

THE ECOLOGY OF ANGKOR

Evidence from the Khmer inscriptions

This paper is based on an investigation into the resources of the Angkorian Khmers and their use of those resources, as evidenced on the Khmer inscriptions of the 7th to 14th centuries.¹ The results of this investigation have been elaborated slightly by means of general information taken from works on the modern Cambodian or South-east Asian environment (e.g. Delvert 1961; Fisher 1966) and by means of special information relating to plants, available in the works of Burhill (1935) and Martin (1971). This paper is divided into three parts: (i) A general introduction to the Angkorian environment as presented on the inscriptions; (ii) Specific introductions to each of the five lists given in the Appendix; (iii) The Appendix, consisting of five lists – 1. Plants; 2. Animals; 3. Minerals; 4. Products; 5. Terms of Measurement.

I

It is well to be forewarned about the kind of knowledge which may be expected from the Khmer inscriptions. Those written in Sanskrit are chiefly poetic praises of gods, kings and learned men. It is the inscriptions in Khmer which are useful to us as sources of information about everyday life. Facts have to be gleaned, nevertheless, from the nomenclature of places and persons as much as from direct references to plants, animals and commodities. The inscriptions record the good works of kings, nobles, Brahmins or lesser dignitaries, who founded new cults and gave gifts, consisting chiefly of land and *kñum*,² to existing religious foundations. The lengthier inscriptions give details, such as names and duties of the *kñum*, lists of other gifts and the location or size of the ricefields. Sometimes warnings are given of punishment in hell for those who hinder the work of the foundation and hopes of heaven for those who further the work.

The inscriptions tell us incidentally something of the organisation of the land and of the religious foundations. Cambodia was administered through a complex hierarchical system even in pre-Angkor times. That the complexities grew considerably in the Angkor period may be surmised from the increasing length of the 10th and 11th century inscriptions and from the accounts they give of legal disputes, taxes, death duties and so on. They indicate, too, that the work of founding and maintaining cults was taking place on a much larger scale. In the pre-Angkor period, for example, we read of gifts of existing villages, with ricefields and the *kñum* to work them. In the Angkor period, however, the founding of new villages is a very common practice. Influential families sent their younger members to acquire land for this purpose and to establish new cults. It was

an honour to be invited by the king to found a new village; failing such an invitation, one applied to the king oneself. Once a branch of a family was established in a new village, the right to that territory and the right to serve the king by sending him revenues from it was assured for the descendants of the founder. Large areas of land were thus being reclaimed from the forest. It was a regular practice to join together the lands and revenues of two foundations with different gods. Perhaps this was not so much a religious decision as a practical step towards the more economical organisation of an area.

We have little information about the internal organisation of the foundations. The Head of the monastery is occasionally referred to, being, for instance, on one occasion ordered by the king to put up an inscription. Of the monks themselves we hear surprisingly little, though sometimes the provision or cooking of their food is mentioned. It is about the *kñum* more than about any other category of person that we have detailed information. The majority of them were workers in the ricefields but there were other agricultural workers – fruit pickers, herdsmen, guards, working outside too. Within the precincts of the foundation were secretaries and cooks and – unless perhaps in these cases they did the actual work at home and brought their goods to the foundation – spinners, weavers and grinders of perfume. Within the temple itself were singers, dancers, musicians and ‘servants of the god’. The *kñum* were bought and sold, given to the foundation, counted, drafted to duties, brought up in the service of the foundation. Some were prisoners of war; some were members of tribes who had been brought from a distance. Most, however, seem to have been the people who lived in the area and who, when their services were offered by their master, continued to do the work which they had done before. In the Angkor period the *kñum* were usually on duty for the god during one fortnight in each month, that is either for the period of the waxing moon or for the period of the waning moon. During the other half of the month, we do not know whether they worked for their master on ricefields which he kept for his own use or for themselves. One master distinguished clearly between the lands and the *kñum* he retained and the ones he gave to the temple but he does not say what the *kñum* given to the god do in their fortnight off duty.

Concerning the destination of the rice produced by the *kñum*, many inscriptions are quite silent. One is helpful, however, recording as follows the purposes for which the rice was required: “one *liḥ* (capacity measurement) of rice for the morning offering, two cooked *liḥ* for the mid-day offering, a *liḥ* for the evening offering, a basket of rice for the New Year, a *liḥ* for the masters living in the *āçrama*, one *liḥ* for the sacred fire, a *liḥ* for the goddess Sarasvati, a *liḥ* for the almsgiving”. Another provides for specific persons: “The remains from the offering” – which seem to be easy to calculate! – “are to go to the inspector of the royal service (5 *liḥ*); the Venerable (2 *liḥ*); the guard of the store (1 *liḥ*); the keeper of the holy register (1 *liḥ*); and the officiating priest (6 *liḥ*). By putting together these and smaller bits of information, a comprehensive picture may be obtained. Each foundation required rice for offerings to the gods, for morning, mid-

day and evening offerings or for the first and eighth days of each fortnight. For the New Year a large offering was required. Rice was also needed to feed everyone connected with the foundation: the Superior, the guests, the officiating monks, the other monks, the other religious personnel, the persons studying in the *āçrama*, the *kñum* – all are mentioned in one inscription or another. The amount of rice which was going to be required was estimated exactly and the *kñum*, listed, often by name, to work on each ricefield or group of ricefields knew how much rice they had to produce per harvest, working during their prescribed fortnight throughout the seasons until some other edict affected them.

The inscriptions informed the local population of the size and exact position of the ricefields given to the foundation. In early pre-Angkor times it is sometimes stated that so many strips of riceland were given at a ricefield known by name, for instance at “Tamarind ricefield” or at “Egg-plant ricefield”. In other cases the location is indicated by reference to local place names, for example: “The extent of the god’s land is from the Spring to Cane Forest to Bees’ Wood to the *Tras Nhora* Pool” and so on. One landmark which occurs repeatedly in this kind of context is the reservoir, usually named as the reservoir of a particular chief. References in inscriptions to the construction of reservoirs are found here and there. Twice we read that “a reservoir was dug and an embankment constructed”. One reservoir was called the “high” one, another the “gravel” one and another the “stone” one. These scraps of information fall into place, however, in the light of Groslier’s studies of Angkor from the air (Groslier and Arthaud 1968) and of Professor’s Luce’s observations (Luce: 1940: pp.290-1) based on the fuller information contained in the Burmese inscriptions. Aerial photography over Angkor shows an extensive system of irrigation, depending on reservoirs at different levels connected to each other, so impressive as to provide the clue, in Groslier’s opinion, to the success of the Angkorian Khmers, the answer to their problem of feeding a huge population. And Delvert (1961) considers the Angkorian irrigation system to be far superior to any modern methods used by the Khmers. Luce (*loc. cit.*) tells us that in Burma there was a similar system and that it was a work of merit to dig a reservoir. Probably, therefore, when Khmer inscriptions use the term “reservoir of Chief X” to indicate the extent of riceland, they are recording the good work of Chief X and not simply that it was *his* reservoir.

Land other than riceland and cleared forest is often listed as being offered to religious foundations: forests, hills, lowlands (one named a “lowland with elephants”), gardens, plantations, orchards, pastures. Place names reveal other local features: watersmeet, mound, landslide, exposed roots of trees, etc. Man-made landmarks are found in place names too: bird-trap, boundary mark, causeway, dyke, fishery, path, road, village, wall.

II

The lists given in the Appendix are introduced individually below. It

should first be mentioned that place names and personal names provide many contributions to these lists, especially to lists 1 and 2. Place names sometimes consist entirely of a plant or animal name, e.g. Fig-trees. More usually, they are composed of a word denoting a geographical or man-made local feature plus a plant or animal home, e.g. Eugenia Ricefield, Citrus Reservoir, Cotton-tree Forest, Shell-fish lake. Personal names for officials tended to be Sanskrit and not connected with plants, animals or everyday matters. Most of the *kñum*, however, had Khmer names, the majority of which either described a characteristic of the person or were names of plants, animals or objects of daily use.

List I: Plants (Appendix, p. 289).

Martin (1971) comments that right up to the 20th century the majority of Cambodian people turned to the plants around them for almost all the materials of life: for building, clothing, food, medicine, implements of all kinds and for the perquisites of religion and magic. She adds that in such circumstances man respects the plant, taking only what he needs. Many trees have multiple uses in the countryside, which are unknown to townspeople. There is, for example, the variety of cane which is edible; the use of the heartwood of the tamarind to make magic boxes; the procedure of rinsing the hair with the juice of the *Randia dasycarpa* fruit. Some uses, one feels sure, must go back to Angkorian times; the use of the rough leaves of the *Streblus asper* to polish shells or of *Mariscus* for weaving mats. One is struck by the great number of trees of which the flowers are edible: for instance, *Dipterocarpus obtusifolius* a tree in connection with which one might think only of the reasonable quality of its timber.

Plantations of areca and coconut palms were frequently given to religious foundations in the Angkor period. Areca and betel have in the past been basic necessities of Cambodian daily life, being not only the source of a pleasant creature comfort and an excellent gift but also a necessary preliminary to the arrangement of a marriage and, most important of all, a proper offering to the gods. The coconut palm has many uses apart from its use as a food. Silk scarves are washed in its milk, for example, and its leaves are used for many temporary constructions such as the triumphal arch.

Many Angkorian place names are concerned with the mango and the Bael fruit. The former is thought to be of South East Asian origin, unlike many plants (sorghum millet or, sesame, for instance) which are considered to have come via the Sabbaean Lane from Africa to India and South East Asia. The Bael fruit tree or Malabar Orange, which was sacred to Çiva, has a fruit which is eaten in other countries but not, according to Martin, in Cambodia.

Turmeric, which occurs as a place name, is used in Cambodia both as a condiment and to make a yellow cosmetic powder and a dye for mats. The plant *Sesbania javanica*, which gives its name to a lake mentioned in the inscriptions, produces its yellow flowers just as the floods subside. It has

been a custom for Cambodians to set off in flotillas of boats on an auspicious day when these flowers are just above the water-level. Ahead of them goes a boat in which there is a bowl of batter and a pan of hot fat. The flowers, dipped in the batter and cooked in the fat, are left on the trees so that the pancakes on trees may be collected by those following behind!

Among personal names are Cardamum and Mulberry. In the comparatively recent past the tribal people living in the Cardamum Hills foraged for cardamum and aloe wood, going on long and quite hazardous expeditions, making offerings to the gods before they went and after their return. Their crop was then sold at an annual fair down in the plains. Cardamum is used medicinally, its use as a seasoning has died out. The name Mulberry suggests silk weaving. This art, which would have come to the Khmers from China, never developed well in Cambodia. The reason is given that, as good Buddhists they did not wish to take the lives of the silk worms!

List 2: Animals (Appendix, p. 293).

Gifts to the religious foundations included cows and buffaloes, with a few goats occasionally. The right to let pigs forage in ricefields is mentioned once. Place names are occasionally composed entirely of the animal name, e.g. Otters, Kites, Shrimps. Forests are named after tigers, pythons, bees; rivers after crocodiles and wild boar. Lakes are named Tortoise, Crane and Leech; and hills are called after lizards and ants. There is an Elephant Waterfront, a Deer Park and a Buffalo Reservoir. Names of *kñum* include those of many wild animals but not of domestic animals.

List 3: Minerals (Appendix, p. 295).

Long lists of precious objects of gold and silver, often set with scores of pearls, dozens of sapphires or with rubies and other gems, are found in the inscriptions. Some were intended as offerings to a particular god, some were to be temple treasure and some were for ritual purposes. Among them are crowns, bracelets, anklets, rings, earrings, chains and shoelaces. Objects of practical use include a gold palanquin, a "large Chinese mirror" and numerous trays, pitchers, bowls, cups, candlesticks and fly-swatters made of silver, copper, bronze and iron. Perhaps the Chinese mirror was traded for the hides, horns or perfume which Cambodia traditionally exported to China.

The Angkorian Khmers may have obtained gold and silver roughly 250 miles north-east of the Tonle Sap, in modern North Vietnam. Malaya also has gold. Jewels have been found at Pailin in north-west Cambodia. Tin is mentioned rarely, using a Sanskrit term; this metal is also present in North Vietnam, in Thailand and in Malaya. Iron is to be found at Kompung Thom (part of the Angkor kingdom, just south-east of the Tonle Sap) where there are villages which have the tradition of making iron rims for

cart-wheels. There is also plenty of iron in present-day Thailand. In Bati, South of Phnom Penh, traditional ironwork has been concentrated on the making of weapons. Production of silverwork, in the shape of cups, betel boxes and, in the 20th century, cigarette packet covers, has been a local craft in certain villages for as long as can be remembered. Copper has still been used in modern times to make funeral urns, cooking pots, bells and bowls for the rice offered to monks.

List 4: Products (Appendix, p. 295).

Many items of food are recorded as gifts to foundations, among them beans, sesame and sorghum millet. Certain items, ginger, honey and syrup, were used to make a ritual food. Ghee was also used ritually, herds of sacred cows being kept for this purpose. One inscription is entirely concerned with a particular herd, the upkeep of the cowsheds and the distribution of the ghee.

It is astounding how few references there are to fish in a country which surely holds some world record in that connection. Once or twice a fishery is mentioned – using a Sanskrit loanword! One person is “sent to catch fish” and one injunction “not to eat the fish from here” is recorded. But we must imagine that the flooding Tonle brought as many fish into the Great Lake then as now, just waiting to float down into the fish-traps contrived of creeper, bamboo and branches as the current changed and the water receded.

The distribution of salt is the subject of a short inscription of the Phnom Penh area in pre-Angkor times. The salt arrived in boats, possibly from the same part of the west coast, the Kampot district, where salt has been produced in modern times, and was sold to buyers who no doubt came by boat too, since the waterways were the chief means of transport in ancient times.

Water is listed, since the provision of it was important enough to be mentioned. “Two buckets of water at every watch” were to be provided, according to one inscription, presumably to be brought from a well or pool. In a large area of central Cambodia, even at 35 feet down, the water is not drinkable and rainwater is collected in specially constructed reservoirs.

Among substances other than foods, cloth is mentioned on inscriptions more often than any other and almost always as payment for land. Although not very much was needed actually for wearing, or for soft furnishing, in a climate which is only chilly at night for part of the year, still cloth was greatly prized. Chou Ta-kouan (1967), Chinese envoy to Angkor, tells us that, after gold and silver, the commodity next in value was cloth of a certain kind: figured silk with double thread. Tinware came next on the list, he tells us, followed by “double-woven” silks. Materials from abroad, from India, Siam or Champa, were highly valued. A length of “royal” cloth was valued at three or four ounces of gold. In the texts of the inscriptions there are many names of different kinds of cloth, few of

which mean anything now. The terms of measurement are also obsolete. All that we can understand is that “double” cloth is referred to and that wool (Sanskrit *kambala*) is mentioned. “New” cloth is said one to be part of the price paid for land but whether it was cloth of a new style or cloth which was unused is hard to determine.

Perfume was a sacred commodity and highly valued. There are references to “guards of the holy perfume”. *kñum* have the duty of grinding perfume. Gifts to foundations included perfume and containers for perfume. Not a word is said about the actual scent! In modern times ylang-ylang, frangipani and citronella have been used.

The list of utensils does not cover all the valuable objects given to the foundations, many of which were connected with ritual; it consists of ordinary utensils. One inscription, for instance, mentioned the gift of 500 axes and 300 levers.

List 5: Terms of Measurement (Appendix, p. 297).

The inscriptions are concerned with measurements chiefly in connection with the size of ricefields; the amount of silver, cloth or paddy used in exchange for the ricefields; and the quantities of commodities such as beans, sesamum, honey or wax provided for a foundation. Riceland is measured in several different ways: by length; by area, using both Khmer and Sanskrit terms; by the amount of seed needed to sow it, again using both Khmer and Sanskrit terms and finally apparently in feet (*pāda*), though the term may perhaps be best translated as “piece” since there is usually only one *pāda* of riceland. The practice of measuring ricefields by sowing capacity was common in India and Burma and probably in other parts of South East Asia.

In connection with measurements of length and dry capacity, a disconcerting habit of omitting the term for the larger measurement is found on the inscriptions, e.g. “riceland, 6 and 3 thlās”. For weight measurements, Sanskrit *bhāra* and *tula* are mixed with Khmer *jyāñ* “balance” and *līn* “ounce”. Other Khmer terms which are understandable are the length measurement, *vlah* “double”; the area measurement *sare/sanre*, an infixed derivative of *sre* “ricefield”; and the dry capacity measurement *je* probably related to Modern Khmer *kañj* “60-litre basket”. The word for a fluid measure, *anton*, now means a “well”.

Many of the statements about measurements on the inscriptions are involved with the exchange values of the land or commodities. There were no fixed prices in ancient Cambodia. The goods offered by a buyer or claimed by a seller were presumably the object of as much Oriental bargaining then as now. The dignitary who urged local squires to give up riceland to the foundation as part of his (the dignitary’s) work of merit had to give to each squire individually acceptable barter. The goods which are recorded as being given are gold (in ounces); objects worked in silver, copper or tin; jewellery; cloth; practical objects such as a cart, blocks of laterite, a quantity of husked rice; and in one case a large quantity of alcohol. Payment

includes “the right to let goats graze on the embankments” and “the right to let pigs look for food in the ricefield”.

Some idea of relative values may be obtained by considering the cost of a few *kñum* and comparing the result with the cost of ricefields. Chou Ta-Kouan (1967) tells us that the rate for a strong young slave captured from the hills and destined to belong to a private family was 100 pieces of cloth. If we keep to temple prices, we have several records of barter given for a female *kñum*: 20 measures of paddy for one, a spittoon for another, a buffalo for a third. A buffalo is exchanged on one occasion for 5 ounces of silver and on another for 41 measures of paddy. For a buffalo one could also buy a modest ricefield. Another modest ricefield is valued at two women and some cloth.

These simple transactions are the usual procedure. In one or two cases, however, although the riceland is evaluated in terms of silver and cloth, the actual payment is made in paddy to the value of that silver and cloth.

NOTES

1. i.e. any appropriate information to be found in the pre-Angkor inscriptions of the 7th and 8th centuries was incorporated with that from the inscriptions of the Angkor kingdom.
2. *kñum* might be translated as “slave” since these workers were bought and sold or as “serf” in so far as they were tied to the land which was given to temples but, since they carried out the work of the gods, are listed with name and title and include workers who are actually in the temples, the complex term is left untranslated.

REFERENCES

- Burkill, I.H. 1935. *A dictionary of the economic products of the Malay peninsula*. London: for S.S. & F.M.S. Governments by Crown Agents for the Colonies.
- Chou, Ta-Kouan 1967. *Notes on the customs of Cambodia* (trans.) J.G. D’Arcy Paul. Bangkok: Social Science Association Press.
- Coedès, G. 1937-66. *Inscriptions du Cambodge. 1-8*. Hanoi & Paris: Éc. fr. Extr.-Orient.
- Delvert, J. 1961. *Le paysan Cambodgien*. Paris: Mouton.
- Fisher, C. A. 1966. *South-east Asia. A social, economic and political geography*. (2nd edn). London: Methuen.
- Groslier, B.P. & J. Arthaud 1968. *Angkor*. London: Thames & Hudson.
- Luce, G.H. 1940. The economic life of the early Burman. *J. Burma Res. Soc.* 30, 283-335.
- Martin, M.A. 1971. *Introduction à l’ethnobotanique du Cambodge*. Paris: Centre National de la Recherche Scientifique.

APPENDIX
LISTS OF PLANTS, ANIMALS, MINERALS, PRODUCTS AND
TERMS OF MEASUREMENT COLLECTED FROM THE
INSCRIPTIONS IN KHMER

Key to appendix

i) Abbreviations used:-

OK	Old Khmer
MK	Modern Khmer
Skt.	Sanskrit
N	Personal name

ii) Key to translation of vocabulary of OK place names:-

Words used in the lists are given here with the OK or Skt. word which they translate and with the MK form of the word, if it is relevant.

cok Translated “bosquet” by C. Coedès.

chok Not identified.

corner *mum*, MK *mum*.

dam *damnap*, MK *damnap*'.

forest *vrai*, MK *brai*.

God *vrah*, MK *brah*.

grassy area *tarañ*, MK *trāñ*'.

headland *jaroy*, MK *jroy*.

hill *vnur*. MK *phnūr* or Skt. *sthalā*.

irrigation canal *pralāy*, MK *pralāy*.

lake *stuk*, *pvār*, MK *buə*.

low place *jeñ*, MK *jñ* “foot”.

orchard *damriñ*, MK *dryñ* trellis.

park *cpar*, MK *cpār*.

place *tpal*, MK *tampan* (translated by G. Coedès as “thicket”).

place name. This indicates that the name of a plant or animal occurs alone as the name of a place.

reservoir *travāñ*, MK *trabāṃñ*.

ricefield *sre*, MK *sre*.

space *lvāñ*.

stream *canhvar*, MK *cañhūr*.

village *sruk*, MK *sruk* "inhabited area" or Skt. *bhūmi*.

waterfront *kamvañ*, MK *kambañ*'.

LIST 1: PLANTS

Aegle marmelos (L.) Corrêa (Rutaceae). Bael fruit or Malabar orange. *vinau*, MK *bhnau*. Hill, place, reservoir, village.

Azelia xylocarpa Craib (Caesalpinaceae). *peñ*, MK *peñ*. Place name.

Aganonerion polymorphum Pierre ex Spire (Apocynaceae). *thniñ*, MK *thnuñ*. Forest.

Alpinia galanga (L.) Willd. (Zingiberaceae). Greater Galangal or Siamese ginger. *ramtyañ*, MK *ramteñ*. Lake.

Alstonia scholaris R. Br. (Apocynaceae). Skt. *saptaparṇa*. Place name.

Amomum kravanh Pierre ex Gagnep. (Zingiberaceae). A cardomom, *kravañ*, MK *kravāñ*'. N.

Anisoptera scaphula (Roxb.) Pierre (Dipterocarpaceae). *phtyāk*, MK *phtiak*. God.

Anthocephalus chinensis (Lam.) A. Rich. ex Walp. (Rubiaceae), *thkū*, MK *thkūv*. Place name, lake, dam.

Aporusa sphaerosperma Gagnep. (Euphorbiaceae). *grañ*, MK *grañ*'. Ricefield.

Areca catechu L. (Arecaceae) (Palmae). Areca palm, Betel nut. *slā*, MK *slā*. Lake, irrigation canal, plantations given.

Artocarpus heterophyllus Lam. (Moraceae). Jackfruit, *jak*. *knur*, MK *khnur*. N.

Averrhoa carambola L. (Averrhoaceae) (Oxalidaceae). Carambola, carambolier. *svī*, MK *sbū*. Village.

Azadirachta indica A. Juss. (Meliaceae). Margosier, nim. *stau*, Mk *stau*. N.

Baccaurea sapida Muell. - Arg. (Euphorbiaceae). *phñau*, MK *phñiäv*. Ricefield.

Bambusa spp. (Bambusaceae/Gramineae-*Bambusoidea*). Bamboos. *ransi*, MK *russī*. Lake, *cok*.

Benincasa hispida (Thunb.) Cogn. (Cucurbitaceae). Wax gourd. *tralāc*, MK *tralāc*. Part of place name.

- Bombax ceiba* L. (Bombacaceae). Cotton-tree. *rakā*, MK *rakā*. Forest, place name.
- Borassus flabellifer* L. (Palmae). Sugar palm, Palmyra palm. *tuñnot*, MK *tnot*. Lake, village, *cok*, *chok*.
- Brassica chinensis* L. var. *brassicata* (Lour.) Burk. (Cruciferae). Chinese cabbage, pak-choi cabbage. *svai*, MK *sbai*. Gift.
- Calamus viminalis* Willd. (Palmae). Cane. *ptau*, MK *ptau*. Forest, ricefield.
- Citrullus lanatus* (Thunb.) Mans. (Cucurbitaceae). Water melon. *anlik*, MK *ūlik*. N.
- Citrus* spp. (Rutaceae). Citrus fruit trees. *kroc*, MK *krūc*. Reservoir, ricefield, stream, place name.
- Cocos nucifera* (Palmae). Coconut palm. *toñ*, MK *tūñ*. Gift, consisting of plantation.
- Colona auriculata* Craib (Tiliaceae). *vrāl*, MK *brāl canloḥ*. Stream, *chok*.
- Combretum quadrangulare* Kurz (Combretaceae). *sanke*, MK *sanke*. Headland, ricefield, space, *chok*, place name.
- Commelina communis* L. (Commelinaceae). *kanteñ*, MK *kañtiñ*. Place name, N.
- Corypha* sp. (Palmae). *cāk*, MK *cāk*. N.
- Croton joufra* Roxb. (Euphorbiaceae). *tañvuñ*, *tañvvañ*, MK *dambūñ*. Forest.
- Cucumis sativus* L. (Cucurbitaceae). Cucumber. *trasok*, MK *trasak'*. N.
- Cucurbita maxima* Duch. (Cucurbitaceae). Pumpkin. *rvau*, MK *Ibau*. Reservoir.
- Curcuma longa* L. (Zingiberaceae). Turmeric. *rmyat*, MK *ramiət*, *lamiət*. Forest.
- Dalbergia* aff. *cochinchinensis*. Pierre ex Laness. (Leguminosae). *grañvañ*, MK *krañūñ*, *krañuñ*. Reservoir.
- Desmodium gangeticum* (L.) DC. (Leguminosae). *guha* (identification of G. Coedès). Reservoir.
- Diospyros* sp. (Ebenaceae). *tañko*, MK *tañko*. Hill, place name.
- Diospyros hermaphroditica* (Zoll.) Bakh. *vleñ*, MK *jhx bhlyñ* Part of N.
- Dipterocarpus intricatus* Dyer (Dipterocarpaceae). *trāc*, MK *trāc*. Reservoir, lake.
- Dipterocarpus obtusifolius* Teijsm. (Dipterocarpaceae). *tpeñ*, MK *tpeñ*. Forest, ricefield.

- Dipterocarpus tuberculatus* Roxb. (Dipterocarpaceae). *khluñ*, MK *khluñ*.
Lake, hill, orchard, reservoir.
- Elaeococca vernicia* (Euphorbiaceae). *cār*, MK *cār*. Headland.
- Entada* sp. (Leguminosae). *aṅgañ*, MK *aṅguñ*. Place name.
- Erythrina orientalis* Merr. (Leguminosae). *raṃnlvas*, *rahuəs*. Forest.
- Feroniella lucida* (Teijsm. et Binnend ex Scheff.) Swingle (Rutaceae).
krasañ, MK *krasaṃñ*. Reservoir, place.
- Ficus* sp. (Moraceae). Fig. *lvā*, MK *lvā*, ricefield, and *jrai*, MK *jrai*, village,
river, garden, place name.
- Ficus* sp. (Moraceae). *kantrāñ* (*kan* is a name prefix), MK *trāñ*. N.
- Ficus religiosa* L. (Moraceae). peepul or bo-tree, bodhi tree. *vo*, MK *bodhi*.
Headland.
- Garcinia merguensis* Wight (Guttiferae). *santān*, MK *sañtān'*. N.
- Gossypium arboreum* L. (Malvaceae). Cotton. *krapās*, MK *krapās*, *kappās*.
Forest, place. Grass (Gramineae). *Smau*, MK *smau*. N. Mentioned as
being looked after at a temple.
- Hopea odorata* Roxb. (Dipterocarpaceae). *gargyar*, MK *gagī*. *chok*.
- Hydnocarpus anthelmintica* Pierre ex Laness. (Flacourtiaceae). False
chaulmoogra, Lukrabo, Ta-Fung-Tsze seeds. *krapau*, MK *krapau*.
Ricefield, forest.
- Hymenocardia wallichii* Tul. (Hymenocardiaceae). *viñvneñ*, MK *bhnam*
bhneñ. Lake, reservoir.
- Imperata cylindrica* (L.) P. Beauv. (Gramineae). Lalang. *chpū*, MK *spūv*.
Reservoir.
- Ipomoea aquatica* Forssk. (Convolvulaceae). Water bindweed. *trakvān*,
MK *trakuən*. *chok*.
- Irvingia malayana* Oliv. ex Benn. (Ixonanthaceae). *campok*, MK *campak'*.
Waterfront, hill. N. of God.
- Kaempferia pandurata* Roxb. (Zingiberaceae). *kajāy*, MK *khjāy*. N.
- Lagerstroemia floribunda* Jack. (Lythraceae). *trapek*, MK *trapek*. Lake,
reservoir, forest, *chok*.
- Lemna minor* L. (Lemnaceae). *cak*, MK *cak*. *lanlan* (> MK *anlan'*, watery
hollow, deep place in bed of river, lake, etc.)
- Mangifera* sp. (Anacardiaceae). Mango. *svāy*, MK *svāy*. Lake, reservoir,
dam, river, grassy place, space, *chok*.
- Mariscus* sp. (Cyperaceae). *kak*, *kok*, MK *kak'*. Lake.

- Melientha suavis* Pers. (Opiliaceae). *vrac*, MK *brec*. River, stream.
- Melodorum schefferi* (Pierre ex Finet ex Gagnep. (Anacardiaceae). *trel*, MK *trial* N.
- Memecylon edule* Roxb. var. *scutellata* C.B. Clark in Hook. (Memecylaceae). Scutula tree. *vlañ*, *vloñ*, MK *phluñ*. Reservoir, village.
- Merremia hederacea* (Burm f.) Hallier f. (Convolvulaceae). *ta-ek*, MK *t-yk*. N.
- Mitragyna brunonis* (Wall. ex. G. don.) Craib. (Naucleaceae ~ Rubiaceae). *kadamva*, MK *khdam*. River, lake, reservoir.
- Morus australis* Poir (Moraceae) Mulberry. *mon*, Mk *man*. N.
- Musa* spp. (Musaceae) Banana. *cyak*, MK *cek*. Ricefield, God.
- Myristica fragrans* Houtt. (Myristicaceae). Nutmeg. Skt. *jātiphala*. Gift.
- Niebuhrria siamensis* Kurz *ceñ*, MK *ceñ*. Marks place where boundary stone is laid.
- Oriza sativa* L. (Gramineae). Rice, paddy. *sru*, MK *srūv*; given as barter. Wild rice. *mo*, MK *muə*; N.
- Pandanus pierrei* Martelli. (Pandanaceae). *rañcyak*, MK *rañcek*. Reservoir, stream.
- Peltophorum dasyrachis* (Miq.) Kurz (Leguminosae). *trasek*, MK *trasek*. N.
- Pentacme siamensis* (Miq.) Kurz. (= *Shorea siamensis* Miq.) (Dipterocarpaceae). *rāñ*, MK *rāmn*. Hill.
- Phaseolus aureu* Roxb. (Leguminosae). Mung. *santek*, MK *santek*. Gift.
- Phyllanthus acidus* (L.) Skeels (Euphorbiaceae) Malay gooseberry. *kañdvat*, MK *kantuət*. God, hill, reservoir.
- Piper betle* L. (Piperaceae). Betel. *añlo*, MK *mlū*. Gift.
- Piper nigrum* L. (Piperaceae). Black pepper. Skt. *marica*, MK *mrec*. N.
- Pterocarpus* sp. (Leguminosae). *dnañ*, MK *dhnañ*. Hill.
- Randia dasycarpa* (Kurz) Bakh. f. (Rubiaceae). *ravyañ*, MK *raviəñ*. Hill.
- Ricinus communis* L. (Euphorbiaceae). Castor-oil plant. *lhañ*, MK *lhuñ preñ*. (*preñ* 'oil') Forest.
- Saccharum officinarum* L. (Gramineae). Sugar cane. *añvau*, MK *añbau*. N.
- Santalum album* L. (Santalaceae). True sandalwood. *candana* Skt., MK *cand*. Gift, N.

- Sesamum indicum* L. (Pedaliaceae). Sesame. *lño*, MK *lña*. Provision.
- Sesbania javanica* Miq. (Leguminosae). *sno*, MK *sno*. Lake.
- Shorea obtusa* Wall. ex Blume (Dipterocarpaceae). *phcik*, MK *phcuk*. Hill.
- Sindora siamensis* Teijsm ex Miq. (Caesalpinaceae). *kukah*, MK *kakoh*, *krakoh*. Hill, N.
- Solanum melongena* L. (Solanaceae). Egg-plant. *trap*, MK *trap'*. Ricefield, N.
- Sorghum vulgare* Pers. (Gramineae). Millet, guinea corn. *tvau*, MK *thbau*. Provision.
- Sterculia foetida* L. (Sterculiaceae). *saṃroñ*, MK *saṃroñ preñ*. (*preñ* 'oil'). Place, village.
- Streblus asper* Lour. (Moraceae). *suññāy*, MK *snāy*. Place.
- Syzygium* (Myrtaceae). Eugenia. *vryañ*, MK *brñ*. Ricefield, space, corner, lake.
- Syzygium zeylanicum* (L.) DC. (Myrtaceae). *smac*, MK *smāc'*. Forest.
- Tamarindus indica* L. (Leguminosae). Tamarind. *aṃvil*, MK *aṃbil*. Ricefield, hill, lake, reservoir, place, N.
- Terminalia* sp. (Combretaceae). *tao*, MK *t-uə*. N.
- Terminalia alata* Heyne ex Roth (Combretaceae). *jlyak*, MK *jhlik*. Village.
- Vitex pubescens* Vahl (Verbenaceae). *valvval*, MK *babul*. Place name.
- Zingiber cassumunar* Roxb. (Zingiberaceae) Ginger. *vanli*, MK *banlai*, Gift.
- Zingiber officinale* Rosc. (Zingiberaceae) Ginger. Skt. *ṣunthī*. Provision.
- Zizyphus mauritiana* Lam. (Rhamnaceae). Indian jujube. Skt. *vadarā*, MK *budrā*. Reservoir.

LIST 2: ANIMALS

a) Domestic animals

- buffalo, *krapi*, MK *krapī*, gift.
- cow, *tmur/go*, MK *go*, gift.
- elephant, *tamre*, *tamrya*, MK *tamrī*, gift.
- goat, *vave*, MK *babē*, N., gift.
- horse, *aseh*, MK *seh*, N., gift.
- pig, *jr vak*, MK *jrūk*.

b) Wild animalsi) *Mentioned as Place names*

- ant, *sramoc*, MK *sramoc*, hill.
 bee, *gmum*, MK *ghmum*, forest.
 crane, *kryel*, MK *krial*, low place, lake.
 crocodile, *krave*, MK *kraby*, river, reservoir, lake.
 deer, *pares*, MK *prvs*, park.
 elephant, *tamre*, *tamrya*, MK *tamri*, waterfront.
 fish, (Var.) *krāñ*, MK *krāñ'*, lake.
 kite, *khleñ*, MK *khleñ*, place name.
 leech, *jeñ*, MK *jhlvñ*, lake.
 lizard, *jās*, MK *jās*, hill.
 otter, *bhe*, MK *bhe*, place name.
 pig, *jrvek*, MK *jrūk*, river.
 python, *ilan*, MK *thlān'*, forest.
 roebuck, *rmāñ*, MK *ramāññ*, lake.
 shell-fish, *kyañ*, MK *khyañ*, hill, lake reservoir.
 " " (helicoidal) *kcau*, MK *khcau*.
 shrimp (freshwater), *kamvrs*, MK *kambus*, lake.
 tiger, *klā*, MK *khklā*, forest.
 tortoise, *antek*, MK *antvk*, lake.

ii) *Mentioned as personal names*

- Barbus macrolepidotus*, *kambho*, MK *kambha*.
 beetle (Var.) *kanlañ*, MK *kanlañ'*.
 cat, *cmā*, MK *chmā*.
 civet-cat, *saṃvoc*, MK *samboc*.
 cockroach, *kanlat*, MK *kanlāt*.
 crab, *ktām*, MK *ktām*
 crow, *kan-ek*, MK *k-ek*.
 dog, *cke*, MK *chke*.
 eel, *aṇḍaṇ*, MK *andañ'*.

egret (black wings, white throat), *kantrəm*, MK *kantrum*, *trum*.
fish (Var.), *kañcus*, MK *kañcuḥ*.
gibbon, *kandoc*, MK *doc*.
Gracupei nigricollis, *graliñ-graloñ*, MK *graleñ-graloñ*.
jay, *kandehv*, MK *diäv*.
maggot, *tañku*, MK *tañkūv*.
monkey, *svā*, MK *svā*.
mouse, *kantur*, MK *kañtur*.
numbfish, *kajiñ*, MK *khjuñ*.
otter, *bhe*, MK *bhe*.
owl, *duy*, MK *diduy*.
pigeon, *prāp*, MK *brāp*.
tadpole, *kanat*, MK *k-āt'*.
tick, *tañker*, MK *tañke*.
vulture, *tmāt*, MK *tmāt*.
wasp, *srāñ*, MK *srāññ*.
weasel, *clak*, MK *chlak*.

LIST 3: MINERALS

bronze, *saṃrit*, MK *saṃriddh*.
copper, *laṅgau*.
gold, *mās*, MK *mās*.
iron, *tək*, *ṭek*.
jewel, stone, *tmo*, MK *thma*.
laterite, *thmo pāy*, *tmo aleñ*, MK *thma pāy kriəm*.
silver, *prak*, *prāk*, MK *prāk'*.
tin, *trapu* (Skt.).

LIST 4: PRODUCTS

a) Foods specifically mentioned
beans, *santek*, MK *sañtek*, gift.
brassica, *svai*, MK *sbai*, gift.

coconut, *toñ*, *tvañ*, MK *tūñ*, gift.
 curds and whey, *dadhi* (Skt.).
 fish, *tr*, MK *trī*.
 fruit-juice, *phalodaka* (Skt.).
 ghee, *ghṛta*, (Skt.).
 ginger (*Zingiber cassumunar*), *vanli*, MK *banlai*, gift
 " (*Zingiber officinale*), *ṣunthi* (Skt.), gift.
 honey, *gmuṃ*, MK *duk ghmum*, gift.
 husked rice, *rañko*, MK *añkar*, gift, barter.
 mango, *svāy*, MK *svāy*, gift.
 milk, *ksīra* (Skt.).
 molasses, *gūda* (Skt.).
 nutmeg, *jātiphala* (Skt.).
 oil, *paryyañ*, MK *preñ*, gift.
 paddy, *sru*, MK *srūv*, barter.
 salt, *ampel*, MK *ampil*.
 sesame, *lño*, MK *lña*, gift.
 sorghum millet, *tvau*, MK *thbau*, gift.
 syrup, *narñor*, MK *rañū*, gift.
 water, *dik*, MK *duk*, provision.

b) Substances other than foods, specifically mentioned as being used, unless otherwise stated.

bricks, *it*, MK *iṭṭh* (Skt. *iṣṭa?*), MK *iṭṭh*.
 camphor, *bhimasena* (Skt.).
 carbon, *dyoñ*, MK *dhyūñ*.
 cloth, *canlek*, *canlyak*, MK *samlīak*.
 gum benzoin, *kaṃyān*, MK *kaṃñān*, N.
 perfume, *danhum*, (MK *dhum*, "smell" v.)
 unguent, *lepana* (Skt.).
 wax, *kalmon*, MK *kramuən*.

c) Utensils of everyday use.

These objects are mentioned as being gifts or as being used, apart from those shown as occurring as names.

axe, *tiñ*, MK *tuñ*.

basket, *je*, MK *kañjv*.

" (small) *uy*, MK *uy*, N.

boat, *dok*, MK *dūk*.

bowl, *bhājana* (Skt.).

box, *tanlāp*, MK *tanlāp'*.

burner for perfume, *canhoy*, (MK *camhuy* "cook by steaming").

candle, *den*, MK *diən*.

cart, *rdeh*, MK *radeh*.

club, *raṇamaraddhana* (Skt.).

cooking pot, *kadāha* (Skt.). , MK *khdāh*.

dish for sauce, *uden*, MK *ūduun*. N.

hut, *kdam*, MK *khdam*.

joss-stick, *dhūpa* (Skt.), *dhūp*.

knife, *kañcet*, MK *cet*, N.

ladle, *ahvek*, MK *vek*.

lamp, *dīpa*, (Skt.).

lever, *jleñ*.

needle, *añjul*, MK *mjul*, N.

pitcher, *kalaça* (Skt.).

press, *suti* (Skt.).

spittoon, *padigaḥ*.

stick, *tampoñ*, MK *tampañ*.

taper-holder, *valvel*, MK *babil*.

tray, *svok*, MK *sbak*.

LIST 5: TERMS OF MEASUREMENT

Terms are presented in the order large to small.

a) Length: of cloth:- *yau*, *vlah* (MK *bhlah* "twin"); of riceland:- (-), *thlās*.

- b) Area: of riceland:- *sanre, sare*; of land:- *caturatra* (Skt.) “square measure”.
- c) Weight: of white silver, cotton, wax:- *bhara* (Skt.), *tul* (Skt.), *jyañ* (MK *jañjñ* “scales”), *liñ* (MK *tañluñ* “ounce”).
- d) Capacity, dry: of seed for sowing, husked rice, fruit:- *tloñ-thlvañ, mā-mās, je* (MK *kañjv* “60-litre basket”; alternative for seed for sowing rice:- *vīja* (Skt. “seed”) and *vroḥ* (MK *broḥ* “sow”); of seed (sesame, beans):- *liḥ, avar*; of parched grain:- *prastha* (Skt.).
Capacity, fluid: of honey, syrup, milk:- *antoñ* (MK *anṭūñ* “well”, *mās*.
- e) Quantity (method of measuring unknown): of salt:- *knañ*; of riceland, milk and syrup (?):- *pāda* (Skt. “foot?”).