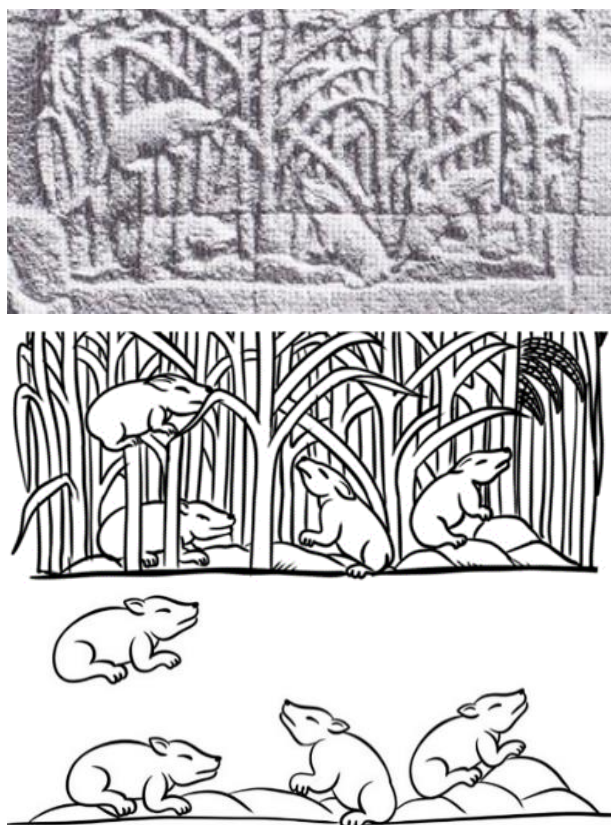
The final ceremony when putting the paddy into the barn is in the form of a feast attended by the residents and led by the elders. Participants come using custom without *keris* (Javanese weapons). After that, the paddy is put in the barn accompanied by offerings to Dewi Sri, including *ampo* (dried clay), *prang* or *kenye* (container for putting on put), mirrors, combs and *Suri*, *boreh* (forest saffron), and powder from paddy flour and *kencur* (*Kaempferia galanga*) (Tabloid Desa 2016). All the mythical stories about the origin of paddy, which are associated with Dewi Sri, come from societies with very strong Hindu-Buddhist influences, such as the people of Sunda, Java, and Bali.

### The rat object as a support for the paddy object in Karmawibhangga

Panel 65 of Karmawibhangga reliefs shows fauna reliefs that are described as paddy-eating pests, namely rats. In the relief, four rats are seen trying to eat away directly at the paddy crop yields, thereby reducing the amount of paddy production (Figure 7). The existence of paddy field rats is quite disturbing because it damages paddy and causes crop failure (Setiabudi 2014). Siregar (2020) explains that the abundance of rat populations strongly influences the intensity of damage to paddy due to rat attacks. The life of rats is very close to humans, and the interaction between the two often has a negative impact (Priyambodo 2009). Generally, field rats or *Rattus argentiventer* live in paddy fields and their surroundings and can reproduce very rapidly (Figure 8). Theoretically, one pair of rats can breed up to 1,270 per year.



**Figure 8.** Field rat [*Rattus argentiventer* (Robinson & Kloss, 1916)]. Source: Ministry of Agriculture, Balibangan



**Figure 7.** Rats in Panel 65 of Karmawibhangga relief of Borobudur Temple. Source: Borobudur Temple Conservation Center and personal sketch

The field rats have special characteristics, namely being of medium size, tending to be smaller than the brown rat, having a length of 30-40 cm including the tail, yellowish-brown hair, gray-haired stomach with white edges, and brown tail. Maryanto (2003) explained that these rodents are a type of agricultural pest and are difficult to control because they can learn from previous actions. However, these animals are known to be intelligent and are often used in animal behavior research. These animals like to eat paddy fields, fields, and meadows to get paddy, corn, or grass grains. They make nests in holes in the ground, under rocks, or in logs.

The field rat is the main pest of paddy and is the most dominant species acting as a pest in paddy (Jacob et al. 2010). Rats prefer paddy (grain) compared to other types of feed (paddy and corn) because the grain has a relatively harder skin layer, and mice use it to reduce the growth of their incisors which grow continuously (Priyambodo and Nazarreta 2013).

The availability of abundant food sources with good quality is a supporting factor for rats to reproduce optimally (Htwe et al. 2012), and paddy in the pregnancy stage is the most preferred feed for rats (Mardiah and Sudarmaji 2012). The high intensity of damage to paddy due to rat attacks occurs because rats have more abilities than other pest groups. That ability includes having high mobility, damaging at all stages of plant growth, damaging in a short time, and at high levels of attack. The rats can damage all paddy clumps, leaving only 1-2 rows on the

edges (Ministry of Agriculture 2013). This condition is even more dangerous because the rats' destructive power to paddy is five times greater than the amount consumed (Priyambodo 2009).

The damage and decrease in paddy production are very large due to rat pest attacks and are difficult to control because most rat attacks occur at night when humans are resting. Mice can damage paddy either directly or indirectly. They do this directly by foraging for food when the plants have started to bear fruit while indirectly by damaging the stems of paddy to sharpen their front teeth. Rats are paddy pests that attack paddy fields and paddy barns (Setyawan et al. 2017).

Krom (1927) explained that based on Panel 65 of Karmawibhangga's relief of rats, rats were handled using guard dogs and two farmers to monitor the surroundings. This effort was made to prevent a shortage of paddy supply. Furthermore, how to eradicate rats is explained in Panel 87 of Karmawibhangga's reliefs. The community members fumigate the rat hiding holes in the hope that the rats will die from lack of oxygen.

#### **The object of dogs as guardians of paddy in Panel 65 Karmawibhangga**

The existence of reliefs of animal species carved on the walls of Borobudur Temple implicitly indicates that these animal species had been used for various human purposes before the 7<sup>th</sup> century AD. The closeness of human relations before the 7<sup>th</sup> century AD and the world of fauna is increasingly familiar. Fauna is no longer just described in the form of symbols or symbols. Moreover, the world of fauna has been studied further for its biological characteristics, especially its morphological features and environmental conditions (Suripto and Pranowo 2001). Panel 65 of Karmawibhangga illustrates that humans have used dogs to protect paddy and other crops. In addition, according to Achmadi et al. (2020), dogs, as animals that always live side by side with humans, appeared long ago. In this panel, apart from being guardian animals for the existence of dogs, they are also very close to human life as a symbol of "loyalty" and "devotion" to their employers.

Panel 65 of Karmawibhangga reliefs shows fauna reliefs depicted as guard dogs (Figure 9). These dogs are used to keep paddy safe and not attacked by rats. Observing from the picture, this guard dog is considered a Labrador Retriever, commonly referred to as a Labrador (Figure 10). Dogs are pets that many people like to keep because they have a high level of intelligence and are loyal, so they become a part of life (Sardjana and Kusumawati 2004). Fergus (2002) explains that this dog is one of the many types of retriever dogs and is popular in the world because it is energetic, intelligent, and friendly, making it suitable to be used as a working dog, including guarding paddy and their granaries. In addition, Labrador dogs are among the smartest and easiest to train and obedient dogs, so they don't make it difficult for their owners (Hatmosrojo et al. 2003). There is a physical resemblance between this dog and the picture in Panel 65, namely the ears are small and hanging down, the tail is long, and it doesn't have hair or fur that is too thick.





**Figure 9.** Dogs in Panel 65 of the Karmawibhangga relief of Borobudur Temple. Source: Borobudur Temple Conservation Center and personal sketch



**Figure 10.** Labrador Retriever Dog. Source: Kompas.com

Cunliffe (2004) explains that this dog breed originates from Newfoundland island, which is currently part of the Canadian province of Newfoundland and Labrador. The Labrador retriever is thought to have originated from the St. John's Water Dog, which is now extinct. Formerly, the Labrador Retriever was called the Lesser Newfoundland. Other sources say that the name "*Labrador*" comes from the word "*Lavradores*," which in Portuguese means an agricultural worker. This type of dog has a balanced body shape, so it is suitable to be used as a working and reliable guard dog (Sianipar et al. 2004). Hereditary dogs like Labrador Retrievers have more value for their olfactory abilities (Anggayasti 2007). This dog is a favorite dog breed for many people as a friend (Rusmana and Abduh 2021).

## Discussion

The Karmawibhangga reliefs in Borobudur Temple are a group of reliefs about the Law of Karma or the Cause and effect of Javanese society in the 8<sup>th</sup>-9<sup>th</sup> centuries AD. This depiction is illustrated in Panel 65 of Karmawibhangga, which in one relief, depicts the forms of flora, fauna, and humans in Javanese society in the 8<sup>th</sup> century AD. The flora

depicted in the panel is in the form of paddy of the *japonica* type and plantation in the form of banana trees and jackfruit. Meanwhile, the fauna in Panel 65 Karmawibhangga in the form of dogs and rats are guard and pest fauna.

The forms of fauna and flora in Panel 65 Karmawibhangga can also use as symbols to describe people's lives at the time of the construction of the Borobudur Temple or symbols regarding Buddhist teachings, which are indeed related to the function of the temple itself as a place of worship for Buddhists. The shape of a dog sticking out its tongue can be interpreted as a symbol of "*licking*," and the shape of a rat gnawing paddy stalks can be interpreted as an activity that undermines prosperity or wealth by taking advantage of other people for their interests.

The panel 65 can be interpreted as a description of human greed activities and the retribution or "*karma*" that will be obtained. In addition, this study also shows that Panel 65 can be used to describe the cultural background in Java in the 8<sup>th</sup>-9<sup>th</sup> centuries AD, which is related to their agricultural economic activities. The cultural background of an agricultural economy in ancient Java is illustrated by a panel pointing to paddy at a center image. That meaning of fertility and the presence of a guardian food storage. This shows that in ancient Mataram, paddy became the main commodity supporting the prosperity of the people in the 8<sup>th</sup>-9<sup>th</sup> centuries AD, with the main type of paddy developed being the *japonica* variety.

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