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YENANGYAUNG AND ITS TWINZA:
The Burmese Indigenous “Earth-Oil” Industry Re-examined

Marilyn Longmuir*

In the early nineteenth century, the indigenous oil industry at Yenangyaung may have been the largest in the world. The article summarizes and evaluates the descriptions of nineteenth and early twentieth century European observers, with special attention to the pre-colonial uses of the oil, the legends about the site, the local institutions governing ownership of the wells, the indigenous methods of oil extraction, and the Europeans' estimates of production levels.

Of all the industries that flourished in Burma in pre-colonial times, one of the most neglected by historians must surely be the earth-oil industry of Yenangyaung, a river port situated on the eastern bank of the Irrawaddy River about 360 miles north of Rangoon and a little south of Pagan. Some have suggested that the oil industry at Yenangyaung may have been the largest in the world at that time.¹ Though the sources speak of Yenangyaung, the hand-dug wells were actually located two miles east in the areas of Twingon² and Beme (see maps). The adjacent site of Khodaung would become an important oil producer in the colonial period, but it was not part of the pre-colonial oil industry.

The actual date when traces of earth-oil first attracted attention remains a mystery, though the Burmese believe that oil production began as early as 905 A.D.³ The pre-colonial industry was most

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² Sometimes referred to as Twingoung, meaning “hill of wells.”

³ Khin Maung Gyi, Memoirs of Oil Industry in Burma 905 A.D.-1980 A.D. (Rangoon: n.p., 1989), title page. On page 1, however, it is stated that “The year of the birth of Burma’s Oil Industry must be traced to the early part of the reign of Sale Min Khwee (Salay Nga Khwee) 268-277 B.E. (1064-75 A.D.)”
likely fostered by the discovery of oil oozing from the ground. The oil fields were on a plateau, and there were deep fissures and ravines that had been created over time by surface water eroding the ground during the rainy season; as Fritz Noetling noted in the late 1800s, oil oozed from “many spots in the ravines where cracks or fissures afford it an easy road.” The industry probably began in a small way as observant people collected oil from the seepages and pools. It would have expanded later to larger quantities as people began to dig small pits and finally hand-dug wells. Beme, the southernmost field, was considered to be the older one, though in the nineteenth century the northern and larger field, Twingon, was the most prolific. The two fields were situated near the crest of an anticline, a geological formation under which oil and gas form. The lack of an intervening water table made it relatively easy for the Burmese to reach the oil sands below the anticline by digging hand-dug wells.

Europeans first heard of the earth-oil town of Yenangyaung in 1755, when Captain George Baker and Lieutenant John North, journeying up the Irrawaddy River on a British diplomatic mission to meet with Alaungpaya, passed by “Yaynanyung [Yenangyaung] or Earth-oil town.” Later, as Baker returned down-river, he described the settlement as follows: “At this Place there are about 200 Families, who are chiefly employed in getting Earth-oil, out of Pitts [sic], some five Miles in the Country.” It can therefore be assumed that by the middle of the eighteenth century there was already a substantial industry in existence.

Over the next 100 years, a procession of British soldier-diplomats journeyed past the site as they traveled up the majestic Irrawaddy to

and on page 34, the date of discovery is given as “during the reign of Sale Min Khwe (906-915 A.D.),” MBK [Ba Kyaw?], An Outline of Burma’s Oil History (Rangoon: Myawaddy Press, 1982), Preface 4, nominates “circa A.D. 906.”


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Upper Burma. Yenangyaung was one of the important calls on this journey north. Baker and North were followed by the sympathetic Michael Symes (1795), the irascible Captain Hiram Cox (1796-97), Symes again (1802), Captain John Canning (1809 and again in 1811-12), John Crawfurd (1826-27), Major Henry Burney (1830),8 Captain William McLeod (1838), and, in 1855, Arthur Phayre, who was accompanied by a large party including his secretary, Henry Yule, and the geologist Thomas Oldham. Shortly after the British annexation of Upper Burma (in 1886) incorporated the Yenangyaung oil fields into the British domains, Fritz Noetling, a member of the Geological Survey of India, surveyed the oil fields and wrote extensively on the subject. In the early 1890s, a report on the oil-producing community was also written by A. R. Bonus, Assistant Commissioner at Yenangyaung.

In endeavoring to establish an overview of the pre-colonial oil industry at Yenangyaung, the historian must turn to journals and reports of these British soldier-diplomats and geologists and administrators. In addition, there is in the papers of Henry Burney a list of questions, which presumably he had prepared, to be asked of the local atwenwoon, a palace privy councilor. The list of questions (written in English) is accompanied by a reply in Burmese that sets out some of the answers.9 Interestingly, although claims have been made that there are additional Burmese language sources on the industry, a 1987 Burmese MA dissertation relies to a considerable extent on these accounts from British sources.10

Although the oil industry was substantial, the earliest British reports appear to have exaggerated its size. There were four major obstacles that hindered accurate reporting. First, except for Noetling and Bonus, the Europeans' visits were always of short duration.

8 Major Henry Burney was sent as Resident to the Court of Ava in April 1830 and remained there until June 1837, although there were interruptions due to his ill health. See Henry Yule, A Narrative of the Mission to the Court of Ava in 1855 together with The Journal of Arthur Phayre Envoy to the Court of Ava (Kuala Lumpur: Oxford University Press, 1968), 222.


10 Kyaw Soe, “Twinyo, Twinza Thamoeng” [History of Twinyo Twinza], M.A. diss., May 1987, University of Yangon. Page references refer to a handwritten copy of parts of the above thesis that were supplied by Universities' Historical Research Centre, Yangon. My thanks to Dr Mya Tu for his translations of these extracts.
Second, early visitors confronted an unfamiliar situation because an oil industry of this size was unique to Burma. The third obstacle was language; although interpreters accompanied the parties, we do not know how fluent they were. Fourthly, even the interpreters were dependent on the local Burmese giving truthful responses to British inquiries, and for their own reasons the Burmese may have inflated their production figures.

Despite these limitations, the sources give useful insight into a significant pre-modern industry that supplied oil for a range of local and international uses while contributing to the coffers of the late pre-colonial Burmese kingdom. The following discussion summarizes what is known about the pre-colonial oil industry, including the pre-colonial uses of the oil, some legends about the site, the institutions of ownership, the methods of production, and the amount and value of production.

The Importance of the Pre-Colonial Industry
The Burmese government of the late 1800s was clearly aware of Yenangyoang’s economic importance. After Burma lost the ports of Lower Burma to the British in 1852-53, King Mindon Min saw Yenangyoang’s oil wells as a possible source of much-needed revenue. Mindon therefore turned his attention to the earth-oil industry and exercised his royal monopoly over the wells’ production. Some 120 tawtwin, or royal wells, date from Mindon’s reign. Presumably to consolidate his interest in the industry, Mindon also married a daughter of U Shwe So, the Yenangyoang Myoza Mingyi (the official who had been granted the revenue of Yenangyoang). The woman Mindon married is usually referred to as Kyimyin Mbura (Queen Kyimyin). She was a twinzayo (one of the 24 hereditary family heads who possessed and distributed

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11 Hiram Cox, *Journal of a Residence in the Burmhan Empire* (Westmead Farnborough, Hants: Gregg International Publishers, 1971), 41, had reported as early as 1797 that “the king’s duty is a tenth of the produce.”

22 *The Journal of Burma Studies*, Volume 5
exclusive rights to dig wells), having inherited this status from her mother.  

Traditionally, the twinza (well-owners) had paid a fee to the twinzayo (hereditary owners of the oil) for the right to dig wells. The twinza had then sold the oil to whomever they pleased at whatever price they could get. However, once King Mindon began enforcing his royal monopoly in the 1850s, the twinza were compelled to sell the earth-oil directly to the king, who, as chief trader in the kingdom, sold the product on to oil merchants. In essence this royal monopoly nationalized the wholesaling of oil.  

In later years, the king sold his oil monopoly to various traders, or “farmers,” for an annual fee. It was believed by the 1880s that the oil monopoly was being sublet for up to Rs 250,000 per annum. The twinza did not benefit directly from this practice, as they were required to sell all the oil they produced to the monopolist or “farmer” at a fixed rate of Rs 1-8-0 per 100 viss (40 gallons).  

On the other hand, the monopoly arrangement provided the twinza with “a guaranteed market for their output as well as certain tax exemptions.” For example, the twinza were exempt from the thathameda (capitation tax) because of services rendered to the government. Noetling reported that both twinza and twinzayo were “exempted from the so called eight royal services, that is to say, he had not to do forced services or to pay taxes.” And Yo Pe has suggested that the twinza were exempt from

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14 Report-Twinza Reserves, 132.
16 Memorandum, Chief Commissioner, Burma, to Government: of India, July 1, 1886, IOR P2664A.
18 Fritz Noetling, “The Occurrence of Petroleum in Burma, and its Technical Exploitation,” Memoirs of the Geological Survey of India 27(2):1 (1898); MBK, Burma’s Oil History, 28. This tax, a household income tax, was not introduced until 1862, according to John F. Cady, A History of Modern Burma (Ithaca, N. Y.: Cornell University Press, 1958), 101. However a translation of the “Konbaung-zet Mahayazawin, III, 251 (1968), suggests that the first collection of this tax took place in 1857 (Burmese era 1219), U Tin in Chapter 533 of his “Myanmar-min-Ookchock-pon-Sadan” (also in translation) notes that there were numerous exemptions to this tax. I am grateful to L. E. Bagshaw for the above information.
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paying tax from “the time of ancient kings,” though no sources are noted.

The Uses of Earth-oil in Burma
In Burma, earth-oil (so-called to distinguish it from the wood oils such as sesameum and palm oil) was mainly used for preservation of wooden buildings against insects and the weather; for caulking of the many boats that plied Burma’s rivers; for preservation of palm leaf manuscripts; for lubrication of bullock cart wheels; for medicinal purposes; and especially for illumination. Crude oil could be used for each of these purposes, so there was therefore no incentive to refine the product.

In 1826, John Crawfurd was informed that one-third of Yenangyaung’s oil was utilized principally as a preservative for teak and wooden buildings and as caulking for boats. Generous applications of earth-oil preserved the timber that was the principal building material for palaces, monasteries, and dwellings. These wooden buildings would otherwise be susceptible to destruction by white ants and other tropical insects. The regular caulking of boats was another significant usage, being supported by the wide use of river transport along the Irrawaddy and Chindwin rivers, along the numerous smaller rivers, and throughout the delta region of the south.

According to John Crawfurd, two-thirds of the total oil production was used for burning, that is, for illumination. This reported employment for illumination seems extremely high, although there would certainly have been considerable use of the oil as an illuminant both in the home and for entertainment (sesameum oil, an alternate means of illumination, was considerably more expensive). Because of the tropical heat, the major Burmese theatrical entertainment, the pwe, took place in the evening, often

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22 Crawfurd, Journal, 98.
23 Crawfurd has noted that to transport earth-oil to distant locations was costly. Earth-oil would sell at “fifty ticals per 100 viss. [Yet] Sesamum oil [would] . . . cost, at the same place, not less than three hundred ticas for an equal weight.” Journal, 96.
extending throughout the night. Every important aspect of the life of a Burmese from birth to death was celebrated by a pwe, which was performed in the open air and was free to all. Around the pan-bin, a tree branch generally situated in the center of the stage area, “small earthen-pots filled with petroleum, usually the thick black crude oil brought from the wells at Yenangyaung,” were placed and then lit. Simple wicks of rag and cottonseed were used, and the pots were “replenished by the actors as occasion may require during the progress of the play.” Sometimes coconut shells were employed instead of earthen pots.

Legends About the Industry’s Origin
A plethora of legends has arisen to explain the oil industry’s existence. One of the most popular stories says that the waters near the present-day wells used to be scented, and that travelers often came to bathe in the fragrant waters. At that time Yenangyaung was known as Kyaukka Myo (Rockcave Town). At one point during this period, an important king was sailing along the Irrawaddy on a golden raft, accompanied by his queens, members of the court, and a mighty army. As the group neared the city, seven of the queens asked permission to leave the raft and stretch their legs ashore. The king granted them permission to disembark but reminded them not to tarry long. The queens did not return, so a search party led by the king was organized. Imagine the king’s anger when he found the little group beside the scented pools. Overcome with a great rage, he ordered that the queens be killed. Later, swept with remorse for his hasty action, the king transferred his anger to the yenathasi. He decided these scented waters should no longer attract anyone and, using his magical powers, he turned the waters into the malodorous

24 Shway Yoe [Sir James George Scott], The Burman: His Life and Notions (New York: Norton Library, 1963), 286.
25 Actually Yenangyaung oil is usually described as a dark green. I can attest to this color from personal observation in 1997.
26 Shway Yoe, The Burman, 288.
28 This story is drawn from MBK, Burma’s Oil History, 10-11.
29 Possibly yenathasi, meaning “fragrant water.”
earth-oil. As a consequence, the name of the city was changed from Kyaukka Myo to Yenangyaung, “river of stinking water.”

Several of the mythical legends have provided the earth-oil region with as many as twenty-four guardians. These twenty-four guardians correspond to the twenty-four twinzayo, or hereditary owners of the Yenangyaung oil lands (whose role will be explained in the following section), thereby providing substance to the twinzayo claim to exclusive control of the Twingon and Beme areas of the oil fields.

In one variation of the tale related above the queens and an accompanying eunuch, Kyoe Ponna (at times said to be their brother), are turned into nats (a kind of spirit). In this version, the king and his raft cannot proceed until the yenun (oil) is pledged to the nats and to the twenty-four descendants of the myothgyi (township or circle headman) who had previously owned the scented pools. Other stories involve twelve royal families who settled at Seiktha Kun Htau (another of Yenangyaung’s legendary former names) after the assassination of King Kan Nett in 906 A.D. Still others purport to show the industry’s importance to early Burma. In one such tale, even the great eleventh century King Anawratha and the famous monk Shin Arahana make appearances; at the behest of Shin Arahana, Anawratha sends to Seiktha Kun Htau for the fragrant oil so it can be used to preserve the palm leaf manuscripts of the Tripitaka (Pali canon).

Eric Hobsbawn once suggested that tales such as these express the winning side of a struggle between competing claims:

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30 Referred to elsewhere as “creek of stinking water.”
32 Yo Pe, History of Yenangyaung, 4-6. A similar story appears in Khin Maung Gyi, Memoirs, 1-2, but there the King is referred to as “Tanet.” He is also referred to in other references as Tannet and even Tannek.
33 Yo Pe, History of Yenangyaung, 8-10. This is mythical history. D. G. E. Hall, A History of South-East Asia, 4th ed., (Houndsmill, Basingstoke, Hampshire: Macmillan Education, 1981) 158, describes Anawratha (r. 1044-77), as “rather a majestic legendary figure than a historical personage.” On page 160, Hall quotes Gordon Luce, an authority on this period, who states that there were no copies of the Tripitaka in Thaton for Anawratha to take with him to Pagan, and that Shin Arahana, although he existed, was associated more with a latter king, Kyanzittha. See Gordon Luce, “The Career of Hluang Min (Kyanzittha), the Uniter of Burma, A.D. 1084-1113,” JRAS, pt. 1 and 2, (1966), 57.
Students of peasant movements know that a village's claim to some common land or right "by custom from time immemorial" often expresses not a historical fact, but the balance of forces in the constant struggle of village against lords or against other villages.\textsuperscript{34}

It is not clear how well Hobsbawn's dictum applies to the present case. The few records available do not show any effort to separate the Yenangyaung twinzayo from their oil lands, though such a struggle may have occurred many centuries earlier. Still, the local villagers must have experienced some envy as they observed the wealth possessed by the twinzayo families. Even Hiram Cox commented, on his visit in January 1797, how well dressed the inhabitants were. He noted their "gold spiral ear-ornaments, and [decided that they] were undoubtedly rich from the great trade they carry on in the earth-oil."\textsuperscript{35}

However, while the above tales support the twinzayo claim, another tale, one that purportedly grounds the origins of the twinzayo in a more historical setting, casts the twinzayo in an unflattering light. E. H. Pascoe, a prominent geologist, reported that what he believed to be "a more credible legend than that of the queens appeared in the Rangoon Times, 15 June 1909." This story concerned a king of Burma who fought in Arakan and brought captives home to Burma across the Arakan Yoma (mountains or hills). As was the custom, when the king reached the eastern bank of the Irrawaddy River, he and his party paused to rest near present-day Yenangyaung. There he commanded that a pagoda be built to enable him "to acquire merit." This pagoda, now known as the Bayin Pagoda, was built about five miles north of Yenangyaung, and the king left his Arakanese captives there as pagoda slaves. The slaves prospered from the collection and sale of earth-oil, and they later destroyed the tablet that denoted their servitude to the Bayin Pagoda by throwing it in the river. Eventually these former slaves obtained a monopoly from the king and formed the corporation of


\textsuperscript{35} Hiram Cox, \textit{Journal}, 33.
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twinzayo. The Burma Petroleum Industry, a small booklet produced by the Burma Research Society, gives an abbreviated version of this legend, commenting that "if this tradition is to be believed, it is possible that the oil industry of Arakan, now also negligible [1946], preceded the development in Yenangyaung." (This comment assumes that the slaves had learned their craft in Arakan before being brought to Burma.)

Though the lack of mystical references may give this story the aura of truth, it is not necessarily more reliable than the others. Yenangyaung was indeed situated close to where parties returning from Arakan via the Arakan Yoma would cross the Irrawaddy River, and there was indeed a primitive oil industry in existence in the Arakan region. However, the suggestion that the twinzayo and their families were descended from "ill-natured slaves" was discounted by an elderly twinyo (a term sometimes applied to individual twinzayo) who suggested in 1997 that the rumor had been spread by people jealous of the twinzayo wealth.

The Corporation of Twinzayo
Descriptions in the Pre-Colonial Period
The word twinzayo is derived from twin or dwin, the Burmese word for well; za, meaning eater, or one who receives revenue from property; and yo, representing the hereditary lineal rights. The people who held rights to revenue from the oil were known as twinzayo, while the people who owned the individual wells were known as twinza, or those who lived off a well. The twinza who produced and sold the oil from a particular well site was required to

38 For more information on the Arakan oil industry, see Marilyn Longmuir, "Footnote to Burmese Economic History: The Rise and Decline of the Arakan Oil Fields," The Journal of Burma Studies 3: 47-76.
39 The Aeng Pass, also known as the An Pass, crosses the Arakan Yoma, and descends into central Burma not far from the Irrawaddy River. At that time the closest route to the river was via Minbu, slightly south of Yenangyaung, though parties returning to Pagan more often took a more northerly route.
40 U Aunt Gyaw (twinyo), interview with the author, Yangon, February 25, 1997.
41 Yai-dwin is Burmese for well, while the pits that are dug for the mining of rubies are known as twinnon.
pay a small monthly rental to the *twinzayo*. In pre-colonial days, these *twinza* were usually relatives of the *twinzayo*.

In 1783, during the reign of King Bodawpaya (r. 1782-1810), a census recorded that there were twenty-four *twinzayo* and forty *twinza* families living in Yenangyaung. This list was kept in the *Thiri Thein-ga* (or * Thinga*) Royal Treasury. During his reign, King Mindon (r. 1853-1878) also arranged for a census of the community. This census, "known as the *Pan Khone-daw* family tree [contained] the names of wives, children and even their dates of birth and days of birth etc." The twenty-four hereditary *twinzayo* formed a corporation of *twinzayo* who collectively had a monopoly on oil rights in the region. The *twinzayo* was the hereditary family head who had the power to allocate well sites to family members. The twenty-four members of the *twinzayo* corporation held a joint interest in the two tracts of oil-bearing land at Twingon and Beme, though the individual wells were considered private property.

*Descriptions in the 1890s*

Immediately after the British annexation of Upper Burma in 1886, various members of the local community attempted to assert their special rights to dig for oil. Accordingly, British officials conducted an investigation into the *twinzayo* community, and this investigation resulted in a report that was issued by A. R. Bonus, Assistant Commissioner at Yenangyaung. This report, which may have been written in 1893, is corroborated by information from Noeling (a geologist who studied the fields in the 1890s) and from other sources.

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42 Noeting, "Petroleum in Burma," 162.
45 Yule, *Mission*, 21. Actually, Yule said there were "twenty-three families," but most sources say twenty-four, and that is what I have listed in the text.
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These 1890s sources report that at that time the ownership of the hand-dug wells was restricted to twenty-four families.\textsuperscript{47} Described as “yowa-families,” they were headed by eighteen men and six women.\textsuperscript{48} The hereditary right to dig wells, described as “yo” by Bonus and “ayo” by MBK,\textsuperscript{49} was passed down in each family from senior male to senior male or from senior female to senior female. This yo gave the twinzayo “the rights of digging for oil within certain vaguely defined boundaries,”\textsuperscript{50} which were described by Bonus as being “lands bounded on the north by Chaukmasin, on the south by Minlintaung, on the east by Taunkgamauk, and on the west by the Pyagyidaung.”\textsuperscript{51}

Khin Maung Gyi, a Burmese oil historian, has suggested that the corporation of twinzayo was originally formed by mutual consent, and that the permission to work these areas was sanctioned by the authorities with representatives of the Buddhist monkhood (sangha) on hand.\textsuperscript{52} Yule noted that in 1855

A respectable owner stated that they had no written grant or confirmation of their exclusive privilege, yet it is upheld by the local Burmese authorities, and apparently they have sufficient influence to prevent any wells being dug by interlopers in the vicinity of their groups or clusters of wells.\textsuperscript{53}

Access to the communally owned oil fields was controlled by an elected head of the corporation, the twingyimin, who settled oil disputes within the group.\textsuperscript{54} For attending to his duties, the twingyimin received, as a fee, a small percentage of the earnings of

\textsuperscript{48} Noetling, “Petroleum in Burma,” 162. Also MBK, Burma’s Oil History, 15.
\textsuperscript{49} Report — Twinza Reserves, Appendix 3, 131 and MBK, Burma’s Oil History, 15. This ayo or yo is a contraction of ayoi (lineage) which represents the lineal family in which the heredity right is vested; in this case the right to dig a well in the specified area and extract oil.
\textsuperscript{50} Report — Twinza Reserves, 131.
\textsuperscript{51} Report — Twinza Reserves, 132.
\textsuperscript{52} Khin Maung Gyi, Memoirs, 2.
\textsuperscript{53} Yule, Mission, 21.
\textsuperscript{54} Report — Twinza Reserves, 132.
each well.\textsuperscript{55} The twinyimin also played a role in allocating new exploration plots. The twinzayo would choose the plot of land in which to dig, but the twinyimin’s permission had to be obtained before the new wells could actually be dug.\textsuperscript{56} The twinyimin would first assure himself that the other twinzayo did not object to allocation of the site and only then would he grant permission.\textsuperscript{57} The twinzayo who had been granted the site was then “at liberty to dispose of smaller allotments within the limits of that site.”\textsuperscript{58} The twinzayo usually allocated individual wells to relatives, but sometimes they also sold rights to outsiders.

Even when selling production rights to a twinza (individual well owner) the twinzayo did not give up ultimate rights to the site. Bonus explained that the twinzayo retained

A kind of right of pre-emption over [the site], for a Twinza cannot dispose of his allotment as he likes. Should he desire to get rid of it, he must restore it to the Twinza from whom he obtained it.\textsuperscript{59}

But while production rights might be transferred to others, the twinzayo rights themselves were supposed to be hereditary and the sale of those rights was therefore strictly limited. Before the industry was commercialized in the late 1800s, if a twinzayo was childless or without direct heirs, the rights could only be sold, with the consent of the twinyimin, “to a close or distant relative, but not to any outsider or stranger.”\textsuperscript{60}

\textsuperscript{56} Report — Twinza Reserves, 132. Also Noetling, “Petroleum in Burma,” 162.
\textsuperscript{57} Report — Twinza Reserves, 132.
\textsuperscript{58} Report — Twinza Reserves, 131. In 1893, the British administration had set down the maximum size of a twinzayo site as one-fifth of an acre, although usually a minimum site of one-fourteenth of an acre was granted (Report — Twinza Reserves, 60-61).
\textsuperscript{59} Report — Twinza Reserves, 132.
\textsuperscript{60} MBK, Burma’s Oil History, 15. Bonus states that before an occupant could transfer “his site to some other person,” the twinyimin was required to give permission (Report — Twinza Reserves, 132). Pascoe, “Oil-Fields of Burma,” 74, gives a variant of this, stating that the head of the family “could sell his [or her] right only with the consent of the whole corporation.” The latter practice may have developed after the industry was commercialized.
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The hereditary twinzayo rights were normally passed down along gender-specific lines from father to son and from mother to daughter. As Bonus pointed out, there was “a difference in the right of succession to a Twinzayo, according as the deceased is a man or woman.” A male twinzayo was succeeded by his eldest son, or, if this son was deceased, by his eldest son’s son. Only when there were no longer any males in the eldest son’s line would the second son, or the second son’s male descendants, succeed as twinzayo. If a male twinzayo died “leaving no descendant connected with him by an unbroken line of males . . . [his] daughter’s son . . . [could] take the yo, or in default . . . [his] grand-daughter’s son [could do so].” A female would inherit the rights of a deceased male twinzayo only if no male descendants were still alive. As for a female twinzayo, she would first be succeeded by her eldest daughter, and a pattern similar to that of the male twinzayo followed, only with female relatives, instead of male ones, inheriting the yo.61

The monopoly exercised by the corporation was so tight that the corporation’s senior members arranged marriages for the younger members.62 This practice served to maintain the families’ control over the wells, and it also made the oil-producing community a distinctive group of people with their own customs and beliefs. The community worshipped principally at the Sa-Nay-Nan (Saturday) Pagoda in Yenangyaung and at the Pin-Sekkalan Pagoda, both of which were well supported by the twinzayo and twinza communities.63 Religious ceremonies, such as the novitiation ceremony for the sons and ear-boring ceremonies for the daughters, were celebrated lavishly, as were the marriage ceremonies. As late as 1985, children of twinzayo were still encouraged to marry relatives,64 although this practice had already begun to change as early as 1855, when Yule reported that “this custom [of intermarriage] had been broken through by the ‘young people.’”65 Funeral ceremonies were also conducted in a distinctive fashion that emphasized the special nature of the twinzayo community.

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61 Report — Twinza Reserves, 131.
64 Notes of Twinza as quoted in Kyaw Soe, Twinyo Twinza, 33.
65 Yule, Mission, 21.
As the industry became more commercialized, there also came to be "Twintzay" by purchase." In these cases the twinzayo would sell their hereditary rights to people outside the community, with the "heir prospective [having] ... no sort of veto on this proceeding." There were also "Twinzas by purchase," whereby a person bought a well site but not the hereditary twinzayo rights.66

A Prime Position
Yenangyaung was a prominent river port, and the oil-producing wells were about two miles to the east. The location of the Yenangyaung wells must surely have been a major contributor to the success of the earth-oil industry, as they were close enough to the port to allow the oil to be transported to the docks in earthenware pots carried by bullock carts and even coolies.67 There were many breakages on the way to the river bank, but shipping by river was still a viable proposition. The port was a busy place. On Cox’s visit in 1797, he reported that there were “seventy and eighty boats, average burthen sixty tons each, loading oil at the several wharfs, and others [were] constantly coming and going.”68 Yet, despite the proximity of the fields, transporting the oil to the port was expensive. Hiram Cox suggests that the oil’s price was “enhanced three-eighths by the expense and risk of portage.”69 Thirty years later, Burrey’s records suggest a “well owner would sell the first two-day shipment of crude” for his own profit, while the bullock cart driver was given the third day’s shipment as his payment for cartage.70

Development of the oil fields was also facilitated by Yenangyaung’s easy access to Burma’s major centers of population. A little to the northeast was the wealthy agricultural district of Kyaukse. Just over a hundred miles upstream, the confluence of the Irrawaddy and the Chindwin rivers provided additional river ports for the distribution of the earth-oil, as these rivers were navigable for many miles northwards. To the south, the Irrawaddy flowed from Yenangyaung to the delta region and the sea.

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67 Cox, Journal, 44. Cox described the pots as “small jars.”
68 Cox, Journal, 44.
69 Cox, Journal, 44.
70 The Burney Papers — Series J: Supplements Series B, VI.
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The Hand-Dug Wells
The construction of a hand-dug well on the Yenangyaung oil-fields was not an easy task. As a Burmese historian has said, “the method of taking crude oil from the pits was primitive, mainly relying on physical power.”

The digging of the well generally commenced on an auspicious day chosen from the Burmese calendar. A suitable ceremony would be held to appease the nats (spirits) who guarded the oil fields, and then the digging would begin. The construction involved a significant financial investment. Cox estimated that a new well would cost 2,000 tical, or 2,500 sica rupees. In 1855, Yule reported that “the cost of digging a well 150 cubits deep was said to be 1500 or 2000 tikals, sometimes even more.” In the words of Thomas Oldham, who traveled with Yule, this was “a large sum for such men to risk.” The money paid for a variety of expenses. The well owners usually engaged teams of professional miners to dig the wells. In addition, there were costs for leveling the ground and roadway, for the wooden staves for the shaft’s walls, for “expenses of propitiatory sacrifices, and perhaps a seigniorage fine to the government for permission to sink” the well. Moreover, upon completion of a well, twinza would usually distribute valuable presents such as “silk gaung-baungs [Burmese headgear], woolen [sic] jackets, and silk pasoes [costumes],” along with the diggers’ wages.

The contract price for a well increased as the well deepened. Cox described the rates as follows:

For the first forty cubits they have forty ticals, for the next forty cubits, 300 ticals, and beyond these eighty cubits to the oil, they have from thirty to fifty ticals per cubit, according to the depth (the Birmah cubit is nineteen inches English).

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72 Cox, Journal, 39.
73 Yule, Mission, 21.
74 Yule, Mission, 318.
75 Khin Maung Gyi, Memoirs, 48.
76 Khin Maung Gyi, Memoirs, 49.
77 Sometimes Itkal. A Burmese silver weight, possibly of Mon origin, used in currency transactions.
78 Cox, Journal, 39. The cubit is an old measurement of land which derives
The note in Burmese that accompanies Henry Burney’s papers shows a graded scale of payments until a well reached 120 feet (80 cubits, if 18 inches per toung is used). Between 105 and 120 feet, the cost was 17 kyat (rupees) per foot, but thereafter there was “an increase of one kyat [rupee] on top of the base rate for every additional 15 feet [around 10 cubits], and this rate would apply until the depth of 270 feet [180 cubits], thus costing up to 25 or 26 kyat.”79 Almost a century after Cox, Noetling found that “a traditional scale of depth” was still being used, although the amount paid had varied over the years and there had even been an increase since the British annexation of 1886. In 1890 there was “a fixed rate for the first 80 cubits (147 feet) [of] R. 105 to R. 120.”80 A higher rate applied from 81 to 90 cubits, and the rate increased again for the distance from 90 to 100 cubits. From 100 to 132 cubits, digging was paid on a per-cubit basis, after which a special arrangement applied.81 Noetling believed that this graded system of payments was based on “long experience . . . of the strata.” He deduced that the reduced rate applying to the first eighty cubits indicated that originally

the oil bearing sand was . . . found at that depth and . . . only afterwards when the uppermost bed was exhausted did it become necessary to adopt a progressive scale, because it was not quite certain at what depth oil bearing sand would be met with again.82

This conclusion seems quite logical. Yet the increased cost could also relate to the fact that the deeper the well was sunk, the more dangerous the digging became, not only because of the well’s depth, but more especially because noxious carbon dioxide gas accumulated at the bottom of well shafts and could suffocate diggers.

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79 The Burney Papers — Series J: Supplements Series B, VI.
80 The size of the cubit appears to have varied. Here Noetling is measuring the cubit at 22 inches, but earlier writers give varying measurements. Previously Cox had given the measurement as 19 inches.
Where possible, the diggers tried to construct new wells near the crown of a hill, which was cut down to produce a flat platform about 13 feet by 20 feet. Next, an inclined pathway was built down the side of the hill. Then the wellhead was opened, usually being about 5.5 to 6 feet square. As the well was deepened, jointed frames were placed inside it to support the excavation. The excavated soil and debris were removed from the well shaft by means of an axe [which crossed] . . . the centre of the well resting on two rude forked staunchions [sic], with a revolving barrel on its centre, like the nave of a wheel, in which is a score for receiving the draw-rope; the bucket is of wicker work covered with dammer.

Workers holding the draw-rope would walk or run down the inclined pathway to draw the buckets of excavated material up out of the well. Later the same rope and pulley system would be used to lift buckets of the oil. The exact container used to send the excavated material to the surface varies from one account to the next. In the quotation above, Cox mentions a wicker work bucket. By Noetling’s day, earthenware pots were in use and were already being replaced by kerosene oil tins.

To the depth of 100 feet, the usual practice was for two diggers to be employed. Below that depth, because of the diminishing light, a single digger was used. The digger, minimally clad, and wearing a palm leaf cap as a protection from falling stones, was lowered by “a strong rope, which [ended] . . . in two slings” on which the digger sat after passing his legs through the slings. The digger usually closed his eyes or wore an eye bandage until his eyes became accustomed to the gloom. (Toward the end of the nineteenth century, light was directed to the digger by means of a mirror held above the well’s opening to catch the sunlight.) Upon reaching the bottom, the digger commenced working frantically, for, in

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83 Noetling, “Petroleum in Burma,” 164.
84 Cox, Journal, 34-37.
85 Cox, Journal, 36. “Dammer,” or damer, is a resin obtained from trees, especially in the southern parts of Asia, and is used as a colourless varnish.
87 Khin Maung Gyi, Memoirs, 3.

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Noetling's day, the digger could only remain at the bottom of the well for thirty to forty seconds.\textsuperscript{89} Below 100 feet, the digger was unable to communicate verbally with those on the surface, but an ingenious system of rope signals provided alternative communication.\textsuperscript{90} Usually a digger was limited to about twenty descents per day,\textsuperscript{91} hence the need for teams of diggers. Progress was slow, and a well could take over a year to be completed\textsuperscript{92}

Until 1896, wells were rarely deeper than 300 feet and never more than 320 feet. In 1896, a rude form of diving helmet was developed that pumped air directly to the digger from the surface. This invention allowed the wells to be deepened to 400 feet.\textsuperscript{93} Khin Maung Gyi has suggested that a native well of this depth could take one and a half to two years to dig.

The miners used various tools. Chief among them was a chisel-shaped piece of iron known as a \textit{tayuwen}, which was "fixed to a heavy club shaped wooden handle."\textsuperscript{94} The \textit{tayuwen} was grasped by both hands about the middle of the handle, while the upper notched end rested against the miner’s shoulder. Thus the miner was able to direct all his weight as he drove the pick into the strata.\textsuperscript{95}

When the diggers encountered hard strata, "a pear-shaped mass of iron about 150 lbs" was used.\textsuperscript{96} This was suspended over the mouth of the shaft by a thin rope passing over bamboo. The rope was then cut, and the iron weight crashed to the bottom, fracturing the sandstone. Two or three performances of this laborious process were sufficient for most hard beds.\textsuperscript{97}

\textsuperscript{89} Noetling, "Petroleum in Burma," 168-70.
\textsuperscript{90} Khin Maung Gyi, \textit{Memoirs}, 49.
\textsuperscript{91} Pascoe, "Oil-Fields of Burma," 75.
\textsuperscript{92} Khin Maung Gyi, \textit{Memoirs}, 3.
\textsuperscript{95} Noetling, "Petroleum in Burma," 165.
gives the weight at 150 lbs, but Aubert, "The Petroleum Wells," 119-20, suggests that the weight of these lumps was heavier at 60 viss (220 lbs).
\textsuperscript{97} Pascoe, "Oil-Fields of Burma," 76. Noetling, "Petroleum in Burma," 165, also describes the process.

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It is important to note that at Twingon and Beme the diggers did not have to deal with a water table intervening above the oil sands. The low water table was an important enabling factor, for, lacking modern machinery, the Burmese would have been unable to remove large quantities of water from the wells. In the Khodaung area between Twingon and Beme (later a prolific oil field), where there were no hand-dug wells, Cecil Barber believed that “a water-bearing sand occurred above the ‘Burmese Sands,’” and that for this reason the twinza were unable to extract the oil successfully.98

Rich as the fields were, well digging at Twingon and Beme was a hit-or-miss affair, as the diggers did not have the assistance of geologists. In 1855, Henry Yule pointed out this difficulty, noting that the investors’ “money might be thrown away, as a well dug within a few yards of others yielding a good supply often proves a failure.”99 Nevertheless, the twinzayo and twinza surmounted these difficulties, and the dark green Yenangyaung earth-oil supplied Burma, parts of India, and, as early as the 1850s, Price’s Patent Candle Company in London, a short-lived concern that intended to distill paraffin wax from Yenangyaung earth-oil for use in the manufacture of candles.100

The Success of Yenangyaung
Just how large was the industry’s production? Some of the figures that have been suggested are impossibly high. In 1797, Hiram Cox described an earth-oil industry comprised of 520 wells producing “92,781 tons, 1560 lbs., or 412,360 hogsheads.”101 As late as 1873, Captain G. A. Strover, the British Political Agent in Mandalay, suggested a production of “6,000,000 viss per annum or 9,375 tons,”102 which is equivalent to 25 tons a day. Regrettably, these

98 Barber, A Geologist, 156. The sands from which the hand-dug wells drew their earth-oil were known to later geologists and oil men as the Burmese Sands.
99 Yule, Mission, 21.
101 Cox, Journal, 43.

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fanciful figures have continued to appear over the years. The largest numbers appear in Anthony Reid’s 1988 work on early commerce in Southeast Asia, which claims, purportedly with support from Cox and Symes, that “the wells of Yenangyaung in Central Burma were producing several hundred tons a day in the eighteenth century.” None of these inflated figures are correct, as the wells were probably producing around 10 or 11 tons per day, perhaps even less.

When Noetling conducted his survey of the industry in 1888, he also assessed the figures given by earlier observers:

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Number of Wells</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1795</td>
<td>Colonel Symes</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>1797</td>
<td>Captain Cox</td>
<td>520</td>
<td></td>
</tr>
<tr>
<td>1826</td>
<td>Mr. Crawfurd</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>1838</td>
<td>Captain McLeod</td>
<td>160</td>
<td>Productive wells only</td>
</tr>
<tr>
<td>1855</td>
<td>Dr. Oldham</td>
<td>200</td>
<td>Ditto</td>
</tr>
<tr>
<td>1855</td>
<td>Captain Yule</td>
<td>130</td>
<td>Ditto</td>
</tr>
<tr>
<td>1873</td>
<td>Captain Strover</td>
<td>150</td>
<td>Ditto</td>
</tr>
</tbody>
</table>

Noetling considered that while the agreement between Symes’s and Cox’s figures of 500 and 520 wells respectively might seem “to speak for their correctness,” in fact the figures were grossly incorrect. There were two reasons for his belief. First, “none of the previous visitors had time enough to go through the tedious task of counting the wells one by one,” as he had done. Second, the results of his own survey challenged the earlier figures. He noted that in early

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104 Noetling, “Petroleum in Burma,” 175. Only a portion of the table is shown. The number of wells and production figures attributed to Michael Symes do not appear in Michael Symes, *An Account of an Embassy to the King of Ava in the Year 1795*, 2 vols. (Edinburgh: Constable & Co., 1827); perhaps they appear in his comprehensive report or in a more expansive earlier publication.

1891, 642 wells were in existence on the Yenangyaung fields. Of these, 130 wells had been dug since annexation, while another 120 wells (Mindo’s royal wells) were not older than 30 years. Therefore, fewer than 400 wells could have been dug before 1861, and some of those wells would have been unproductive.

Noetling was of the opinion that many of the statistics provided by earlier visitors included both productive and unproductive wells, although he considered both Yule’s and Dr Strover’s figures (see Table 1) to represent productive wells only. In 1888, the ratio of productive to unproductive wells was 53.4 to 46.5. Based on that ratio, Noetling estimated productivity retroactively as follows:

Table 2
Noetling’s estimates of productive and unproductive wells in the pre-colonial period

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Productive Wells</th>
<th>Number of Unproductive Wells</th>
<th>Total Wells</th>
</tr>
</thead>
<tbody>
<tr>
<td>1795-97</td>
<td>70</td>
<td>60</td>
<td>130</td>
</tr>
<tr>
<td>1826</td>
<td>107</td>
<td>93</td>
<td>200</td>
</tr>
<tr>
<td>1855</td>
<td>130</td>
<td>113</td>
<td>243</td>
</tr>
<tr>
<td>1873</td>
<td>150</td>
<td>130</td>
<td>280</td>
</tr>
<tr>
<td>1874</td>
<td>214</td>
<td>186</td>
<td>400</td>
</tr>
<tr>
<td>1885</td>
<td>245</td>
<td>289</td>
<td>538</td>
</tr>
</tbody>
</table>

Interestingly, the Burmese language notes in the Burney Papers (relating to the period 1830-37), which Noetling did not cite, give the number of oil wells as between 100 and 200. This figure roughly corroborates Noetling’s estimates.

In addition to questioning the number of wells, Noetling queried production, stating that it was “extremely difficult to obtain an accurate estimate of the average yield per well by relying on native information.” Crawford had made a similar complaint in 1826.

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106 Noetling, “Petroleum in Burma,” 175.
107 Noetling, “Petroleum in Burma,” 175.
110 The Burney Papers — Series J: Supplements Series B, VI.

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Table 3 shows Noetling’s compilation of the average daily yields reported by earlier visitors.

### Table 3
Noetling’s compilation of daily yields reported by earlier visitors

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Average daily yield (in viss)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1797</td>
<td>Captain Cox</td>
<td>300</td>
</tr>
<tr>
<td>1826</td>
<td>Mr. Crawfurd</td>
<td>235</td>
</tr>
<tr>
<td>1838</td>
<td>Captain McLeod</td>
<td>36</td>
</tr>
<tr>
<td>1855</td>
<td>Dr. Oldham</td>
<td>180</td>
</tr>
<tr>
<td>1855</td>
<td>Dr. Oldham, different estimate</td>
<td></td>
</tr>
<tr>
<td>1855</td>
<td>Captain Yule – Twingon</td>
<td>220</td>
</tr>
<tr>
<td></td>
<td>&quot; &quot; – Beme</td>
<td>40</td>
</tr>
<tr>
<td>1873</td>
<td>Captain Strover</td>
<td>100</td>
</tr>
</tbody>
</table>

Here again there are wide variations, but Noetling considered that “Captain Strover’s estimate seems fairly correct.”

T. A. B. Corley, using Noetling’s estimates, believes that production in 1795 (presuming no doubt that the yields reported by Strover would have been the same 80 years earlier) was 25,000 forty-gallon barrels. Based on 100 viss (365 lbs) being equivalent to a forty-gallon barrel, this would equate to 4,073 tons per annum or approximately 11 tons per day. Although nowhere close to Cox’s stupendous figure of 92,781 tons, this is still a remarkable level of oil production for 1795, a year that precedes the introduction of kerosene and the internal combustion engine. By comparison, Corley lists 1886 production, based on Burmah Company records, as 50,000 forty-gallon barrels, 48,000 of which were refined at the Burmah Oil Company refinery. The greater portion of this oil would have come from the hand-dug wells on the Yenangyaung fields.

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112 Crawfurd, *Journal*, 98.
113 Noetling, “Petroleum in Burma,” 194. Table slightly shortened.
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The first modern well was drilled at Yenangyaung in 1889, but hand-dug wells were still being used in the early twentieth century, at which time L. Aubert commented that new wells were being dug in the same manner as in the late eighteenth century. The only major change in procedure was the introduction, in 1896, of the helmet that pumped air directly to the digger and thereby facilitated the sinking of slightly deeper hand-dug wells.

**Monetary Value of Production**

The early English visitors made numerous efforts to estimate the value of Yenangyaung's oil production. Presumably there were wide variations, depending on supply and demand. Cox noted that "at the wells the price of the oil is seven anas seven pice, per 112 lbs. avoirdupois." This would equate to an approximate price of 1.6 kyat per 100 viss (40 gallons). Forty years later, the Burmese note in the Burney Papers stated that "there was no constant market price for the crude," which fluctuated between 2 and 8 kyat per 100 viss.

The British Burma Administration Reports for 1862-1877, summarized in Table 4, show the kingdom of Ava receiving an increase in revenue from oil exports to Lower Burma:

<table>
<thead>
<tr>
<th>Year</th>
<th>Weight in maunds (4.5 maunds = 100 viss)</th>
<th>Value in Kyats</th>
</tr>
</thead>
<tbody>
<tr>
<td>1862-63</td>
<td>93,223</td>
<td>3,19,897</td>
</tr>
<tr>
<td>1870-71</td>
<td>174,825</td>
<td>6,13,054</td>
</tr>
<tr>
<td>1871-72</td>
<td>141,330</td>
<td>5,72,769</td>
</tr>
<tr>
<td>1875-76</td>
<td>92,977</td>
<td></td>
</tr>
<tr>
<td>1876-77</td>
<td>189,620</td>
<td>12,13,017</td>
</tr>
</tbody>
</table>

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117 Corley, _Burmah Oil Company_, 36.
119 Cox, _Journal_, 44-45.
120 The Burney Papers — Series J: Supplements Series B, VI.
121 Report on the _Administration of Burma_ (1871-72), 17, 47, 48; and (.876-77), 104, quoted in Myint Myo, "The Politics of Survival," 237; MBK, _Burmah's Oil History_, 16.
While it must be remembered that only part of the kingdom’s production went to Lower Burma, the table can still be instructive. As can be seen, the increase in revenue was driven both by increases in production and by increases in market price, both of which stemmed in part from European interest in Yenangyaung crude. In 1858, an attempt was made to refine oil in Burma at Dunneedaw. This was a flow-on from Price’s Candle Company’s abortive venture on the oil fields. The collapse that year of the burgeoning export trade left local British merchants with large quantities of Yenangyaung crude on hand and they turned to refining the oil themselves. Greater demand for this oil was soon sparked by the development of the modern world-wide oil industry, which began when Drake’s well was dug in Pennsylvania in 1859. Though kerosene (paraffin oil) was already being distilled from petroleum, the Burmese oil industry would have benefited from the rising world demand after that date. In addition, export production doubled over this fifteen year period. The 120 royal wells believed to have been dug during Mindon’s reign would have added to the oil output, though it would appear that the twinza community was also able to increase production whenever a demand existed. Revenue was also boosted by price increases, as prices of earth-oil rose 279 percent from 1870-71 to 1876-77. Costs on the field would not have increased dramatically, but prices to consumers escalated due to the royal monopoly. As Mindon increased the purchase price to the “farmer,” the “farmer” in turn increased the wholesale price for the merchants.

Conclusion—The Reasons for Yenangyaung’s Success
Discussion of Yenangyaung’s pre-colonial earth-oil industry is often restricted to but a few lines in the books and journals that discuss Burma’s early industries. However, this extensive and highly organized industry was an impressive achievement. There were several reasons for Yenangyaung’s success. The first was that this industry was in the hands of a hereditary monopoly, the corporation of twinza, that was able to deny entry to outsiders. Though entry by purchase was sometimes allowed, the limited hereditary structure remained in place without diluting the corporation’s membership.

A second important ingredient was that the Burmese demand for local earth-oil was enhanced by the nature of local housing, the climate, and the reliance on boats as a major form of transport. The
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need to treat wooden building materials, the need to hold entertainments in the cool of the night, and the need for oil to caulk boats all contributed to local demand for oil, which was also used as a lubricant and for medical purposes. In China, by comparison, the rudimentary local oil enterprise failed to develop because there was insufficient demand “to trigger the emergence of a significant petroleum industry.” In that country the main uses of oil were, as in Burma, for lighting, as a lubricant, and as a medical remedy. In addition, the Chinese used oil as a carbon source for ink sticks. However, in China’s temperate climate, there was no need for earth-oil as a protection for timber housing. Also, in China no mention is made of using earth-oil to caulk boats.122

A third reason for Yenangyaung’s success was that, as in the modern oil industry, once the hand-dug wells were in place and in full production, costs decreased greatly. Wages were low, pottery was close at hand to provide containers, land transport by bullock carts was readily available, and merchant-exporters waited by the riverside to purchase the earth-oil for shipment along the vast Irrawaddy-Chindwin river network.

The fourth important reason was the proximity of the river. Without its ready availability as a means of mass transport, the industry could not have flourished to the extent it did. Finally, a minor point, but one that still benefited the industry, was that the hand-dug earth-oil did not ignite easily, and the oil’s high flash point allowed it to be transported safely throughout the country.

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Maung Htin Aung

MBK [Ba Kyaw?]

Myint Myo

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Pascoe, E. H.

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Shway Yoe [Sir James George Scott]
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