Handling ecological problems in gaga rice cultivating through mantra darmawarsa of Merapi-Merbabu

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Abstract. Darmawarsa text (L 329) is one of Merapi-Merbabu manuscripts tradition which currently is stored in The National Library, Jakarta. The text is written in “Buddha” script with an Old Javanese language. Darmawarsa has its meaning of goodness or virtue of the rain, which comes from two words namely dharma for obligation or virtue, and warsa for the year of the rain. The content of Darmawarsa text is about the mantra (spell) to summon and stop the rain that’s related to irrigating gaga rice cultivation which is known in the agricultural culture of Java. The methods applied to examine the text is textual criticism and ecological-religious approach. The results of the research are: (1) Gaga rice cultivation is an ancient method of planting rice that can be done in hilly land contour such as the slope of Merbabu mountains, (2) the peasant community has solved problems on the unstable of ecological conditions based on mantra (rain summoning spells) which theologically as part of their religious-cultural life, and (3) philologically, Darmawarsa text is a documentation of agricultural tradition of the past in dealing with environmental (ecological) problems by including local wisdom.

Keywords: Darmawarsa, rain summoning mantra, Gaga rice cultivation, Merapi-Merbabu manuscript tradition, old Javanese.

1. Introduction

Many old manuscripts are stored in various places, such as libraries, museums, and also palaces. This happened because a palace in its culture also created and developed its own written tradition which made it a scriptorium. In addition to the palace, a place that is also suspected of being a scriptorium is a Mandala in the mountains, which is usually associated with ongoing religious activities.

Mandala, often referred to as kadewaguruan, is a religious housing complex that is built in places far from the crowds and is usually in the form of a village in the middle of the forest. I Made Suparta [1] in his dissertation mentioned the development of the sastra-ajar environment in the 16th century on Mount Damalung, which was also supported by Pigeaud's statement [2] that the location of the sastra-ajar had been known since Majapahit times. Sastra-ajar refers to teaching or training activities related to the concept of Kadewaguruan which differs students in stages based on their level of knowledge [1]. Mount Damalung is another name for Mount Merbabu, which at that time was used as a place of religious learning for priests and wiku. Not surprisingly, many ancient manuscripts were found around Mount Merapi-Merbabu, because besides being a place of religious learning, Mount Merapi-Merbabu also became a center of literacy to write down their teachings and knowledge.

Located as the center of Old Javanese literacy, the Merapi-Merbabu's sastra-ajar environment also produces various old manuscripts which are currently known as the Merapi-Merbabu (hereinafter abbreviated as MM) Tradition Manuscript. In 1852, the Bataviaasch Genootschap succeeded in...
acquiring ± 400 manuscripts from ± 1000 manuscripts belonging to a Buddhist priest who estranged himself after the influence of Islam in Java named Kyai Windusana, on the western slope of Mount Merbabu, precisely in the village of Kedakan, Resident of Kedu [3,4].

Texts with a type of mantra are found in the traditional text of Merapi-Merbabu. Widyaningrum [5], stated that most types of manuscript collections are mantras and marks related to their lives and human's essence in life. One of the texts relating to the use of mantras in human life is the Darmawarsa text (PNRI 12 L 329). In its description, this text contains stories about the origin of the gods and their duties in nature, besides that it also says that the text contains the mantra of bringing and stopping rain along with several decorative marks [6].

Darmawarsa (hereinafter abbreviated as DW) text is a tutur text, which is meant by tutur literature is a book that contains religious teachings (dogma) of Hinduism or Buddhism and related matters such as rituals or ceremonies. The meaning of the word tutur is 'lesson' or 'tradition' which is verbally passed from teacher to student [7]. The ritual aspect of this text is a ritual in summoning rain using a mantra. This mantra is widely developed in the text of the Merapi-Merbabu scriptorium.

DW is one of the mantra texts of the tutur genre. Etymologically, Darmawarsa comes from the Javanese language, namely the word dharma which means obligation and virtue, while warsa means rain and year [8]. So that if translated can mean the year of virtue. Then, the word dharma is also found in Old Javanese which has a broader meaning, including, virtue, kindness, rules of life and behavior, the law of truth [9] and warsa which means the same as those mentioned previously.

Regarding the description of the contents of the text in the catalog, as well as the etymological explanation above, it can be assumed that the DW text contains mythology, found in the lifes of the community of Merapi-Merbabu at that time. Mythology is a story or legend that develops in society, which is believed to have meaning in it and is considered important because it contains cultural information and knowledge. In its purpose, mythology in Java usually uses supernatural figures such as Batara Guru, Batari Gangga, and Batari Uma, as mentioned in the text.

In the DW text, the information contained are some mantras used to summon and stop the rain. This is interesting, because the nature of the mantra is not usually written in the text. Rather it is pronounced or transferred through the teacher to the student by whisper [10]. The author can reach the conclusion that the DW text is a tutur genre because the writing indicates that this mantra is used as a teaching material that is derived or preserved. Then, a suspected indication is: the mantra writing in the DW text was motivated by the ecological problems that occurred around the Mandala at that time. And text writing is expected to be an effort to transfer the knowledge from teacher to student so that it can continue to be transferred in the hope that ecological problems can be overcome.

Based on the explanation above, it is known that mandala is the place to live for clerics. This is directly related to the way they fulfill their needs, especially in foods that are still dependent on the surrounding environment. Heri Purwanto [11] in his archaeological research on Sukuh temple relief said, that religious people who live on the mountain slopes or mandalas are mostly farmers. The types of plants that were planted at that time were also types of plants that did not require much water so they could be harvested, such as coconut, eggplant, areca nut, jackfruit, mango, and rice in the form of gaga rice. Purwanto also suspected that in the past, rice was planted on the lower slopes of religious settlements and when harvested it was taken to their settlement in the mandala.

If examined further, there are two assumptions that might explain the existence of a rain summoning and rain stopping mantra. First, rain is an important aspect for the survival of the community in their living environment. In this case, rain can help them to irrigate rice crops of the gaga rice plants that they plant, so that their source of daily needs can be fulfilled. This is also inferred by the emergence of Old Javanese vocabulary of gaga which means rice fields without irrigation, rice grows on moor [9]. Gaga Rice or Gogo rice is an annual crop. This variety is planted only in the wet monsoon season and in low rainfall areas. Gaga rice is also of high yield, resistant to major diseases, early maturity so that it is suitable to be developed in certain planting patterns, and the taste of this rice is delicious with relatively high protein [12]. Second, besides being a practical function for maintaining plants, this mantra may also be used to complete rituals that does not require rain.
What happened in the DW text, is that the mantra was finally revealed through the written tradition in sastra-ajar. Therefore, this study makes the Darmawarsa text an object of study because the spells contained in the text contain traditional knowledge and spiritual knowledge of the Merapi-Merbabu community. Traditional knowledge in the form of ways or efforts made by the people of the past in overcoming the natural phenomena that occurred around them by combining the spiritual side through the creation of mythology. With that being said, this paper will try to explore further regarding the efforts made by the community in dealing with ecological problems with the creation of spells contained in the DW text.

2. Related works

Several studies that present the results of research with the object of Merapi-Merbabu manuscript research are now quite popular, added after the publication of the 2002 National Library of the Republic of Indonesia Manuscripts Catalog. Thesis, dissertations, and scientific articles published in various sources.

In the span of ± 1800 until the beginning of 2000, only a few researchers presented the results of research on the traditional text of Merapi-Merbabu. Willem van der Molen, who in 1983 opened the exploration of this traditional text through his research [13]. In his research, van der Molen revealed broadly and deeply about the development of critical criticism of Javanese texts according to their chronology, and placed the importance of textual data by presenting parallel diplomatic editions [1]. Next is I Kuntara Wiryamartana [14] which reveals the existence of one other important link in the transition from Old Javanese literature to New Javanese literature, namely the traditional texts of Merapi-Merbabu [15].

The first publication which then discusses the traditional text of Merapi-Merbabu is a scientific article entitled "The Scriptoria in Merbabu Merapi Area" by Wiryamartana (1993). Seven years later, a scientific article entitled "The Merapi Merbabu Manuscript: A Neglected Collection" written by two experts on the tradition of Merapi Merbabu, namely Willem van der Molen and Wiryamartana [4] was published. Then following the publication of the Merapi Merbabu Manuscripts Catalog of the National Library of the Republic of Indonesia [6] which became the gateway to enlightenment towards further research.

Until now, there have been several studies that have examined the contents of the Merapi-Merbabu tradition. Kartika Setyawati examined Kidung Surajaya [16], and written the mantra text generally in MM Tradition Manuscript [10]. I Made Suparta [1] regarding the Old Javanese eschatological concept for her dissertation through the text of Putru Kalepasan, then Agung Kriswanto with two published titles, Gita Sinangsaya: Text and Translation Edition [17] and Bismaprawa : Old Javanese Prose Text from the Merapi-Merbabu Tradition Source from Adiparwa [18]. In future studies will continue to develop, along with the increasingly diverse references obtained, such as references to literacy and intertextuality. There’s also Kartika Widyaningrum [5] who used lontar number 104 that contains mantra for asking the protection and strength by God. Last is, Andreanto which used lontar number 31 as his object, contains mantra for traditional medication.

A discussion of the mythology contained in the text, namely the story of the journey of the Ptejala who was awarded by the Batara Guru and the origin of the creation of the earth and its contents are represented by Hindu deities, as well as the story in Cosmogony and Creation in Balinese Tradition written by Hooykas [19].

From the description above, the research that discusses mantra text is done by Kartika Setyawati [10], Kartika Widyaningrum [5], and Andreanto [15] which each of them addressed a different topic of the mantra. Besides that, the DW text in the Merapi-Merbabu Traditional Manuscript, along with the mantra contained in the text, as far as is known has never been carried out and discussed scientifically by academics both abroad and within the country. So, it can be said that this research is considered as a renewal in revealing traditional knowledge and mythology in the treasures of the Merapi-Merbabu writing tradition.
3. Materials and methodology

Philology is the knowledge of literature in a broad sense, covering the fields of language, literature, and culture [20]. Etymologically, Philology comes from the Greek word Philos which means 'love' and Logos which means 'word'. Both words form the meaning of 'fond of word' or 'fond of speaking'. This meaning then develops into 'fond of learning', 'fond of science', and 'fond of literature', or 'fond of culture' [20]. In a more specific sense, Pollock states that philology is a discipline of understanding the text that is different from the science of language-linguistics or the science of meanings and truth-philosophy [21].

The objects of philological studies are texts and manuscripts. Text is the content of a manuscript, an abstract nature that can only be imagined [22]. Text consists of content and form. The content contains ideas or messages that the author wishes to convey to the reader. The form contains the story or lesson to be read or learned according to various approaches through its elements [23].

This research focuses on the old manuscript containing DW text. DW manuscript used as research data is a group of MM manuscript collection of Perpustakaan Nasional Republik Indonesia (hereinafter abbreviated as PNRI) number L 329. The collection of MM traditional manuscripts is unique because the manuscript was written on lontar leaves (Borassus flabellifer) and written in the Budhha script, as well as known with a mountain script. This Budhha script is a unique character because it has a different form with the Javanese or Balinese script [24].

“The form of the Buddha script is more similar to the script used in Java in pre-Islamic period. The naming of the Buddha script refers to the religious teachings contained in these texts which generally contain pre-Islamic religious teachings”[2].

Although most manuscripts are written in Buddha script, there are still variations which were based on differences in writing time, regional differences, and differences in handwriting style [24].

Research conducted on the DW text fully follows the steps of philological work. Steps in philological work are: manuscript inventory, manuscript description, source grouping and comparison, and transliteration [25]. In the phase of manuscript inventory, the Javanese manuscript catalogues, in particular the MM texts compiled by Behrend [26] and Setyawati, Wiramartana, & van der Molen [6] are examined carefully. As a result, one manuscript was found containing DW prose text in Old Javanese language. Therefore, the author decided to make a textual edition of this text using diplomatic edition method.

The diplomatic edition is the publication of one text as thoroughly as possible without any change [20]. In its most perfect form, this edition also includes a photographic reproduction of the source text (facsimile) [25]. However, this can not be done on the DW manuscript because the form of photographic reproduction is not yet available in PNRI. Therefore, the diplomatic edition of DW text will be presented in transliteration as applied in Van der Molen [13] Kuṇjarakarnā prose text and Wiramartana [14] Kakawin Arjunawiwāha text.

The next step is transliteration. Transliteration is the replacement of the type of script by following the guidelines relating to the division of words, spelling, and punctuation [22]. Transliteration by Van der Molen [13] and Wiramartana [14] takes into account the comparison of Javanese letters and the ideal Latin transliteration, namely 1:1 correspondence. Therefore, the use of special signs can not be avoided to distinguish each of the transliterated letters.

4. Results and discussion

Lontar Darmawarsa (L329) is currently stored in the National Library of the Republic of Indonesia with a description of the Primbon title contained in the manuscript storage box. Lontar DW has a microfilm roller number of 355/13 and is written on 19 palm leaves (Borassus flabellifer). Palm leaf is a material commonly used in Java as a writing medium besides nipah and dluwang at that time, because the tree is still commonly found [13]. The writing of the manuscript is still intact and quite good, because it is still golden brown so the writing is still visible and clear. This slab has an average size of 30 x 4 cm which is perforated on the middle side, to insert thread strings. This string of strings serves as a slab collector so it doesn't scatter. Like lontar in general, DW lontar is written using a
screw which is scratched onto the palm leaf, then smeared with black candlenut oil \((tingkiah)\) [27]. On each plate there are three holes, each on the left side in 1.2 cm hole, the middle side along 1 cm, and the right side in 1.4 cm hole.

The DW text is written with the recto verso system. Writing starts with the first throw of the version. A blank page is found on the first recto and the 19th verso. The beginning of the text is written from the left margo to the right margo, then proceed to the next line as many as four lines. Writing is paused in the middle margo because the center of the plate is used as a thread hole, so the plate looks like it is written in two columns. The length of the right text block, on average, measures 12.8 cm, while the left text block measures 11 cm. Then for the non-writable part or middle margo measuring 2.2 cm. Each letter is written with a page numbering located on part of the lower left side of the verso. This prose text is written in Buddha script and Old Javanese language which contain mantras and mythology. Illustrations in the form of marks are found on several plates, such as 11 verso, 12 recto verso, 13 recto verso, and 19 recto. Each mark has a picture of fish, a human face, creatures, puppet characters, and symbols of sacred characters.

Before entering the discussion on the contents of the text, it is necessary to explain in advance the characteristics of upland rice and its relation to the lifes of the Merapi-Merbabu community. The links include 1) geographical conditions, 2) climatic conditions, and 3) socio-cultural conditions. Gaga rice (or upland rice) is not planted in rice fields as it is in general. To verify, gaga rice and field rice are two different vegetations. Siregar (1981) states that upland rice and field rice have one similarity, which is equally planted on land. The difference lies in the land that is used for planting, where field rice is planted indeterminate on former forest land or shrubs, while upland rice is planted on permanent land [28]. Then, Prihatman [29] emphasized that rice can be divided into paddy rice and upland rice. Rice paddy is usually planted in lowland areas that require flooding, while upland rice is planted in highlands on dry land. There are no morphological and biological differences between paddy rice and upland rice, the only difference being the growth place [30].

In its growth, gaga rice needs water as long as its growth and water needs rely solely on rainfall. Plants can grow in areas ranging from low land to high land. It grows in tropical / subtropical regions in 450 North Latitudes to 450 South Latitudes with hot weather and high humidity with a 4 months rainy season. The average rainfall is 200 mm / month for 3 consecutive months or 1500-2000 mm / year. Rice can be planted in the dry or rainy season. In the dry season production increases as long as irrigation water is always available. In the rainy season, although abundant water production can decrease due to less intensive pollination. In the lowlands rice requires an altitude of 0-650 m above sea level with temperatures of 22-27 degrees Celsius while in the highlands 650-1,500 m above sea level with temperatures of 19-23 degrees Celsius. Rice plants require full sun shade or without shade. In Indonesia the length of solar radiation is 12 hours a day with a radiation intensity of 350 cal / cm2 / day in the rainy season. The radiation intensity is relatively low when compared to sub-tropical regions which can reach 550 cal / cm2 / day. Wind has an effect on pollination and fertilization but if too tight it will knock down plants [30].

Gaga rice can grow on various types of soil, soil type does not significantly affect the growth and yield of upland rice. While the more influential on growth and yield are physical, chemical and biological properties of the soil or in other words fertility. For good plant growth, it is necessary to balance the composition of the soil, namely 45% of the mineral, 5% of the organic matter, 25% of the water, and 25% of the air, in the soil layer of 0 - 30 cm [30].

The soil structure suitable for upland rice plants is a crumbly soil structure. Suitable land varies from the pliable, fine dust, smooth clay to rough soil and the available water is needed quite a lot. The soil should not be rocky, if there must be 50%. The acidity (pH) of the soil varies from 5.5 to 8.0. At lower soil pH, generally found a breakdown of P elements, Fe and Al poisoning. whereas if the pH is greater than 8.0 it can experience Zn strength [30].

Basically, in plant cultivation, plant growth and development is strongly influenced by genetic factors and environmental factors. The most important environmental factors are soil and climate and the interaction of these two factors. Upland rice plants can grow on various agroecology and soil
types. There is land that needs little tillage or even no need for tillage. Perfect soil management is detrimental, because besides increasing costs it also causes the soil to be more sensitive to erosion so that its fertility decreases. Similarly rice yields obtained between perfect tillage systems and minimum soil are not significantly different, so minimum tillage systems are more economical [30].

If it is to be matched with the climatic and geographical conditions of the Merapi-Merbabu mountains, it will be found that the compatibility of the descriptions mentioned in the previous paragraphs on the characteristics of gaga rice. As released by the website of Mount Merapi National Park, climatologically, the presence of Mount Merapi is in the tropical monsoon climate, which is characterized by high intensity rainfall in the rainy season (November-April) which then changes to dry months (April-October). Annual rainfall ranges from 2500-3000 mm. The variation of rain along the slopes of Mount Merapi is influenced by orographic rain. Like other tropical monsoon regions, variations in temperature and humidity are basically not striking. Temperatures range from 20-33 °C and air humidity varies between 80% - 99% [31].

This area is a type of Regosol land and dominates the Mount Merapi area. With the still active Mount Merapi, the volcanic material is the main material in the region. Thus, the land is a young land because it has not experienced a profile development. The land in this area is characterized by gray to blackish with a rustic texture. The soil structure has not been formed so that it is still a granular structure. With this structure, the ability to absorb water is quite high, but the organic matter is relatively low. Soil acidity is generally neutral [31].

As for DW text, rain summoning mantras were found as their way to care for their fields. As a plant that grows on rainfed land, gaga rice is not planted on wet soil which is drained by water. Gaga rice is planted on coarse granule (regosol) soil which is not in a water reservoir. However, this type of land is highly absorbent so that the growth of rice gaga is still normal. Besides mantras, The DW text also explains how the hydrological cycle works. For example,

... get water from the sea then collected into jet black clouds, it becomes rain which falls from the sky, words of Hyang Prtiwi, before the rain, firstly it will form clouds, then it will be lowered with the help of Bhatar Jaga. [32]

In the translation, it can be understood that knowledge of the modern hydrological cycle has been known since earlier times. Although the description in DW text still has a religious background, this still indicates the existence of local knowledge from the general concepts described.

Then, the contents of the rain summoning mantras in the DW text also explain what kind of water is showered and how good water can give grace to the universe. Next is the passage from the rain call spell,

... also bring down the rain there, give it to reward their contemplations, Brahma goes down, Vishnu, Isyara goes down, says with a slightly constricted forehead, showered the water is so big / rainy. [32]

In the process of summoning the rain, spells are only part of the ritual substituents performed. In addition to chanting the mantra, anyone who calls for rain is asked to prepare the equipment and services that are performed before chanting the mantra.

The process of summoning the rain is not expected to only run for one day. It can be said as such, because there is a series of individual worship rituals that need to be done beforehand. In addition, there are also ingredients that complement the rain-summoning ritual, however, the explanation of the sequence of ritual processes and their duration is not specifically explained in the DW text. The following are excerpts from DW text about rain summoning ritual processes.

That's how the world travels in making light in the sky, bringing down rain, thrilling Hyang Garanga. Bhatara Jaga is the name that gives its essence so that it becomes alive, then it is also issued by him the extraordinary miracle, which is capable of issuing rain, making the sound of thunder roaring. That is the gift given to him, and this servant the Prtajala invited the Guru to give grace to make it rain too. Sang Hyang Siwa ... our father is in space, there is not the slightest bit of servant thinking to go back there. That's how I should take care of the world, then there is also the one who gives the source of life, Bhatari Mahadewi, whose name
is guarding the spring named Batari Harsa Dewi, which is found in a shower called Batari Hasiluman, which makes a well named Dewi Batari. who guarded the lake named Batari Gangga Sdada, who guarded the river named Batari Lodraga Dewi also guarded the sea, which guarded at the top of the mountain named Batara Gaga Sungci, who was waiting for a land called Batari Durga. They all gathered to wait for the arrival of rain water, they also complained so that rain was immediately sent down, if the rain had come, one should make a rajah, yellow white caru tumpeng, grisung fish, so said Hyang Gana Warsa,

Giving Darmmawarsa, immediately do tapa, drink without sleep, be in the yard, in the mind of the Prtajala, crying while walking. One heard up to the river crying the Prtajala ... while preparing a yellow caru tumpeng and give rajah. You should make tattoo also in the form of flowers, pour it up while chanting. While heading north, east, south, west and also in the middle, that's what must be prepared when trying to ask for rain. So that it could bring as many as one head to request water from the sea. So that the clouds in the sky can soon gather little by little like buffalo dung in the forest. [32]

Individual worship rituals which served as requirements for summoning the rain includes doing tapa, drinking without sleeping, and being in the yard. In addition, before and during the rain, prepare a yellow white caru tumpeng and give rajah. You should make rajah also in the form of flowers, pour it up while chanting. While heading north, east, south, west and also in the middle, that's what must be prepared when trying to ask for rain. So that it could bring as many as one head to request water from the sea. so that the clouds in the sky can soon gather little by little like buffalo dung in the forest. Then, after the rain came, anyone who called the rain was asked to make a rajah, yellow white caru tumpeng, and grisung fish.

5. Conclusion
Thus, it can be seen that the summoning of rain is a form of 1) handling ecological problems, 2) actualization of relations with deities, and 3) actualization of local science. Handling ecological problems can be seen from the way people in the Merapi and Merabu communities face the famine or when they are entering the rainy season. The actualization of the relationship with the deities is manifested through individual offerings and worship before the summoning of rain, when it rains, and after the rain falls. The deities mentioned in the text DW are representations of the elements that exist in nature, such as rain itself, water, earth, clouds, and the direction of the wind. Then, the actualization of local knowledge is realized through explanations about the process of rainfall and equipment that needs to be prepared so that water from the sea gathers into rain clouds. Although this explanation is still motivated by religious teachings, the basic concepts of the hydrological cycle are similar to modern scientific concepts.

If it is seen in relation to the characteristics of gaga rice and the geographical conditions of Mount Merapi, there will be a match between the two. Both of these are also implicitly summarized in the contents of the DW text, that is, on the reason for the rite summoning ritual. Thus, the results of the research are: (1) Gaga rice cultivation can be done in rice fields in the land of the slope of mount Merapi and Merbabu, (2) the community has solved problems on the unstable of ecological conditions rain summoning spells which theologically as part of their religious-cultural life, and (3) philologically, DW problems with dealing with environmental (ecological) problems by including local wisdom.

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