

Año 36, 2020, Especial Nº /

Revista de Ciencias Humanas y Sociales ISSN 1012-1587/ ISSNe: 2477-9385 Depósito Legal pp 19840222045



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# Analysis on the Factors of Declining the Collection of Agricultural Zakat

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#### Abstract

In Malaysia, the agricultural produce that is required to pay zakat is in the form of staple food (gut al-balad) that is filling on a state. This meaning is used by most zakat institutions in Malaysia namely Kedah (State Zakat Board), Selangor (Selangor Zakat Board), Malacca (Melaka Zakat Center), Pahang (Pahang Zakat Collection Center) and others. In the Malaysian context it is understood that the staple food of the people is rice (paddy). Therefore, zakat on crops is compulsory on rice when certain conditions are fulfilled. Kedah is considered as the "rice bowl"(Jelapang Padi) of Malaysia, accounting for about half of Malaysia's total production of rice. Base on the statement, Kedah should have a high collection of agricultural zakat. Recently, data shows that the collection of agricultural zakat among the farmers in Kedah is declining due to certain factors and issues. Using qualitative method, this article analyses the historical aspect, fatwas, legality and current implementation of agricultural zakat in Kedah. Further, using interview and documentation method, the study analyses the factors of declining the collection of agricultural zakat in Kedah.

**Keywords:** Agricultural zakat, Decline, Kedah, Zakat Collection

# Análisis sobre los factores de disminución de la colección de Zakat agrícola

#### Resumen

En Malasia, el producto agrícola que se requiere para pagar el zakat está en forma de alimento básico (qut al-balad) que se está llenando en un estado. Este significado es utilizado por la mavoría de las instituciones zakat en Malasia, a saber, Kedah (Junta Estatal de Zakat), Selangor (Junta Selangor Zakat), Malacca (Centro Melaka Zakat), Pahang (Centro de Colección Pahang Zakat) y otros. En el contexto de Malasia, se entiende que el alimento básico de las personas es el arroz (arroz). Por lo tanto, el zakat en los cultivos es obligatorio en el arroz cuando se cumplen ciertas condiciones. Kedah es considerado como el "cuenco de arroz" (Jelapang Padi) de Malasia, que representa aproximadamente la mitad de la producción total de arroz de Malasia. Basado en la declaración, Kedah debería tener una alta colección de zakat agrícola. Recientemente, los datos muestran que la recolección de zakat agrícola entre los agricultores de Kedah está disminuvendo debido a ciertos factores y problemas. Usando el método cualitativo, este artículo analiza el aspecto histórico, fatwas, legalidad y la implementación actual del zakat agrícola en Kedah. Además, utilizando el método de entrevista y documentación, el estudio analiza los factores de disminución de la recolección de zakat agrícola en Kedah.

Palabras clave: zakat agrícola, declive, Kedah, colección Zakat

#### **1. INTRODUCTION**

The state of Kedah is well known for paddy cultivation areas until it is known as the "rice bowl" (Jelapang Padi) of Malaysia, accounting for about half of Malaysia's total production of rice. The area managed by the Muda Agricultural Development Authority (MADA) is 130,282 hectares of which 100,685 hectares are paddy fields. The area of rice paddy covers two (2) states namely Kedah State (82,968 hectares) and State of Perlis (17,717 hectares). The area of rice paddy crop area represents 35.13% of the national rice paddy area (http://www.mada.gov.my/am, 28.04.2020). The graph below shows the paddy plant area under MADA.

| Areas under mada                 | Paddy plant areas under mada (hectar) |  |  |
|----------------------------------|---------------------------------------|--|--|
|                                  | Current paddy plant areas (mada)      |  |  |
| Region i (perlis)                | 20,073                                |  |  |
| Total area (perlis)              | 20,073                                |  |  |
| Region ii (jitra)                | 32,595                                |  |  |
| Region iii (pendang)             | 22,681                                |  |  |
| Region iv (kota sarang<br>semut) | 25,336                                |  |  |
| Total area (kedah)               | 80,612                                |  |  |
| Mada                             | 100,685                               |  |  |

Figure 1: Paddy Plant Area under MADA

Source: http://www.mada.gov.my/orang-awam/keluasan-tanaman-

padi/ 28.4.2020

Base on the information above, Kedah should have a high collection of agricultural zakat because of it large plant area of paddy fields. According to agricultural zakat collection statistic from 2008 to 2015, there has been an increase on each year but in 2012, zakat

collection reduced by RM1.1 million (Zainal et al., 2017). Agricultural zakat collection is smaller than the amount of other types of zakat in Malaysia. For example, although rice production in Kedah is the highest in Malaysia, its agricultural zakat collection accounts for only 3.8% of the total (Hasan & Mat Noh, 2015). Reports from the Lembaga Zakat Kedah (LZNK) also confirmed that they received only 1.045% of the total agricultural zakat (paddy) collection amounting to RM38 million per season, which involves two planting seasons (Berita Harian, May 23, 2016). For example, the agricultural zakat for the Yan district should be RM3.4 million for a total area of 10,025.25 hectares of rice, but the total rice zakat collection for 2012 is only RM907,000 and represents a significant difference from the actual collection target. The figure below shows the total amount of agricultural zakat collected for each district in the state of Kedah Darul Aman from 2014 to 2018.

|        | 2014      | 2015      | 2016      | 2017      | 2018      |
|--------|-----------|-----------|-----------|-----------|-----------|
| Kota   | 1,205,257 | 1,018,709 | 1,032,483 | 785,428.8 | 795,800.7 |
| Setar  | .46       | .77       | .94       | 5         | 1         |
| Kuban  | 1,381,096 | 1,257,912 | 1,382,014 | 1,161,008 | 955,487.5 |
| g Pasu | .65       | .10       | .47       | .30       | 0         |
|        | 1,159,481 | 1,062,243 | 1,155,991 | 984,502.6 | 787,366.3 |
| Yan    | .41       | .84       | .75       | 2         | 7         |
| Pendan | 441,116.0 | 359,864.1 | 427,073.0 | 330,156.4 | 360,381.7 |
| g      | 0         | 0         | 0         | 0         | 0         |
| Kuala  | 493,661.8 | 445,926.8 | 516,704.0 | 395,531.3 | 382,071.5 |

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| Muda    | 0         | 0         | 5         | 5         | 0         |
|---------|-----------|-----------|-----------|-----------|-----------|
| Kulim   | 74,828.70 | 62,876.90 | 74,489.00 | 68,106.20 | 43,678.70 |
| Langka  | 191,144.0 | 140,489.4 | 159,102.5 | 106,232.0 |           |
| wi      | 0         | 0         | 0         | 0         | 36,108.00 |
| Padang  | 121,284.9 | 112,686.1 | 119,209.4 | 102,563.6 |           |
| Terap   | 0         | 0         | 0         | 0         | 87,799.70 |
| Pokok   |           |           | 203,557.0 | 169,950.0 | 201,693.0 |
| Sena    | -         | 71,749.00 | 0         | 0         | 0         |
| Baling  | 22,005.00 | 19,167.00 | 17,175.00 | 13,050.00 | 10,565.00 |
| Sik     | 6,317.00  | 6,120.00  | 3,580.00  | 7,867.00  | 3,570.00  |
| Bandar  |           |           |           |           |           |
| Baharu  | 51,615.30 | 42,068.80 | 21,827.00 | 29,801.00 | 16,115.55 |
| Head    |           |           |           |           |           |
| Quarter |           |           |           |           |           |
| S       | 51,924.53 | 50,655.67 | 49,796.22 | 55,627.30 | 79,584.55 |
|         | 5,199,731 | 4,650,469 | 5,163,003 | 4,209,824 | 3,760,222 |
| Total   | .95       | .48       | .33       | .62       | .28       |

Figure2: Collection of agricultural zakat in each district of Kedah 2014-2018.

Source: Lembaga Zakat Negeri Kedah (LZNK) (2019)

The figure above shows the decline of agricultural zakat collection in most of the districts in Kedah which has contributed also to the decline of collection in the state level. Recent studies also indicate that the collection of agricultural zakat in Kedah is not in line with the size of its agricultural land (paddy fields). Total agricultural zakat collection in Kedah is accounts for 3.8% only of total zakat collection (Hasan & Mat Noh, 2015).

### 2. METHODOLOGY

Zakat has a special position not only in term of acts of worship but also in the economic side of Muslims. Al-Quran explains in specific the form of asset (al-mal) on which zakat is made compulsary namely gold and silver in surah al-Taubah 9: 34, the minerals and rikaz (treasure) in surah al-Baqarah 2: 276, income from business in surah al-Baqarah 2: 276 and crops and fruits in surah al-An`am 6: 141. Agriculture is one of the assets of which zakat is to be made obligatory in Islam and it serves as a wealth distribution mechanism collected from excess wealth in the Islamic economic system (Arip et al., 2012). The fuqaha' have unanimously agreed in determining the types of crops in which it is obligatory to impose agricultural zakat based on qat'ie (definitive) texts as well as on the 'illah (reason) that makes its obligatory for zakat to be imposed however, they differed in the aspect of its implementation (Al-Kasani, 2003).

Crops in which zakat is compulsory are grains from the types of staple food that are filling and resilient if stored for a considerable amount of time such as paddy or rice, dates, corn, wheat and so on. For Malaysians, their staple food is rice and rice is made from paddy. Thus the agricultural zakat that is suitable to be produced for Malaysia is zakat of paddy (Hanapi, 2014). According to Tarimin (1990), the definition of agricultural zakat is: "Spending part of the net income from the agricultural revenue that has been developed by the people in term of grains, fruits, and any crops that benefits the people, when all its conditions, pillars and 'illah for zakah has been met". Agricultural zakat is also known as al-'usyr, zakat al-zuru' wa al-thimar, or zakat al-mu'asyirat (Al-Qaradawi, 1994).

In Malaysia, only paddy plantation is obligated to pay zakat because the Muslims in Malaysia follow mazhab al-Syafi'i in jurisprupence. According to mazhab al-Syafi'i, agricultural zakat is only required to crops that are the staple food crop of a place which can be dried and resilient. Therefore, paddy is subject to zakat based on the 'illah that it is a staple food in Malaysia as well as resilient when kept within a considerable period of time (Hanapi, 2014). The method of assessment of agricultural (paddy) zakat practiced in Malaysia today is 1/20 or 5 % if it is harvested by means of human energy, animal and machinery or incurs a lot of costs. The zakat rate is 1/10 or 10 % if it is harvested relying on rain water only. If a crop is dependent on these two methods, that is, sometimes using natural resources and at times using humans, animals or tools (because water from natural sources is not adequate), then zakat is imposed at a rate of 7.5% which is in the middle between the two previously mentioned rate (Al-Bujayrimi, 1996). Ibn Qudamah (1997) also agrees to this ruling in his book al-Mughni.

Agricultural zakat becomes obligatory when the production of the crops reaches the nisab and hawl, which is five awsuq. The calculation of the nisab at five awsuq is for crops that have been cleared of the skin (skin removed or hay), soil and dust that stick as well as dried fruits based on the normal drying rate. There are differences in defining the nisab rate for crops/paddy (5 awsuq) between states in Malaysia (Ali, 2013). Further, human beings instead of growing on their own must plant the yield of the crop. However, for agricultural zakat there is no stipulations as to the hawl (timeframe - due within a year), but zakat should be paid once the crops is harvested as mentioned in surah al-An'am (6:141).

### 3. RESULT

The legality of zakat management in Kedah is subject to the existing zakat rules which was implemented a years ago. According to the historical records, Kedah is the oldest state in Malaysia to have a legal system of zakat management. According to some sources, zakat law in Kedah has been written since the last 3 centuries. In 1667 AD, the 15th Sultan of Kedah, Mukarram Shah 1 ordered Dato Seri Paduka Tuan together with Sheikh Alauddin and all the scholars to write a law of the State of Kedah. This law was written for the purpose of reference of the State Commander, Kweng (Head / Village Head) and Sambang (Spy) in carrying out the task of administering the state. This law has played an important role in coordinate the regulation of zakat administration in Kedah (Othman, 2019). Based on the original text from clause 3, Tembera Seri Paduka Tuan, the Sultan of Kedah at that

time fully utilized the powers of the ulil amri (ruler of the state) to order the people of Kedah to pay zakat. If they refuse, the authority is given to the ruler (kweng) to take decisive action against them for the purpose of educating others.

Apart from the record of Tembera Seri Paduka Tuan (1667M), there was also a version of the Kedah Zakat Law of Ku Din Ku Meh, which was written in 1625-1651 AD during the reign of Sultan Rijaluddin Muhammad Shah (the 13 sultans of Kedah) who ruled Kedah from, 1625-1651. There are specific laws regarding agricultural zakat detailed in the Kedah Zakat Law of the Version of Ku Din Ku Meh (Othman, 2019).

This legal structure is being extended to administer the zakat of Kedah. In context of modern law, Kedah has a special set of laws called as the Kedah Zakat Enactment 1955 which established a zakat committee to administer zakat. The Kedah State Legislative Assembly formulated the enactment before being approved by the Sultan of Kedah to be gazetted as an enactment (Yaqin, 2007). Several amendments were made through this enactment in 1962 and 1982. It was the only zakat-related enactment that went into effect till Independence Day of Malaysia until it was replaced with the Kedah Darul Aman Zakat Board Enactment 2015. This new enactment was passed at the Kedah Darul Aman State Legislative Assembly in August 20, 2015 equivalent to 5 Dzulkaedah 1436H and published in the Government Gazette on December 3, 2015 (Badarulzaman et al., 2017).

From the statement above, it is very clear that Kedah for a long time already had laws regarding with agricultural zakat, which was recorded since 350 years ago. Logically, the existence of this particular law would have a positive impact on the agricultural zakat payment process and thus increase the LZNK's zakat collection.

In Malaysia, all laws relating to the administration of fatwa are enacted by the state government. It includes the appointment of mufti, the establishment of the Mufti Department and the discussion to issue a fatwa. All of us aware that our country adheres to the mazhab Shafie in matters relating to Islamic jurisprudence, including zakat. Therefore, according to mazhab Shafie, the agricultural zakat is calculated on the basis of gross income without deducting the costs associated with paddy cultivation. On the other hand, the view in mazhab Hanafi allows for the deduction of costs and expenses in cultivating rice in the calculation of agricultural zakat.

In Kedah, there are two fatwas issued on zakat of crops (paddy). The first fatwa mentions that the zakat rate of crops (paddy) is 10 percent while the second fatwa clarifies the zakat rates are 5 percent, 7.5 percent and 10 percent based on the method of irrigation and energy used, either through natural irrigation or using machinery or human energy (Collection of Fatwas (1), Kedah Darul Aman, n.d). In addition, there is another ruling by the Kedah Mufti Department regarding the deduction of the costs of paddy plantation which include the cost of input materials namely the costs of fertilizers, pesticides, seedlings and others, also that the costs of labour double with the use of modern machinery, the harvesting, fertilizing and so on (Zakariya,

2013). This fatwa take into account the condition of farmers who are categorized under low-income people. If the farmers maintain their paddy zakat collection base on mazhab Shafi'is view (imposing zakat on gross income without deduction of expenses and cost of producing crops) it would be a heavy burden on the farmers (Collection of Fatwas (2), Kedah Darul Aman, n.d). The application of this method of calculation which is based on mazhab Hanafi will encourage farmers to pay zakat for their crops. It is not intended to free farmers from the obligation to pay zakat, but as a stimulus to obey the obligation because the zakat rate is based on the net income of their production.

As mention in clause 13, Section 9, of the Kedah Zakat Law the minimum threshold (nisab) of agricultural zakat in Kedah is 1300.449 kg. In the current practice, there are two methods of calculation of agricultural zakat yield; sack method and bulk method. Based on the sack method, the calculation of paddy zakat is on the basis of the yield of every ten sacks of paddy to be issued a zakat of one sack (one tenth of a rice) (1/10 or 10%). Otherwise, the method of calculating agricultural zakat according to the bulk method is to know the nisab of zakat first after it was sold. The total revenue generated will be calculated by deducting 1/10 or 10% of the total sale of paddy (Azhar & Hussain, 2017). The bulk method is practiced by the majority of farmers in Kedah. In addition, the farmers who cultivate the paddy fields twice a year, then zakat is obligated if they reach the minimum threshold (nisab) for each harvest season that is 1300.449 kg.

As mentioned earlier, Kedah is the "rice bowl" of Malaysia with accounting for about half of Malaysia's total production of rice. Base on the statement, Kedah should have a high collection of agricultural zakat. Recently, data shows that the collection of agricultural zakat among the farmers in Kedah is declining due to certain factors and issues. The researchers conducted a research in four major districts of paddy plantation and production in Kedah namely Kota Setar, Kubang Pasu, Yan and Langkawi Island. The study includes officers in charge of zakat collection in each district and also the farmers in that particular districts. The research utilized interview as a method of data collection. The findings of the study on factors that lead to the decline of agricultural zakat in Kedah are:

Based on the interviews with the respondents especially farmers, they are more likely to pay their agricultural zakat directly to asnaf (receiver of zakat) as well as to certain parties without having to go through official channels (amil of LZNK). However, there are some farmers who pay their zakat of paddy directly to LZNK amil (official zakat collector), but the amount is less than those who pay directly to asnaf. The researcher found that the self-distribution of zakat was the most influential factor in the decline of agricultural zakat collection of LZNK. From the interviews held, researchers summarize the following methods adopted by farmers in paying their agricultural zakat.

i. Paying the agricultural zakat directly to the asnaf (fuqara and masakin) who stay in the same village with the farmers. This method is based on the tradition (uruf) of the farmers in that particular area.

ii. Paying the agricultural zakat directly to asnaf and the rest is to be given to the LZNK official zakat collector (amil). For example, the amount of sufficient agricultural zakat during the season is RM700, then RM200 is to be paid to the LZNK fund and the rest is to the asnaf (fuqara and masakin) in the area (RM700).

iii. Paying agricultural zakat to official amil of LZNK if the amil is actively collecting zakat (doing his job) in the area OR paying zakat directly to the asnaf in their areas if there is no amil collecting zakat of paddy/rice in the area.

Based on the above interview's results and methods of payment of agricultural zakat in Kedah, the researchers concluded that the farmers in Kedah are more likely to pay their agricultural zakat directly to the asnaf (especially fuqara and masakin) as they were satisfied and confident that the zakat was distributed to the appropriate parties. This point is considered as a major factor leading to the decline of agricultural zakat collection in Kedah.

The decline in agricultural zakat payment among Kedah farmers is also due to the lack of awareness on zakat obligation. Some farmers consider that knowledge of zakat is not important to them. In addition, some farmers are aware of zakat obligations but still refuse to pay zakat. They do not obey Allah's command to pay zakat as it is an obligation stated in the Quran and Sunnah. The lack of awareness among farmers on the obligation of zakat on their crops contributes to the decline of rice zakat collection in Kedah.

Based on the interviews conducted with zakat officers and farmers, it can be concluded that this lack of awareness refers to four situations:

i. Knowledge of zakat and its payment is not considered as vital and important. This issue is particularly prevalent among the young farmers.

ii. Understanding the obligation of zakat, but refuse to pay agricultural zakat. Most of them only understand zakat in the context of zakat fitrah only.

iii. The awareness campaign of paying agricultural zakat to the LZNK official amil is not comprehensive up to the whole farmers because it is held only in certain mosques.

iv. The farmers who are totally do not know and not aware the obligation to pay agricultural zakat, thus lead them not to obey this obligation (minority).

The issue of lack of awareness of agricultural zakat among the farmers contributes to the decline and deterioration of the agricultural zakat collection to LZNK. Awareness can motivate a person to do something voluntarily. Therefore, the researchers opine that there is a need for LZNK to further enhance the farmer's understanding and preaching about agricultural zakat obligations through a broader channels which directly involved with farmers such as Muda Agricultural Development Authority (MADA), District Farmer's Organisation (PPK) and others.

Based on the interviews conducted, the respondents relate their answers with the low production of crop yields and other factors which also lead to the deterioration of agricultural zakat collection. In calculating and determining the eligibility to pay agricultural zakat, the yield of paddy plantation during harvest season is one of the elements taken into account to determine whether the farmers are required to pay zakat or not. The crop yields and productions are generally influenced by certain factors such as weathers, fertilizers used, diseases of rice crops, natural disasters and so on. The aforementioned factors contribute to the shortage of paddy crops yield that will result to insufficient minimum threshold (nisab) of agricultural zakat (1300.449 kilograms paddy) to pay zakat.

In addition, the age factor of the farmers (old farmers) cause them to hire others to work in their paddy fields from beginning to the end. This involves costs that allow the deduction to be made from the yields of paddy production. It can indirectly reduce the amount of agricultural zakat imposed to the farmers which also contributes to the decline of agricultural zakat collection in Kedah. Furthermore, other costs of paddy cultivation such as the cost of seeds, fertilizer, pesticide, labour involved in cultivating, irrigation, harvesting, weeding, drying and many more are also deduced in the calculation of agricultural zakat base on method B as stated on the LZNK website (https://www.zakatkedah.com.my/zakat-padi/ 25.4.2020). The costs incurred by the farmers allow for the deduction to be made on the calculation of agricultural zakat.

# 4. CONCLUSION

Generally, as a rice bowl of Malaysia with a huge area of paddy fields, Kedah should get a high agricultural zakat collection each year. However, the data from LZNK shows the declining of agricultural zakat collection in almost all the districts and paddy fields areas in Kedah. Legally, Kedah has a complete set of laws regarding the administration of zakat since 350 years ago. The existence of this particular law would have a positive impact on the agricultural zakat payment process and thus increase the LZNK's zakat collection. The research found that there are some factors that lead to the deterioration of paddy zakat collection in Kedah Darul Aman. The interviews conducted by the researchers revealed that the factors like unofficial payment of zakat; lack of awareness among farmers; low production of crop (paddy); lack of knowledge about agricultural zakat; roles of amil and zakat's agents and additional factors (development and calculation method) contribute to the decline of agricultural zakat collection in Kedah. Some of the actions have been taken into consideration by LZNK to overcome the issues namely down to earth program to meet and discuss with the farmers, zakat preaching via Kedah FM, opening booths at agricultural markets, religious talk and forums about zakat and Jumaat sermons. It is hope that this kinds of initiatives reach the farmers and motivate them to pay zakat, hence can increase the collection of agricultural zakat in Kedah.

#### REFERENCES

Arip, M. A. S. M., Jais, S. M., Benu, A., Zakaria, M. S., Zahariman, N. H., & Ishak, N. (2012).

Construction, Validity and Reliability of the Inventory of Basic Religious Knowledge (IBRK). Asian Journal of Assessment in Teaching and Learning, 2, 86-94.

Azhar, A., & Hussain, M. A. (2017). Pengurusan Zakat Tanaman Padi. Sintok : Uum Press.

Al-Bujayrimiy, Sulayman Bin Muhammad Bin 'Umar Al-Syafi'Iy. (1996).

Al-Bujayrimiy 'Ala Al-Khatib (Syarh Al-Iqna'), Jld. 3. Beirut, Lubnan: Dar Al-Kutub Al-'Ilmiyyah.

Ali, N. (2013). Taksiran dan Aplikasi Zakat Padi di Malaysia. Tesis kedoktoran, Institut Pengajian Siswazah, Universiti Malaya. Kuala Lumpur.

Al-Kasani, Abu Bakr Bin Mas'ud (2003). Badai' Al-Shanai' Fi Tartib Syarai'. Beirut : Dar Al-Kutub Al-'Ilmiyah.

Al-Mawardi. (1999). al-Hawi al-Kabir. Beirut: Dar al-Kutub al-'Ilmiyah.

Al-Nawawi, Yahya Bin Syaraf. (N.D.). Al-Majmu' Syarh Al-Muhadhdhab. Jeddah: Maktabah Al-Irshad.

Al-Qaradawi, Y. (1994). Fiqh al-Zakah Dirasah Muqaranah li Ahkamiha wa Falsafatiha fi Dhau' al-Qur'an wa al-Sunnah. Kaherah: Maktabah Wahbah.

Al-Sarakhsi, Syams Al-Din. (1978). Al-Mabsut. Beirut: Dar al-Ma'rifah.

Al-Syafi'i, Abu 'Abd Allah Muhammad Bin Idris (2001), al-Umm, j. 3. Mansurah: Dar al-Wafa' li al-





Año 36, N° 26, (2020)

Esta revista fue editada en formato digital por el personal de la Oficina de Publicaciones Científicas de la Facultad Experimental de Ciencias, Universidad del Zulia.

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