Deconstructing a biofuel hype : the stories of jatropha projects in South Sulawesi, Indonesia

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2 Reconstructing Jatropha history in Indonesia

2.1 Introduction

The fact that agriculture is such a multi-faceted activity means that a great many disciplines and sources must necessarily be involved in the reconstruction of its past It may be observed that students of agriculture hailing from different disciplines have never communicated adequately with each other. The botanists, for instance, have generally known little of prehistory and history, and the historians have returned this slight with interest (Hill 2004: 19)

Jatropha Curcas is a perennial succulent shrub native to Central America. The name jatropha comes from the Greek *iatros,* meaning doctor, and *thrope,* meaning food, which alludes its applications in traditional and folk medicines. Although it has medicinal properties, jatropha is toxic to animals and human. Jatropha has already existed in Indonesia since the period of settlement by the Dutch and Portugese (Siang 2009) Throughout Indonesia jatropha curcas is fairly 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: 23).

The first intensive cultivation of jatropha in Indonesia is claimed to exist during the occupation of Japanese administration in 1942-1945 which 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) writes 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 references on jatropha in Indonesia (see for examples: Hambali *et al*. 2006 Prihandana 2006 and Tim Jarak Pagar RNI 2006). However, little attention and effort was dedicated to verify this claim and to reconstruct the history of jatropha in Indonesia. This chapter will specifically contribute to address the absence of a clear historical reconstruction of jatropha in Indonesia. This chapter 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 does the existing popular claim on*

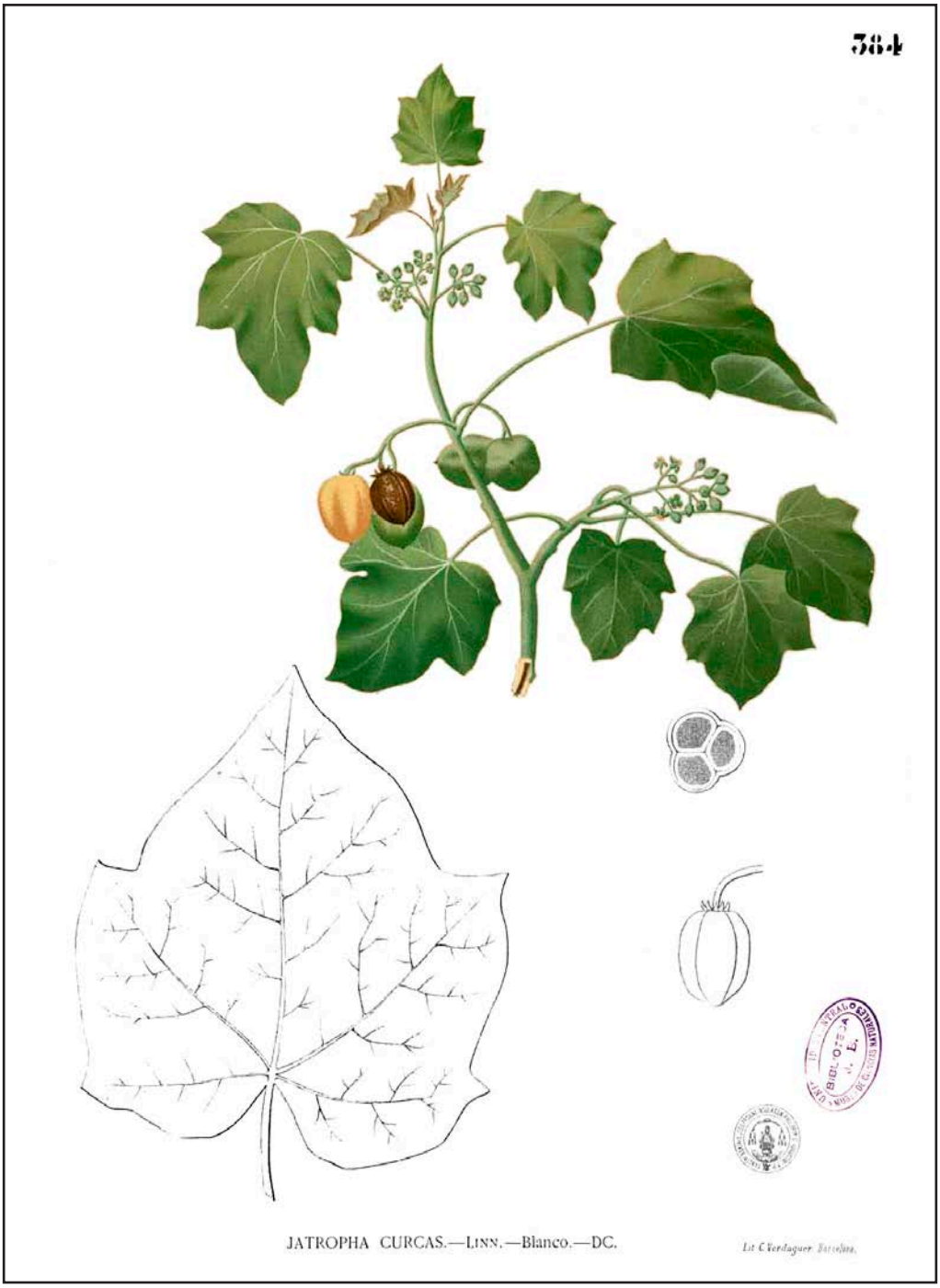

Figure 2.1 The sketch of Jatropha Curcas L.
(Source: http://upload.wikimedia.org/wikipedia/commons/7/79/Jatropha_curcas_Blanco2.384.png)

jatropha history link to the creation of jatropha hype? The answers to these 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, most literature 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 family of *Euphorbiaceae* (the spurge family) Jatropha is of the genus *Jatropha curcas L*. (or the Barbados or Physic nut) whereas castor plant is of the genus *Ricinus communis L.* (USAID 2007: 19, Jongschaap *et al.* 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 used for lubricant oil and medicines.

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

2.2 *Jarak* in the Dutch Colonial Period

One of the earliest written documentation 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 references is explicitly called as *jarak.* Literature sourced from the colonial and

contemporary publications on the economy and agriculture during the colonial time provides 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 (Kloppenburg-Versteegh 1907). Liesbeth Hesselink in her book on Healers on the Colonial Market writes 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: 44 and 283). Aside from being used as lubricant and medicines, castor was also used as fertilizer material. A publication by Peter Boomgaard (1999: 59) 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 (*Landbouwvoorlichtingsdienst* / LVD) (Heersink 1995: 211). 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: 574).

In terms of trading, castor was already traded since the eighteenth century. Fernando (1996: 96) writes 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*: 113). Another publication by Peter Carey suggests that at that period of time, castor was a significant commodity for the local economy in Java and subject to colonial tax (Carey 1986: 126). Until the beginning of the nineteenth century, prior the Japanese occupation, the island of Java had been exporting castor with annual volume of 10,000 tons and 90% of the export was for Japanese market (Kurosawa 1993: 36). In Japan, the oil extracted from the beans was used for lubricating airplanes, trains, automobiles, and precision machines (Post *et al.* 2010: 294).

2.3 *Jarak* in the Japanese Colonial Period

It is said that castor oil was used during the Japanese occupation here (1942-1945). But it is not clear whether they used it as lubricant oil that was processed from *Ricinus communis* or it was used as fuel, processed from *Jatropha curcas*. The problem is there are no written records either in Indonesia or Japan about the type and quality of the oil and what it was used for (Robert Manurung - Jakarta Post, 6 August 2006)

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

Figure 2.2 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)

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 was sourced from the literature 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 campaigns and mobilization (Kurosawa 1993: 36).[32] To meet the target, on February 9, 1943 the large-scale compulsory planting of castor bean was begun (Post *et al.*2010: xx). 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.[33] The Japanese utilized social organizations such as the *Tonarigumi* (neighborhood association), *Seinendan* (paramilitary organization), and *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 task of planting the seeds on wasteland was given to schoolchildren (*Kinrōhōshi* or volunteer work by students)[34], where each school was allocated its own piece of land and the one, which produced the most seeds won a prize. How much castor oil this campaign yielded is unknown (De Jong 2002: 236).

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 became 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: 36). 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: 236). Until the end of Japanese occupation in Indonesia,

[32] Instructions by military administration were circulated for the mobilization of people to cultivate *jarak*, such as *Makloemat Keizabucho Semarang tentang Tanaman Jarak* in 1942 and *Kediri Shi Makloemat* in 1944. Two Japanese companies: Takenokoshi Shoji and Senda Shokai were given authority to collect *jarak* seeds (Kurosawa 1993: 62).

[33] 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: 36).

[34] 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. 2010:530).

Figure 2.3 Japanese administration propaganda poster on castor cultivation (Source: Post et al.2010: 246).

the administration data suggest that there were1200 hectares of agricultural area planted with castor in Java by 1944, which produced 1081 tons of castor seeds from the expected quota of 3000 tons (Post *et al.*2010: 227).

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: 256). 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 economic crisis (Sato 2006: 240-241). The general 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*: 101). This period of time is remembered in the Indonesian history for the extreme hardships, especially for the stories on the slavery, crisis and starvation.

Another useful publication with complete reference on Japanese alternative fuel policy during the war is 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 writes 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 islands, 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: 80-81).

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 cultivation 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 independence as an industrial crop.[35] Most of the yields are absorbed by PT Kimia Farma, a state-owned pharmaceutical enterprise, to be used as medicine and cosmetics ingredients.[36]

When jatropha hype struck Indonesia in 2006, the cultivation of jatropha was very different from the previous castor cultivation period. In contrast to the forced cultivation system of castor, the cultivation of jatropha was conducted voluntarily with a strong profit orientation. Farmers were willing to invest in this crop by buying expensive seeds and allocating their productive lands for the cultivation of this crop. Furthermore, many also joined various cooperation schemes or business models offered by the investors.

2.4 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 for the question posted at the beginning of this chapter. Firstly, it is very clear that it was not jatropha curcas but castor plant (*ricinus communis* or

[35] As an industrial crop, castor also received 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).

[36] PT Kimia Farma in its Semarang factory specially processes the production of castor oil, vegetable oils and cosmetics (talc) (http://en.wikipedia.org/wiki/Kimia_Farma - accessed on 12 May 2013).

Figure 2.4 Women and buckets of the harvested castor fruits with castor trees as the background (Source: Marilah Menanam Djarak! Book, circa 1943)

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 2.3 and 2.4 – showing castor trees (*ricinus communis*) in both pictures. Yet, despite 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 a 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 medicinal 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 numbers in combination 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. Milieudefensie (2012: 20) suggests that jatropha as hedges has replaced the fodder plants and forced women to spend longer time to collect fodder for their livestock.

Secondly, the studied literature also clearly suggests 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

Figure 2.5 The application of legume trees as hedges in which is common in the rural area in Indonesia (Photo: Henky Widjaja, 2011).

options, especially sugarcane, soybean, coconut (copra), castor and pili nut (*canarium ovatum*) (Kurosawa 1993, Knothe 2001, Danquah 2005). From this list of options, however, by referring to the technology at that time, only some that can become relatively reliable substitutes.[37] 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: 103).[38]

After the World War II, research projects 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: 26). 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 (USAID 2007, GFA 2008).

2.5 Conclusion

This chapter 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 chapter 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. Achten *et al.* (2014: 3214) point out that local knowledge

[37] Danquah points out that 90% of 250,000 tons sugarcane in the Philippines was processed into ethanol fuel with a mixture of 5% gasoline and 95% alcohol. Yet, vehicles that operated on such fuel only reached 60% of their normal capacity in terms of speed and range because of its relatively lower octane content (Danquah 2005: 78).

[38] While since 1900, Rudolf Diesel, the inventor of diesel engine, had tested the application of peanut oil to run his diesel engine, the development of vegetable oils application for diesel fuel was still very basic during the war period. Researches on vegetable based diesel fuel were accelerated during the war to meet the fossil fuel shortage emergency but they were very sporadic. Work on vegetable oils as diesel fuel was again ceased after the war when petroleum- based diesel fuel became available again plentifully at low cost (Knothe 2001: 103 and 105).

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 is 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 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.

In the parallel discussion on the story of castor, the given discussion shows that along with the long history of castor cultivation, trade, and applications, the existence of proven markets for various high value products from castor has become a current key advantage of castor in comparison with jatropha. Therefore, it is important to note that only when the marketable jatropha based derivative products are materialized, then jatropha can become a lucrative commodity crop for farmers.