

Reconstructing the History of Jatropha Introduction and Commoditization in Indonesia

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Article history

Received : 2021-07-22

Accepted : 2022-03-24

Published : 2022-04-10

Keywords

Jatropha Curcas
Jarak pagar,
Castor,
Biofuel
History,
Indonesia.

Abstract: This article discusses the history of jatropha in Indonesia, an oil producing plant, which was praised globally as a miracle crop in the first decade of 2000s. After its recent global failure, scientists started to acknowledge the existing insufficient knowledge about this crop. While many current studies on jatropha are focusing on the agronomic, socio-economic and technical aspects of this plant, little effort has been dedicated to explore its historical aspect. This article will specifically contribute to address the absence of clear historical reconstruction of jatropha in Indonesia. The reconstruction is important to present the actual history of the past regarding the cultivation and the application of jatropha. This article addresses the following questions: Have the cultivation and application of jatropha curcas as biofuel been taken place since the Japanese administration period in Indonesia? If not, what was the actual history of biofuel crop cultivation and application at that period of time? How did the popular claims on jatropha history link to the creation of Jatropha hype? The answers of the questions are essential to understand why until today little experiences, knowledge and technologies are available on the ground for both jatropha cultivation and oil processing either at the farm level and industrial scale.

Abstrak: Artikel ini membahas tentang sejarah jarak pagar di Indonesia, tanaman penghasil minyak yang dipuji secara global sebagai tanaman ajaib pada dekade pertama tahun 2000-an. Setelah kegagalan global baru-baru ini, para ilmuwan mulai mengakui kurangnya pengetahuan yang ada tentang tanaman ini. Sementara banyak penelitian terkini tentang jarak yang berfokus pada aspek agronomi, sosial-ekonomi dan teknis tanaman ini, sedikit upaya telah didedikasikan untuk mengeksplorasi aspek sejarahnya. Artikel ini secara khusus akan memberikan kontribusi untuk menjawab tidak adanya rekonstruksi sejarah jarak pagar yang jelas di Indonesia. Rekonstruksi ini penting untuk menyajikan sejarah aktual masa lalu mengenai budidaya dan penerapan jarak pagar. Artikel ini menjawab pertanyaan-pertanyaan berikut: Apakah budidaya dan penerapan jarak pagar sebagai bahan bakar nabati sudah dilakukan sejak masa pemerintahan Jepang di Indonesia? Jika tidak, bagaimana sebenarnya sejarah budidaya dan aplikasi tanaman biofuel pada periode tersebut? Bagaimana klaim populer tentang sejarah jarak pagar terkait dengan penciptaan hype jarak pagar? Jawaban dari pertanyaan-pertanyaan tersebut sangat penting untuk memahami mengapa sampai saat ini hanya sedikit pengalaman, pengetahuan dan teknologi yang tersedia di lapangan baik untuk budidaya jarak pagar maupun pengolahan minyak baik di tingkat petani maupun skala industri.

Cite this article: Widjaja, H. (2022). Reconstructing the History of Jatropha Introduction and Commoditization in Indonesia. *Paramita: Historical Studies Journal*, 32(1), 57-66. <http://dx.doi.org/10.15294/paramita.v32i1.31277>



Available online at
<http://journal.unnes.ac.id/nju/index.php/paramita>

INTRODUCTION

Jatropha Curcas (*Jatropha Curcas L.*) is a perennial succulent shrub native to Central America. Jatropha has already existed in Indonesia since the period of settlement by the Dutch and Portugese (Heller 1996, Siang 2009). Throughout Indonesia, Jatropha curcas is widely distributed and consist of around 400 ecotypes. The rich

variety of *Jatropha curcas* in Indonesia is highly determined by the local environment condition, such as the climate and soil. Most of the local ecotypes are known for low in productivity and oil content (Jongschaap *et al.* 2007, USAID 2007).

In early 2000s, *Jatropha* received a global wide attention for its potential as a promising biofuel feedstock. Various claims were presented to justify the viability of *Jatropha*. It was introduced as a 'wonder crop' for the claim that it is a low maintenance crop suitable to most climatic and soil conditions with an ability to withstand drought and as a 'money tree' that can produce a constant stream of income. *Jatropha* was promoted as a biofuel feedstock option with critical advantages in comparison to the conventional biodiesel alternative, oil palm, for its inedible characteristic and ability to grow productively in marginal lands which address the risk of direct trade-off of 'food versus fuel' and land grabbing over productive agriculture lands (Hunsberger 2012). As a result of this global wide promotion, there were at least 242 *Jatropha* projects implemented globally in 2008 with a total coverage of approximately 900,000 hectares of lands. (GEXSI 2008).

In Indonesia, various *Jatropha* projects were initiated since 2001 and reached the peak in the period of 2006 to 2009 after the launch of the National Biofuels Development Blueprint in 2006 (Dillon *et al.* 2008). The 2008 GEXSI Report suggests that there were around 75,671 hectares that had been covered by the surveyed twelve *Jatropha* projects in Indonesia at that time. The report also provides a further projection that eight projects were planning to expand their area further up to 7,036,951 hectares in 2015 (GEXSI 2008: 150). These twelve projects were only a small part of the total number of *Jatropha* investment projects in Indonesia at that time, which were estimated around hundreds. They consist of investments and projects by various actors: governments, universities, state-owned enterprises, private sector, and NGOs; and cover projects from upstream to downstream: nurseries, plantations, oil productions, equipment and machineries (e.g. pressing machines and stoves), as well as the production of other *Jatropha* based products. However, despite the global enthusiasm on *Jatropha*, none of the projects either in Indonesia or globally shown a successful result both in the cultivation and biofuel production stages. The central explanation of this failure has been associated with the absence of viable markets and the unproven overwhelming agronomical claims on the potential productivity of *Jatropha*.

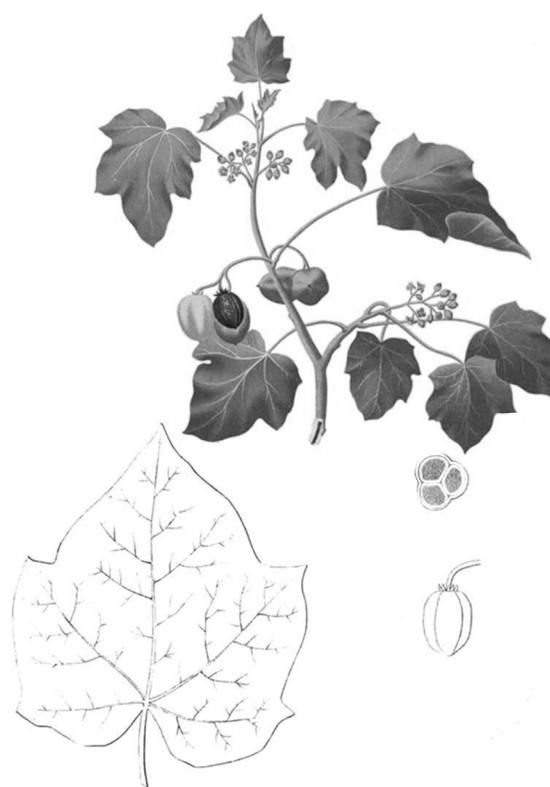


Figure 1. The sketch of *Jatropha Curcas* L.

(Source: http://upload.wikimedia.org/wikipedia/commons/7/79/Jatropha_curcas_Blanco2.384.png)

Furthermore, *Jatropha* is currently widely criticized for its adverse effects, especially on the agricultural and forestland conversion, land grabbing, competition with food crops and the impoverishment effects on farmers (Hunsberger 2012, Milieu Defensie 2012).

Only after the widespread of failure then scientists started to acknowledge openly that little has been known about this crop. For example, Hardman & Co, a corporate research institution that had intensively involved in the research and promotion of *Jatropha* investment, wrote in its 2012 report that apparently the plant at the center of this excitement was still a wild species that had been subjected to very little scientific research and development (Hawkins and Yinghen Chen 2012)

One of the less studied topics of *Jatropha* is its historical context. The disconnection from the historical context of the plant resembles a concern coined by Ronald D. Hill that the historical reconstruction of agriculture has rarely become an interest of the concerned parties. Hill argued that the fact agriculture is a multi-faceted activity has required a collaboration of various disciplines and sources in the reconstruction of its past (Hill 2004: 19).

While many literatures have included a sec-

tion of jatropha history, the given description was usually very brief and only limited to the discussion on the origin of jatropha without further effort to reconstruct its history prior the jatropha hype regarding its domestication and application as biofuel either globally or in the respective region or country (see for example, Gubitz *et al.* 1999, Heller 1996). Against this background, this article aims to present a comprehensive literature overview on the pre-hype history of jatropha in Indonesia in order to verify the existing claims on its cultivation and application.

The first intensive cultivation of jatropha in Indonesia is claimed to exist during the occupation of Japanese administration in 1942-1945 who was aiming to use jatropha oil as fuel for their military engines due to fuel shortage during the World War II. Some reports and journals, such as Koizumi (2011) wrote that jatropha curcas based biodiesel was developed by army related petroleum refiners for tank fuel and lamps. This claim or story line can be commonly found in a paragraph of the introduction section of many literatures on jatropha in Indonesia (see for examples: Hambali *et al.* 2006 Prihandana 2006 and Tim Jarak Pagar RNI 2006). Yet, little attention and effort was dedicated to verify this claim and to reconstruct the history of jatropha in Indonesia. This article will specifically contribute to address the absence of clear historical reconstruction of jatropha in Indonesia. This article addresses the following questions: Have the cultivation and application of jatropha curcas as biofuel been taken place since the Japanese administration period in Indonesia? If not, what was the actual history of biofuel crop cultivation and application at that period of time? How did the popular claims on jatropha history link to the creation of Jatropha hype? The answers of the questions are essential to understand why until today little experiences, knowledge and technologies are available on the ground for both jatropha cultivation and oil processing either at the farm level and industrial scale.

One main caveat in studying the history of jatropha is the common misidentification of jatropha as castor plant, either written or verbally, where both plants are commonly addressed using similar names: *jarak* and castor. It is noted that prior the jatropha hype in the first decade of 2000s, most literatures refer castor plant as *jarak*, and the two names were used interchangeably. Furthermore, in many places in Indonesia the two plants are addressed as *jarak* by the local people despite of their significant differences. Jatropha curcas and castor are both oil producing plants from the same



Figure 2. The sketch of Ricinus Communis L.

(Source: http://nl.wikipedia.org/wiki/Wonderolie#mediaviewer/Bestand:Ricinus_communis_-_K%C3%B6hler%E2%80%93s_Medizinal-Pflanzen-257.jpg)

family of *Euphorbiaceae* (the spurge family) and both are commonly grown as hedges. Jatropha is of the genus *Jatropha curcas* L. (or the Barbados or Physic nut) whereas castor plant is of the genus *Ricinus communis* L. (Jongschaap *et al.* 2007, USAID 2007). In terms of plant characteristic, jatropha is a perennial plant while castor is an annual plant. Historically, castor plant is more popular as oil producing plant and the oil has been traded for centuries and being used for lubricant oil and medicines.

The common misidentification of both castor and jatropha has served as a main challenge in investigating the history of jatropha based biofuel development in Indonesia. This for example can be seen in the interview of Robert Manurung, the leading Indonesian scientist on jatropha research with The JakartaPost on 6 August 2006. In the interview, Manurung stated that castor oil was used during the Japanese occupation. Yet, he was not clear whether the Japanese administration at that time used *Ricinus communis* or castor plant for lubricant oil production or they used as *Jatropha curcas* for fuel production. He argued that the unclarity was caused by the absence of written records either in

Indonesia or Japan about the type and quality of the oil and what it was used for (The JakartaPost 2006).

By referring to the common misidentification that creates misleading perceptions and claims on the history of jatropha, the discussion in this article will cover the presentation on the history of castor cultivation, trade and applications in Indonesia as an important part of the reconstruction.

METHOD

The applied methodology in the history reconstruction was focused on literature research over various available sources: books, journals, and internet sources on Japanese colonial period in Indonesia and Southeast Asia during the World War II regarding their alternative fuel policy, as well as sources that discuss or mention about jatropha and castor in even earlier period of Dutch colonial with specific keywords search of jatropha, *jarak*, *djarak*, castor and alternative fuel. The data and information gathered from these sources were compared with the contemporary sources on claim and statement on jatropha history to analyze both differences and similarities.

JARAK IN THE DUTCH COLONIAL PERIOD

One of the earliest written documentations on jatropha in the Dutch colonial time is a book entitled *Wenken en Raadgevingen Betreffende het Gebruik van Indische Planten, Vruchten etc.*, which was written by J.M.C. Kloppenburg-Versteegh in 1911. This is a recipe book as well as a plant atlas on indigenous medical herbs that were widely used by Indo-Europeans as well as Europeans in Java in the shortage of professional western health care. In this book, *jarak pagar* (written as *djarak pager*) was described by the author as a plant which was widely used in Java for hedges, and that the seeds, leaves and tree sap were used as rigorous laxative, and antiseptic (Kloppenburg-Versteegh 1978 as cited in Vel 2011).

There are not many explicit historical records on jatropha during the Dutch Colonial period. The available records, as mentioned above, suggest that jatropha was planted mostly to be used for traditional medicines. Yet, no records on its cultivation, trade and other applications. This is very different from the records on castor plant, which in many literatures is explicitly called as *jarak*. Literatures sourced from the colonial and contemporary publications on the economy and agriculture during the colonial time provide sufficient information on the cultivation, trade and applications of castor or *jarak*

in that period.

Since the Dutch period, castor has been traded for its oil. The oil was primarily used as engine lubricant and was also popularly used for both traditional and modern medicines (Heyne, 1917, Kloppenburg-Versteegh 1911). Liesbeth Hesselink in her book on Healers on the Colonial Market wrote that castor oil was a very popular medicine to be prescribed by the Dutch doctors in Indonesia (then was Dutch East Indies) and was widely accepted by the natives (Hesselink 2011). Aside from being used as lubricant and medicines, castor was also used as fertilizer material. A literature by Peter Boomgaard (1999) notes that castor cake that remained after pressing *jarak* (the castor-oil plant) for oil was used by farmers in Cirebon, West Java as an organic fertilizer material for their tobacco plants in 1834.

The economic value of castor as a cash crop had made this crop to become one of the cash crops recommended by the Dutch Agricultural Extension Service (*Landbouw voorlichtings dienst / LVD*) (Heersink 1995). Castor was commonly planted as a rotation crop. N. P. Van den Berg in his 1894 article on *China en Java* published in *De Economist* journal states that castor became an alternative rotation crop for Javanese farmers in the eighteenth century, aside from maize, taro and other annual crops, to be planted after paddy during the two years of fallow period (Van den Berg 1894).

In terms of trading, castor was already traded since the eighteenth century. Fernando (1996) wrote that the traders in Pekalongan were travelling to gather peanut, soy bean, tobacco, indigo, castor oil, textiles and batiks by bartering cotton, fish paste, leather, oil and coconut brought in from other areas. He also notes that in 1842 from Kediri alone 49 tons of castor was exported (ibid). Another literature by Peter Carey suggests that at that period of time, castor oil (*lisah jarak*) was a significant commodity for the local economy in Java and subject to colonial tax (Carey 1986).

Until the beginning of the nineteenth century, prior the Japanese occupation, the island of Java had exported castor with annual volume of 10,000 tons and 90 percent of the export was for Japanese market (Kurosawa 1993). In Japan, the oil extracted from the beans was used for lubricating airplanes, trains, automobiles, and precision machines (Post *et al.* 2010).

JARAK IN THE JAPANESE OCCUPATION PERIOD

The investigation of *jarak* stories in the Japanese

colonial period in Indonesia (1942- 1945) was very crucial since the contemporary narratives on *jarak* history were basing their historical claim on this period. The major claim that will be verified in this section is the claim that *jatropha curcas* (*jarak pagar*) was massively cultivated under the instruction of the Japanese military administration to address the diesel fuel shortage during the war period.

The verification on which oil producing crop that was officially instructed to be massively cultivated in Indonesia and its application in this article was sourced from the literatures on the Japanese occupation period in Indonesia and Southeast Asia. During their occupation period, the Japan military administration introduced and intensified the cultivation of new crops to address the shortage of food, fibers, and oil. Rice was the main food crop, cotton and jute were the main fibers, and coconut oil, palm oil, and castor oil were used as cooking oil, fuel, lubricant, and making soap and other products (Post *et al.* 2010: 256).

Because of the war, the Japan military administration decided to increase the production target of castor seeds from 10,000 tons up to 40,000 tons in 1943 and later on 60,000 tons in 1944, which was implemented through massive campaign and mobilization. The military administration issued several instructions, such as *Makloemat Keizabucho Semarang tentang Tanaman Jarak* in 1942 and *Kediri Shi Makloemat* in 1944 for the mobilization of people to cultivate *jarak*. Two Japanese companies: Takenokoshi Shoji and Senda Shokai were given authority to collect *jarak* seeds (Kurosawa 1993: 62).

To meet the target, on February 9, 1943 the large-scale compulsory planting of castor bean was begun (Post *et al.* 2010). The Japanese military administration gave orders for all grounds and wasteland to be planted with castor seeds. People, both in the rural and urban were mobilized and forced to cultivate castor. For instance, the *Kediri Shi Makloemat* in 1944 instructed the town dwellers to plant half of their home gardens with castor and another half with food crops (Kurosawa 1993). According to *Jawa Sangyō Sōkan* Vol. I, the production of tea at tea estates was almost abandoned, and the land was planted with castor plants together with hemp, ramie, acacia, and quinine. Coffee production was also cut by twenty-five percent and these lands were used for castor plants and cacao production. (Post *et al.* 2010: 289)

The Japanese utilized social organizations such as the *Tonarigumi* (neighborhood association), *Seinendan* (paramilitary organization), and



Figure 3. Japanese administration propaganda poster on castor cultivation (Source: Post *et al.* 2010: 246)

Fujinkai (wives association), to mobilize unpaid labor. Seeds were distributed with specific targets of land size to be planted by people in every area under the supervision of extension officers. The job planting the seeds on wasteland was given to schoolchildren (*Kinrōhōshi* or volunteer work by students), where each school was allocated its own piece of land and the one, which produced the most seeds won a prize.

School classes in Java, Sumatra, Bali and elsewhere were also made to perform unpaid menial work such as planting trees, cotton, castor beans and other crops or carrying rice to collection centers. In November 1944, some 200,000 people carried out *kinrōhōshi* (Post *et al.* 2010). How much castor oil this campaign yielded is unknown (De Jong 2002).

In rural areas, castor was cultivated in productive agriculture lands together with food crops. Castor was usually planted after the rice harvest in March mixed with the dry season crops. To meet the target, castor was also planted in many other places, such as along the roadsides, riverbanks and home gardens. The seeds were bought and collected by the appointed collectors and become an additional income source for farmers.

However, due to the shortage of supply, the military administration forbid people to use the seeds for their own needs (Kurosawa 1993). The Japanese totally ignored the need of the civilian population for paraffin needed for cooking and lighting which was very scarcely available since all fuels were only available for purposes allowed by the Japanese administration (De Jong 2002). Until the end of Japanese occupation in Indonesia, the administration data suggests that there was 1200 hectares of agriculture area planted with castor in

Table 1. The comparison of agricultural estates in Java (managed areas and production in tons) between 1940 and 1944.**Agricultural estates in Java, 1944**

	Managed areas (hectares)		Production (tons)		
	1940	1944	1940 result	1944 quota	1944 result
Rubber	240,956	226,171	99,059	38,255	24,330
Tea	104,967	48,781	62,712	7,754	1,523
Sugar	90,765	31,712	1,587,364	547,831	496,804
Coffee	83,081	65,000	32,974	24,467	12,748
Sisal	16,000	16,000	30,700	30,680	21,572
Cinchona	14,677	16,255	15,326	12,916	9,687
Cacao	6,425	6,650	1,544	1,169	756
Derris	3,820	3,820		493	240
Coca	383	380	141	140	85
Dalmatian pyrethrum	10	138			
Ramie		1,798		367	269
Castor beans		1,200		3,000	1,081
Food crops		47,000			

(Source: Post *et al.* 2010: 227)

Java by 1944, which produced 1081 tons of castor seeds from the expected quota of 3000 tons (Post *et al.* 2010).

The large-scale project to grow the castor plant and other non-edible crops had caused disastrous effects on the local economy in Java since it undermined food cultivation and neglect the cultivation of existing cash crops, such as tea, coffee, sugarcane and tobacco. The attempt to increase production of food, fibers, and oil proved self-defeating because these items competed with one another for land and labor (Post *et al.* 2010). This was late realized by the administration before they started a massive campaign to increase rice production in Java not only for their own consumption but also to address the economy crisis (Sato 2006).

The table 1 above shows a comparison table of agricultural estates in Java between 1940 and 1944 which was published in the *Economisch Weekblad voor Nederlandsch-Indie* (20 April 1946), p. 45. The data in the table were sourced from the statistics reported in the *Indisch Verslag 1941, Jawa Saibaikigyo no Gaikyū to 19 Nendo Jisseki* ” (Outline of the agricultural estates in Java and the results in 1944), and *Togyo Kodan Gyomu Hokoku* (Report from the Sugar Industry Corporation). From this table, it is learned that the total managed area of the estates decreased from 561,084 hectares in 1940 to 464,905 hectares in 1944 although some new crops were introduced. Food crops took up over ten percent of the estate land, apparently not including the sugar cane fields that were converted to wet rice fields. The aim of growing food crops on

the estates was to establish self-sufficiency in food within the estates, and the produce was to be consumed by the estate workers. Ramie was to supplement the shortage of clothing materials. Castor beans were for producing lubricant for airplanes, trains, automobiles and precision machines. However, as recorded in the history, the attempt to increase the production of food, fibers, and oil proved self-defeating because these items competed with one another for land and labor (Post *et al.* 2010: 227 and 294).

The life condition of Indonesians was worsening at that time after the Japanese administration imposed the forced labor (*romusha*) policy and also launched a campaign to deliver rice and other food materials to the government with certain quota to each village and followed by a restriction of trading and transporting of rice and other agricultural produce over administrative boundaries (Post *et al.* 2010). This period of time is extremely remembered in the Indonesian history for the hardships, especially for the stories on the slavery, crisis and starvation.

Another useful literature with complete reference on Japanese alternative fuel policy during the war is sourced from an article written by Francis K. Danquah on the state of the Philippines industrial crops in the World War II. In the article, Danquah specifically used the term castor for the oil plant, where he wrote that due to oil shortages, the Japan military administration decided to exploit the Philippines castor beans that grew wild along rivers, highways and railways throughout the is-

lands, and then later on also decided to cultivate the plant. The decision was driven by the claim at that time that castor oil was an adequate substitute for petroleum, as well as an excellent source of high-grade lubricant for machinery and aviation fuel. In order to attract farmers to plant castor, the Japanese administration distributed free castor seeds to farmers along with incentives of scarce commodities, such as soap, matches and cigarettes. This persuasive strategy was also accompanied with government instruction to each family to grow at least twenty five castor plants in their yards. Despite such enthusiastic efforts, the castor oil project failed to address the oil crisis due to low yield (Danquah 2005).

The description presented in Danquah's article is a useful reference in studying the alternative fuel policy by Japanese military in Indonesia at that time, especially regarding the exploitation strategy. There are similarities of story lines on the exploitation strategy on both voluntary and forced castor cultivations in Indonesia. After the Japanese occupation ended, farmers immediately abandoned their castor farms and shifted back to the food and cash crops cultivation. Yet, castor is continued to be grown in several places in Indonesia after the independence as an industrial crop.



Figure 5. Women and buckets of the harvested castor fruits with castor trees as the background (Source: *Marilah Menanam Djarak!* Book, circa 1943).

As an industrial crop, castor continues to receive attention from the Agriculture Department. For example, in 1968, The Industrial Crop Research Center (Lembaga Penelitian Tanaman Industri / LPTI) in Bogor issued a manual on castor cultivation, *Petundjuk untuk Bertanam: Pedoman Singkat Tjara Bertanam Djarak*. Until today, the domestic yields of castor are absorbed by various industries for the production of castor oil, vegetable oils and cosmetics.

WAS JATROPHA CULTIVATED DURING THE JAPANESE PERIOD IN INDONESIA?

Based on the literature review presented above on the historical records of Japanese alternative fuel policy in Indonesia and the other Southeast Asian countries, two important facts can be concluded against the question posted at the beginning of this article. Firstly, it is very clear that it was not *jatropha curcas* but castor plant (*ricinus communis* or *jarak kepyar*) that became the focus of the Japanese military administration. This can be concluded not only from the texts but also the visual archives – see **Figure 3** and **4** – showing castor trees (*ricinus communis*) in both pictures. Yet, in spite of this fact, by referring to folk stories on the existence of *jatropha curcas* and castor in their locations, it is believed that both plants were exploited to meet the targeted collection quotas. *Jatropha* seems to be cultivated in traditional way as hedges and many seeds were also collected from the existing wild trees.

It is important to note that in Indonesia, the concept of plants for hedges does not necessarily mean that they only function as hedges. Traditionally in rural Indonesia, hedges become the spot where the people grow traditional medicine plants (*tanaman obat keluarga*) as well as plants that can be used as fodder for their livestock, such as *lamtoro* (*Leucaena leucocephala*). Therefore, it is very likely that *jatropha* is planted not for its function as hedges but because of its traditional uses for medicine and fuel. It seems that *jatropha* is planted in small population in mix with other useful plants in the fence area. This also explains why *jatropha* in Indonesia is not planted as dense as it is planted elsewhere (such as in Africa, see the practice in Kenya in Hunsberger 2012) to function as hedges. The recent introduction of *jatropha* for hedges is suggested to have negative implication on the local practice. The Milieudedefensie (2012) based on their assessment on the impacts of *jatropha* cultivation on agriculture in Central Java argued that *jatropha* as hedges has replaced the fodder plants and forced



Figure 5. The application of legume trees as hedges in rural Indonesia (Source: Henky Widjaja).

women to spend longer time to collect fodder for their livestock.

Secondly, the studied literatures also clearly suggest that the exploited oil was used to address the scarcity of fossil-based lubricant and not as diesel fuel replacement. In terms of fossil fuels substitution during the war, it is suggested that the Japanese military administration was experimenting on the exploitation of a number of vegetable oil options, especially sugarcane, soybean, coconut (copra), castor and pili nut (*canarium ovatum*) (Danquah 2005, Knothe 2001, Kurosawa 1993).

From this list of options, however, by referring to the technology at that time, only some that can become relatively reliable substitutes. Danquah wrote that 90 percent of 250,000 tons sugarcane in the Philippines was processed into ethanol fuel with a mixture of 5 percent gasoline and 95 percent alcohol. Yet, vehicles that operated on such fuel only reached 60 percent of their normal capacity in terms of speed and range because of its relatively lower octane content (Danquah 2005: 78).

There was no success recorded on the use of substitutes for diesel fuel. A range of options, such as castor and coconut oil, was not able to be processed further than as lubricating oil only. It is assumed that the failure was caused by the hasty experimentations driven by the exigencies of the war and the fragmentary data at that time (Knothe 2001).

After the World War II, research on the application of plant oil for biodiesel, which also include *jatropha*, have been continued until now. Positive results have also been reported in various published, and unpublished, research papers at least since 1950 (USAID 2007). However, even until now a final formula for the production of reliable *jatropha* biodiesel, especially for the degumming

and deacidification is still under development to make it compatible for all diesel engines and can be produced at economical production cost (GFA 2008, USAID 2007).

CONCLUSION

This article has presented a discussion on the history of *jatropha curcas* with a specific aim to verify the existing popular claims on the history of *jatropha* cultivation and application during the colonial years, especially in the Japanese colonial period. The verification shows the absence of records to support the claims that *jatropha* had been widely cultivated and applied as biodiesel during the Japanese occupation period. The studied publications clearly indicate that it was castor, instead of *jatropha*, that was cultivated under the mandatory instruction of the Japanese colonial administration. Furthermore, the literature points out that the cultivation of castor in that period was aimed at addressing the shortage of fossil-based lubricant and not as diesel fuel replacement in the war period.

This article concludes that until the starting of *jatropha* hype in the 2000s, *jatropha* was mostly grown in the wild or planted in small population for its traditional use as herbal medicines and lighting fuel. This conclusion explains why there is so little knowledge of farmers about the cultivation technique and the actual yield result that can be expected from the plant. The limited knowledge on *jatropha* at the farmers level has contributed to the existing failure of *jatropha*.

Different situation is experienced by castor, where with its long history of cultivation, trade and applications, the plant continues to excel as a valuable commodity crop that has been ongoing for centuries. These differences echoed the argument by Achten *et al.* (2014: 3214) that local knowledge on an emerging crop is necessary to enhance activities around new species. In case of native species, local knowledge on these species is generally available. In introducing new tree species to new areas, capacity is necessary to handle the introduction and development (infrastructure, knowledge, and so forth) of these species and their products.

The limited knowledge on *jatropha* has caused farmers to fall easily into the trap of overwhelming promises and claims on *jatropha* potentials at the time of hype. Afiff (2014: 1688) writes that although a substantial number of people in Indonesia retained a collective memory that associated the term of *jarak pagar* with the Japanese wartime occupation, very few Indonesians actually have clear knowledge about the plant.

According to Seligman *et al.* (2013: 128-129), episodic memory for specific prior events, including information about who was present, what occurred, and what was felt, appears to be a fundamentally constructive process. Each time an event is remembered, past episodes are reconstructed anew and, in most cases, a little bit differently than the last time. Why memory functions in such fallible way are because it provides details needed to construct prospective simulations of future events. This situation has allowed the creation of false storylines about jatropha, including localizing its profile by ‘inserting’ the plant in the local history to increase the familiarity of the crop to the locals, as if it has been part of their agriculture for long time; and it is also to create a vision based on the unclear past memory about the application of jatropha that the plant can solve immediate present problem of energy crisis. This type of storyline is very much unchecked and taken for granted. Therefore, it is strategic both in gathering support for jatropha as a promising solution to energy crisis and in mobilizing people to grow the plant as what happened during the period of hype in the first decade of 2000.

ACKNOWLEDGEMENT

This article is based on a chapter of the author’s PhD dissertation entitled ‘Deconstructing a Biofuel Hype: The Stories of Jatropha Projects in South Sulawesi, Indonesia’ (2018) at the Anthropology Department and the Van Vollenhoven Institute of Leiden University. The author participated in the research cluster Jarak: The Commoditization of an Alternative Biofuel Crop in Indonesia under the Agriculture beyond Food Program from 2010-2018, and gratefully acknowledge funding by the Royal Netherlands Academy of Sciences (KNAW) and the Netherlands Organization for Scientific Research (NWO).

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