Paper for Annual Meeting of the Asian Studies Association, Napoli, 2007

Writing the Histories of 'Traditional' Agriculture in Southeast Asia

by

R.D. Hill

Honorary Professor, Department of History,
Honorary Professor, Department of Ecology and Biodiversity
University of Hong Kong.

Introduction

A necessary preliminary to this introduction to the historiography of agriculture in the region is to define terms. Obviously there are many kinds of histories of agriculture; those linking trade, politics or economics with agriculture, histories of agricultural technology in general or particular (much neglected), histories at all scales from the region as a whole to single villages or social groups. Both pre- and proto-histories may be subsumed within 'histories'.

By 'traditional' is meant those forms of agriculture that have been so long established that this term can be legitimately applied to them. Such are far more than simply 'subsistence', a term that begs a further set of questions, not to be addressed here. 'Traditional' clearly excludes those forms of agriculture involving high levels of capitalization and export orientation of non-food commodities though it includes those with some degree of centralized management, whether this was the form of the *metayage* that developed in colonial-era Cochinchina or in the religious foundations of early Cambodia. Even if partly market-oriented, 'traditional' agriculture includes a significant subsistence component and its methods are those of long standing rather those of modern agricultural science though clearly in more recent times, some modern aspects may be included, such as large-scale irrigation from stored water, written titles to land or the use of fertilizers. 'Traditional' agriculture is also economically part of an over-arching and at the family level, an integrated system of obtaining the necessities of life from cultivation, the rearing of animals and from foraging, some of the last in the fields. (It may be argued, with some justification, that conceptually extracting agriculture from such a system fatally damages what in reality and in the eyes of its practitioners is a single entity).

The European distinction between agriculture and horticulture is demonstrably inapplicable in Southeast Asia for the scale of operations has long been very different. Equally, agriculture subsumes the rearing of livestock, whether these are farmyard animals such as pigs, chickens (and in some societies, dogs, for food) or large animals such as cattle and buffaloes. The specialized rearing of herds of the latter two may also be considered as part of the traditional economies, not least because of the former, and in some remote areas, still-surviving importance of these animals for transportation, especially in continental Southeast Asia.

Both historically and prehistorically, agricultural Southeast Asia extends well beyond the region's present political boundaries. In the northeast, the agriculture of the aboriginal peoples of Hainan, Taiwan and the Ryukyus, like their languages and culture in general, have clear Southeast Asian affinities. In eastern Nusantara (eastern Malay Archipelago) there is a transition zone from rice-based agriculture, itself probably a fairly-recent phenomenon, through sago-based cropping and collecting to rather different 'Papuan' or more generally Melanesian systems based upon tubers, in relatively recent times including the American sweet potato. In the west, Southeast Asian agriculture extended to the islands off Sumatra, but not to the island chains of the Andamans and the Nicobars for until quite recently these lacked any form of cultivation and some areas still do. In the northwest, the agriculture of the peoples of the uplands of Arakan, the Hill Tracts of Bangladesh, of Tripura, Mizoram, Manipur and, especially, Nagaland in India have strong Southeast Asian affinities as many writers, notably von Furer-Haimendorf, have pointed out (von Furer-Haimendorf, 1971). To the north lies a great three-way transition zone. At lower and intermediate elevations in this tangle of high mountains and deep valleys, people such as the Yao, Miao and a host of others occupy the borderlands with China, over the last several centuries with Han Chinese settlements intercalated amongst them. At higher elevations, in northern Burma and the Chinese provinces of Yunnan, Sichuan and Guizhou, the uplands are occupied by peoples of Tibetan cultural affinities with very different crop and animal assemblages.

Some major works

Though most Southeast Asians are but a generation or two removed from being agriculturalists, it is ironical that historians of the region, indigenous and foreign, have thus far singularly neglected the histories of farming in the region as a whole. To be sure, there is a reasonably long list of books that cover various countries. This includes Michael Adas, *The Burma delta* (Adas, 1974), Yoneo Ishii's edited volume *Thailand, a rice-growing society* (Ishii, 1978), Yoshikazu Takaya's study of the Chao Phraya delta, *Agricultural development of a tropical delta* (1987), Hill's *Rice in Malaya* (Hill, 1977) and Robert Elson's *Javanese peasants and the colonial sugar industry* (Elson, 1984). For Indochina Pham Cao Duong's *Vietnamese peasants under French domination* (1985) is noteworthy, as is Jean Delvert's *Le paysan cambodgien* (Delvert, 1961, reprinted 1994) . The latter, however, is geographical in approach, though with the effluxion of time, it is, like Pierre Gourou's equally geographical *Paysans du delta tonkinois* (Gourou, 1936), an invaluable source for the 1930s. Michael Vickery's superbly documented *Society, economics and politics in pre-Angkor Cambodia* (Vickery, 1998) certainly contains much

of interest to the agricultural historian, and pre-historian, but is more broadly focused, as the title suggests.

Two further major works are basically theoretical but have significant Southeast Asian content. Carl Sauer's *Agricultural origins and dispersals* (1952, reprinted 1969) outlines in lecture form the globe's major centres of plant and animal domestication. Unfortunately, the form of this stimulating work precluded the provision of any documentation. The other is Clifford Geertz's much-debated *Agricultural involution* (1966), based substantially upon his sociological investigations in a small part of Java but then generalized far beyond that region to Indonesia, indeed to Southeast Asia.

Agricultural histories covering the Southeast Asian region as a whole are singularly scarce, doubtless in part reflecting the limited linguistic skills of researchers. Noteworthy is Robert Elson's challenging book *The end of the peasantry in Southeast Asia* (1997). But that deals mainly with the post-colonial transformation of the region's agriculture and fails to deal as fully as may be desirable with the still substantial continuation of subsistence production in parts of the region, in Viet Nam, parts of Laos, West Papua and many other remote areas, for example. The focus on particular parts of the region remains substantial, as is shown in the recent volume edited by Boomgaard and Henley, *Smallholders and stockbreeders* (Boomgaard and Henley, 2004). Most of the contributors examine single countries or regions within them. The editors in their introduction and the opening chapter by Hill cover the broader region.

By contrast, a number of prehistorians and ethnobotanists have cast their net wider, perhaps because artifacts may be easier to interpret than documents in sometimes-obscure languages, though problems remain in the interpretation of botanical evidence. Karl Hutterer's papers on the natural and cultural history of Southeast Asian agriculture and the ecology and evolution of agriculture in Southeast Asia are noteworthy, wide-ranging studies that bring to bear a variety of lines of evidence, not just archaeological (Hutterer, 1983; Hutterer, 1984). They are, however, necessarily brief. Wilhelm (Bill) Solheim has produced a number of valuable overviews and is a strong proponent of 'local genius' in the evolution of agriculture. (See, for example, Solheim, 1972 and Solheim, 1994). By contrast, Peter Bellwood at the ANU and Charles Higham at the University of Otago take a more unilinear approach in their interpretation of archaeological finds. (See, for example, Bellwood, 1980; Bellwood, 1985, second edition 1997; Bellwood, 1987; and Bellwood, 1996. Also Higham, 1995; Higham, 1996; Higham, 1996; Higham and Kijngam, 1985; Higham and Lu, 1998). All are, or have been, very active excavators, which adds authority to their work. Among the historically-minded ethnobotanists, Jacques Barrau and Douglas Yen are notable, though for both their primary focus has been upon Oceania rather Southeast Asia. (See, for example, Barrau, 1972 and Barrau, 1970). Given that agriculture in the former is in part derived from the latter, the two regions are intimately linked. Barrau's edited collection of papers, with Bernot, Chiva and Condominas, *Agriculture et societes en Asie du Sud-est* (1974) is a masterly summary, alas never translated into English. Among geographers, few have followed Carl Sauer's lead though Hill (1976) has written on the origins of domesticated rice, a paper that has been largely ignored.

Major gaps in writing - regional

As has been shown already, there is a major gap in writing about the whole region from early historic times through the colonial era and it was suggested that this may be explained in part by the limited linguistic skills for researchers. These should not be underestimated. For the pre-colonial high civilizations, Sanscrit, Old Khmer, Old Javanese, Vietnamese in Chinese characters and a number of other extinct tongues require mastery though there is an increasing body of translations available. For the colonial period, at the very least, the historian who would cover the major part of the region needs English, French and Dutch, with Spanish for the Philippines before the end of the nineteenth century. For the earlier period of contact, Portuguese is essential though this writer's experience is that published sources in that language offer slim pickings indeed. Spanish-language offerings are a little better but the researcher has the major advantage of a steady stream of work on the Phillipines in Spanish being translated, with varying degrees of skill, into English. At this point, it may be apropos to enter a word of warning. Many of the translators, and not just of Philippine sources in Spanish, are essentially linguists and translations may contain significant errors because of lack of familiarity with agriculture. For example, Alcina's major *La historia de las isles et indios de Bisayas* of 1668, published in 2002 in Spanish with a parallel English translation, definitely needs a gloss to cover agricultural and forestry terms the writer used but which have been mistranslated (Alcina 1668/2002). Part of the problem is that authors often used non-standard terms, many being variants of indigenous terms, and these are not to be found in dictionaries.

For pre-colonial and early colonial times, there is also a steady stream of materials translated from various vernaculars. Some are records of inscriptions such as the monumental *Inscriptions du Cambodge* by George Coedes, published in eight volumes beginning in 1937. This followed earlier reports on Siam and Srivijaya, by the same scholar (Coedes, 1929, reprinted 1961, Coedes, 1930 and Coedes, 1937-1936). Indeed, it may be said with some confidence that virtually all of the known inscriptions have been translated into one or other western language. Some are being translated again, many into English where such translations have not previously existed. Much of the early material published by the Ecole francaise d'Extreme Orient, for example, is now being re-evaluated. But the fact remains, most of this considerable corpus contains rather little of interest to the agricultural historian. A partial exception is the Khmer material, but this has been substantially used by Michael Vickery.

Amongst the component parts of the region, the Philippines and the former French Indochina stand out as areas about which much remains to be studied. For the former there is not a single major work though Norman Owen's detailed studies of Bicol provide valuable insights to a component part, an area substantially oriented towards the production of abaca fibre (Owen, 1982; Owen, 1986, Owen, 1999). There is no overview of agriculture and land colonization in Mindanao, which was transformed from the early twentieth century. There is rather little on the Visayas outside the sugar haciendas and much remains to be done in Luzon, notwithstanding McLennan's work on Nueva Ecija (McLennan, 1980; McLennan, 1981) and W.H. Scott's many studies on the Cordillera, most collected in his *On the Cordillera* (1969) and in the Visayas (Scott, 1990).

Precolonial agriculture in particular remains largely darkness, illuminated here and there by the work of archaeologists. For Indochina, early Cambodia and to a degree colonial Cochinchina are covered but for the rest little is known, especially in Laos, though, as will be pointed out later, there is material available, sometimes for quite remote areas. The borderlands of China and India have been sorely neglected. For the former there are limited sources, some translated from Chinese, before the early twentieth century. Most fall into the category of curiosae. (See for example, Playfair, 1876; Clarke, 1883; Laufer, 1919). For the Indian borderlands, sources in English begin in the nineteenth century but have scarcely been used. The same is true of the aboriginal areas of Hainan, Taiwan and the Ryukyus.

Major gaps in writing – topical

An alternative approach to agricultural history is via specific topics rather than agriculture as a whole. Here the lacunae are very large. While there is abundant material, researchers have been remarkably slow to tackle the history of agricultural technology either as a whole or in its component parts. One exception is the spread of crop plants. To the present, this has mainly been the preserve of historically-minded botanists. I.H. Burkill's magisterial *Dictionary of the economic products of the Malay Peninsula* in fact covers much of the region (Burkill, 1935, reprinted 1966) while Purseglove's volumes on tropical crops in general contain much of relevance to the spread of crops in Southeast Asia (Purseglove, 1972). Particularly valuable are Smartt and Simmons, *Evolution of crop plants* (Smartt and Simmonds, 1995) and for the spread of American plants Zingg's rather obscurely-published study on the Philippines (Zingg, 1934). If some points of criticism may be entered here, they would focus on the fact that in many botanical works close documentation is often lacking. It may also be suspected that there has been a good deal of uncritical borrowing of information amongst their writers.

But many other topics have been almost entirely neglected, especially at the region-wide scale. For instance, it is well known but not well documented that in the 1960s, much of insular Southeast Asia, the sickle began to replace the traditional small harvesting knife, Malay *aniani,* a process that probably began much earlier in mainland Southeast Asia where in parts of which it is possible that the small knife has never been used.

Irrigated terracing, now for rice, is a spectacular feature of a number of upland areas, in Viet Nam, along some of the borderlands with China, in Luzon, regions occupied by the so-called Igorots, and many densely populated parts of Java and Bali. The question of whether these may have started out as the home of taro cultivation, as suggested by Barrau, remains unresearched. The issue of whether they are a response by spatially circumscribed peoples with growing populations also remains unaddressed.

The question of whether Southeast Asian peoples ever built permanent water-storage structures has been partly addressed, mainly in the context of Angkor, where an emerging consensus indicates that the famous *barays* did not, in fact, serve as irrigation reservoirs. For one thing, they lack the necessary control structures such as characterize the tanks of ancient Sri Lanka. (See, for example, Moore, 1989: Moore, 1997). Single-season diversion structures with a very limited storage capacity certainly existed but in most

parts of the region, probably all, substantial, permanent storage had to await the arrival of colonial reinforced concrete. (See , for example, Short, 1980; Overton, 1994).

Current-driven waterwheels (*noria)* lifting water for irrigation were, and in remoter locations remain a feature of the landscape in a number of disparate parts of the region. They existed among some non-Han peoples of southwest China (and amongst Han), amongst the Vietnamese, of Quang Tri province especially, the Khmer, the northern Thai and the Minangkabau of north-central Sumatra and the Negeri Sembilan of the Malay Peninsula. How such a disjunct distribution may have evolved is a complete mystery.

Another field that remains to be investigated thoroughly is the question of the intensification, especially of rice cultivation. This is often envisaged as proceeding from early or 'primitive' shifting cultivation, through a single annual rain-fed crop, at first broadcast sown, later transplanted, to double and then multiple cropping. This schema begs many questions. First, it should be recalled that domesticated rice *Oryza sativa,* is a hybrid, one of whose ancestors was the wild perennial, *O. perennis.* This fact alone would suggest that early cultivation did not necessarily involve annual cultivation, for cultivation is hard work and can easily be avoided for a year or two subsequent to initial planting by allowing the ratoon crop to emerge. To be sure, there is a yield penalty, for crops drop by a third or so at the second harvest of the original plants and drop again in the year following, by which time weed invasion is usually so serious that tillage and replanting must follow. Second, it cannot be that the shifting cultivation of rice on hill slopes was the earliest form of cultivation, for rice is physiologically a swamp plant, as well as being a perennial, a fact not always recognized, even by botanists (Grist, 1959). Time must have been required to select varieties that would grow where standing water was absent.

Another aspect of the intensification of rice cultivation is transplanting. This is highly advantageous in terms of yields for the practice greatly reduces competition from adventitious plants early in the growth of the rice. The price of this enhancement is a greatly increased labour input in the preparation of nurseries, either wet or dry, and in the transfer of the seedlings to their final destination in the fields. By contrast, broadcast sowing of seeds directly into the prepared soil reduces the labour input, as many Southeast Asian growers are beginning to discover for themselves in the face of rising labour costs. But weeds grow with the rice shoots thus reducing yields. In some parts of the region, broadcast sowing into ploughed but unbunded flat or gently-rolling fields survived into the 20th century (see Grist and Abdul Rahman, 1921, for example). As with other forms of intensification, it is tempting to see population growth as a driver for increased labour inputs and consequential increases in yield, for rice above most other crops, is very responsive to such increases in inputs. The question needs much more close attention than it has thus far received.

In recent times, disintensification of agriculture has begun. In parts of Peninsular Malaysia, for example, transplanting rice has been replaced by broadcast sowing with a substantial saving of labour though some reduction in yield. Courtenay (1988) has drawn attention to this process in that area but it is clearly much more widespread. Tree crops may give much higher economic returns than rice, for lower inputs of labour in most cases, and it is clear that this process began some decades ago in some urban fringe areas.

The issue of the double cropping of rice is another that has been less than thoroughly investigated. Traditional varieties were photoperiod sensitive and most required 180-220 days to mature, leaving little time for another crop. Dry-season cultivation virtually everywhere requires the application of water. Much has been made of so-called 'Champa' rice, one or more early short-tem varieties. But the yield penalty compared with long-term rices was probably considerable. Those 90-day varieties seen in the field in Peninsular Malaysia in the 1960s, termed *padi ringan*, certainly yielded less than the long-term *padi berat*. The use of short-term varieties, in earlier times as then, was probably as a stop-gap when the rains were late or they were used only where land with higher, drier soils had to be cultivated, on alluvial terraces for example. In the land-rich situation that existed in most of Southeast Asia until late in the colonial era, it defies economic logic to suggest that double cropping was a subsistence imperative. Where weak polities had problems in controlling their oecumene, however, it must be conceded that there could be a real need to intensify production on such lands as could be secured and protected. Obviously there is much here that requires documentation.

In the region generally, it is clear that crop assemblages are and have been far from autochthonous in origin. Hill's recent paper (Hill, 2004) is the merest sketch and much remains to be described especially for crops that entered the region in pre-colonial times, such as pepper. Crops of American origin such as sweet potato, maize, manioc (cassava), tobacco, chilli, pineapple, guava and many others arrived in Southeast Asia both direct via the galleon trade between Manila and Acapulco, Mexico, and indirectly through the agency of the Portuguese in South Asia. But when and how each spread in the region is largely a mystery, dispelled only in part by Zingg for the Philippines (Zingg, 1934). Burkill's *Dictionary* is a good starting point, especially because his documentation is excellent (Burkill, 1935). However, it was first published long ago and, regrettably, remains unknown to many historians.

It is suspected that missionaries may have played some part in the process of spread. Early introductions are not well documented though comprehensive searches have yet to be made. It would not be at all surprising to find mentions in early Dutch, Spanish and Portuguese documents. In later colonial times, European crops such as the so-called 'Irish' (actually American) potato, were introduced by homesick colonials in a number of places. District officers in the borderlands of India and Burma certainly introduced a number, as did Protestant missionaries in Palawan. Especially notable here was the work of the Botanic Garden at Buitenzorg, now Bogor, in the uplands of Java, not far from Batavia (Jakarta).

Another field that has remained unresearched is that of crop assemblages. These have unquestionably been added to by the 'Americans'. Equally it seems likely that crops have dropped out of the usual repertoire, the tuber *Pueraria* is one (see Groeneveldt, 1960; Watson, 1968). If Sauer and Barrau are correct, tubers such as yam and taro were once the basic starch foods in the region, displaced by rice at very varying rates for some peoples grew tubers (or millets) into recent historical times. Clearly, this was a major change. Those who enjoy foods flavoured with vitamin-rich chilli might argue that this too represents a major change, if not in crop repertoire, then certainly in cuisine.

Amongst domestic animals, it seems likely that dog-raising for food continues to drop out of domestic activities though it survives in the Philippines, Viet Nam and the

borderlands of Southwest China. Certainly, a major change that accompanied the spread of Islam was the dropping of domestic pig rearing and possibly dog-rearing. These, too, remain substantially unresearched.

Amongst large animals too, there remain many mysteries. Just where and how the buffalo was domesticated is still uncertain though Southeast Asia is a candidate for it has wild species. Its spread remains undocumented but clearly was uneven. Sarawak, for example, seems not to have had the animal until colonial times. Cattle too were by no means universal in early times though as with the buffalo there is every possibility that there is an ancient indigenous domesticated type in the region. The Zebu strain, marked by a fatty hump on the neck, especially pronounced in males, is doubtless an introduction from South Asia but details of this are unknown. Later, in colonial times, other strains were brought in, mainly by governments, though no one has yet written an overview from the reasonably large published literature let alone used archival sources. In this context, it should be noted that equally there has been almost nothing written on the causes and effects of the many epidemics that afflicted domestic animals. Notable are rinderpest and foot-and-mouth disease. Their economic significance was very considerable for the number of deaths was often substantial and the loss of animals for traction quite devastating to the agricultural economy.

The rearing of animals in herds is often seen as a rarity in the region. To be sure, this is the case in many lowland areas to the present. But in the past even such now densely-populated plains as the Chao Phraya and earlier the Red River delta were by no means fully occupied so that there was plenty of space for herds. In addition, the demand for animals was much greater than nowadays. The displacement of buffaloes as plough traction by hand tractors, ‘iron buffaloes’, is, of course a matter of the last three decades at the most, though only partly documented. But, especially in continental Southeast Asia where long distance overland transportation systems sprang into being every dry season, both buffaloes and cattle were widely employed as traction animals for carts. The Korat Plateau, for example, was crisscrossed by a network of routes centred upon Korat town. Cattle were also extensively used as pack animals, a practice that survives in the still roadless uplands of southwestern China and the adjoining borderlands. Many sources describe the rearing of both in herds, a practice that survives in upland areas in central Viet Nam, in Sabah and upland Luzon where fires are often annually set to promote the growth of new grass in what are naturally rather tough and indigestible grasslands. The roles of large animals have clearly changed since the nineteenth century but details are so far lacking, except in some of the contributions to *Smallholders and stockbreeders* (Boomgaard and Henley, 2004).

Before the twentieth century, modern medicine had scarcely penetrated the Southeast Asian countryside. In most villages herb gardens existed from which both lay persons and indigenous medical practitioners drew remedies of very varying efficacy. Such gardens also commonly contained plants for dyes, a practice that continues with indigo in villages of northern Viet Nam for example. Travellers’ accounts contain references to such gardens. Only for Burma, and that long ago, has there been a systematic description of such dyestuffs (Fraser, 1896). Most have long been superceded by aniline and similar dyestuffs of western origin for these are more stable than most traditional vegetable dyes,

some of which were cultivated and others collected from the wild. Their history has yet to receive systematic attention.

In the social and spiritual spheres, it is obvious that in the face of modern understandings and the opposition of organized religion, many ancient agriculturally-based folk beliefs are on the way to extinction. The widespread notion of the 'soul of rice', Malay '*semangat padi'*, is now seriously heterodox in many quarters, though it persists. Agrarian rites have been of interest to generations of anthropologists so that abundant material exists to trace their evolution, at least since colonial times.

Major gaps in writing – environmental history

The discipline of environmental history in Southeast Asia is in its infancy and has thus far focused mainly upon deforestation in the colonial and post-colonial periods. Deforestation for agriculture has taken two main forms. That for shifting cultivation, which results in a shift to grassland, scrub and various types of secondary forest has been widespread for millennia though questions remain as to just how widespread. Potentially, may be possible to document this by recovering charcoal from soils, a proceeding that is likely to prove extremely laborious. Clearance for more spatially permanent systems has yet to be examined in detail though for the colonial era, there exists considerable district-level data, much of it published in official reports. Once in agricultural use, land has not necessarily remained in the form of use to which it was initially put, usually rice. The intercalation of crops such as sugar, especially in Java and in parts of lowland Luzon and, especially some of the Visayan islands (Negros, for example) into pre-existing crop systems has not been as closely documented as it might be. The expansion of such export crops is often discussed as if there were no pre-existing systems present, though admittedly in many instances there were not.

Changes in the relationships of crops with climatic parameters are another seriously under-researched area. Nieuwolt has examined this relationship in modern times (Nieuwolt, 1984, 1986) but it seems likely, with the expansion of settlement and selection of strains of crop plants, that there may have been changes in spatial patterns, especially in upland areas. Changes in the altitudinal limits of rice, for example, seem likely to exist. Equally, it seems possible that tropical crops such as the coconut are now to be found at higher elevations and further inland than once they were. Travel accounts seem likely to supply the raw material for such studies, for most travellers record their whereabouts, often on a day-to-day basis. Much the same applies to changes in seasonality. There are abundant records of the major stages of the cultivation calendar – tilling, sowing and transplanting, harvest - but how these may have changed needs analysis.

In the more monsoonal parts of the region, rainfall can be quite unreliable. Drought was not infrequent and reports of complete crop failure are not rare, see Pavie, for instance (Pavie, 1900-19). There is, as yet, no systematic analysis of drought and crop failures and their consequences in the region.

The effects of epidemic animal disease upon agricultural economies have been briefly mentioned earlier in considering the role of large livestock. But equally important are the relationships of human disease. Norman Owen's edited collection of papers in historical demography (Owen, 1987) is a valuable addition to the literature but its papers do not

necessarily focus on the specific relationship with agriculture. People fleeing smallpox epidemics, for example, seem to have taken to the forest on occasion. Did they stay there long enough to settle and did they adopt culturally new forms of cultivation as a consequence?

Plant disease and pests have the potential to wreak havoc on crops. This was even more true before the advent of modern forms of control. Yet very little is known of such matters in earlier times. One serious periodical pest, one that could wipe out crops within hours, was the Asian migratory locust, *Locusta migratoria manilensis*, concerning which there are scattered reports from various parts of the region, commencing in the late nineteenth century. Leaf rollers and plant hoppers are likewise occasionally reported, especially in the reports of colonial-era district administrators. The history of crop and animal diseases and pests and their consequences does not yet exist.

Sources for prehistory

These are, as everywhere, the results of archaeological investigations in situ. Compared with Europe or North America the number of 'digs' is much smaller in Southeast Asia. Prehistory has unquestionably suffered from the fact that before the latter part of the twentieth century, and in some cases even after that time, the overwhelming focus of excavators was upon artifacts - stone tools, ceramics, occasional finds of glass. Organic remains were treated as so much waste. Since the 1950s there have been major advances in dating, C14, especially, and in the recovery and treatment of organics. Phytoliths and pollens have added their lines of evidence though problems of interpretation remain. In the field of palynology, for example, it is not uncommon for pollen grains to be identified only to family or genus rather than to species. The work of the late Bernard Maloney and of John Flenley has been particularly valuable in this field (Maloney, 1991, 1994, 1996; Flenley, 1988). But it frequently remains difficult to distinguish material from domesticated species from those of similar wild species. Thus, for example, at the famous Thai site of Spirit's Cave, it has proven difficult to attribute carbonized rice grains to domesticated *Oryza*, as Douglas Yen has shown (Yen, 1977).

As in most fields, in prehistory there have been important misinterpretations. Much of the older Southeast Asian literature assumed a link between ceramics and cropping, a link that certainly exists in many cases but not in all. The hoary debate concerning single 'invention' and parallel development has also continued in the region. For example, it seems likely that the world's earliest domesticated rice comes from sites in the middle Yangtze with dates back to about 10 000 BP. The dominant view is that the crop accompanied 'Austronesian' peoples as they moved south into what is now Southeast Asia. All the domestic rices thus far found in the region post-date the earliest Chinese finds. Yet the consensus amongst botanical authorities is that it was in a broad region extending from the western side of the Bay of Bengal to southern China which contains the range of wild rices from which *Oryza sativa* evolved. It is thus possible that rice was taken into cultivation in more than one area and at more than one time. The current evidence suggests that this was not so but the question, despite confident assertions, remains open. The solution will eventually emerge with continued and highly

sophisticated excavations and analyses undertaken by Bellwood and Higham amongst many others.

It also seems possible that early rices were treated as the perennials that they were (and are) rather than being treated as annuals as they are almost universally today. There is some limited historical evidence to suggest ratooning was indeed once more common than at present and that the recent interest in the subject by commercial rice growers is merely a reversion to an ancient practice rather than something new.

Archival sources

Perhaps the major problem facing the agricultural historian wishing to use archival materials is their extreme unevenness. For the pre-colonial era epigraphs survive reasonably well. Not so paper. Of the indigenous records, there are significant materials that remain as yet unpublished and untranslated though that is happily becoming less true. In the Malay world a number of *hikayat* are now available. Examples include the *Hikayat Patani* (Teeuw and Wyatt, 1970) and the *Hikayat Negeri Johor* (Ismail Hussein, 1979), but there are dozens of others. In the Thai realm, much the same is true of *phongsawadan*, traditional histories such as the *Nan Chronicle* (Saenluang Ratchasompahan, 1966). Unfortunately most of these traditional histories contain very little of relevance to agriculture.

Pre-colonial land records also survive but these are limited in number and often very fragile. For example, the Malaysian Arkib Negara contains documents from the Kelantan land records of the early twentieth century (Hill, 1977) but in Peninsular Malaysia, most surviving land records date from the colonial era. However, it can be safely assumed that to some extent the earliest colonial records capture the immediately pre-existing situation.

Most metropolitan archives contain important materials on land matters in general, on the law relating to land and to policy matters. But because only selected items were sent or copied to metropolitan administrators, most agricultural mundanities were never transmitted and many are thus not preserved at all. The use of some major archives is hindered by the fact that indexing is very weak. This reportedly applies to both Spanish and Portuguese archives. However, the holdings at the Public Records Office, London, at the French Archives nationals at Aix-en-Provence and at the Rijksarchief and KITLV in the Netherlands are very adequately indexed and easy to use.

By contrast, regional archives in Phnom Penh, Ha Noi and Vientiane are inadequately indexed and many documents, if they can be accessed at all, are in a poor state of preservation though that situation is steadily improving. Of the state of Burma's national archive little can be said. Its web-page does not even indicate the existence of an index. The important *Landsarchief* of the Netherlands East Indies administration has largely survived but reports suggest that it is difficult to use because of deficiencies in indexing. Matters are much better in Thailand and Malaysia. In both, a substantial proportion of the material is available in surrogate form, necessarily so for much is very fragile. (In the 1960s to use colonial records at the Arkib Negara Malaysia was to become liberally sprinkled with fragments of decaying paper). The indexing is also well up to international standards. The Philippine national archive is well indexed and easy to use but it is clear that the archive has been looted, it is thought during the Marcos era.

Agricultural historians have scarcely examined the archives of Christian missions in Southeast Asia though many are well preserved and well managed. To judge from a cursory examination of material in the archive of the Baslermission, Switzerland, the proportion of relevant material is likely to be low but indexing is adequate and that alone may offset the low returns to effort that may otherwise be expected. The Jesuit archive for the 19th century Philippines is extensive and is steadily being worked up and published by Father Arcilla (Arcilla, 1990-). Early Jesuit archives were dispersed as a result of the suppression of the Order in the 18th century but some remain in the Gregorian University. That is only one part of mission material for there were many Orders at work and at least some of their records survive. Augustinian archives exist in Rome, Paris, Dublin and elsewhere. The French *Missions etrangeres* began in the 16th century and was active in Southeast Asia, especially among non-Han peoples in southwestern China. Its archive is in Paris.

At the other end of the theological spectrum, beginning with Adorinam Judson at the end of the 18th century, Baptists worked extensively in Burma, especially in the once largely pagan hill districts. Both the northern and southern branches of the denomination in the United States retain extensive archives on foreign mission activities. Samuel Pollard, a Methodist, was posted to Yunnan in 1888, a forerunner of the many Protestant missionaries who worked in southwestern China, especially under the China Inland Mission, founded by Hudson Taylor in 1865. Much of its archival material is at the School of Oriental and African Studies, London.

Overall, it seems likely that missionaries of many affiliations played some role in agricultural history. Their concerns were not simply spiritual and their activities clearly included some related to agriculture, especially in respect of improved seeds, better tools and the introduction of draught animals. However, returns to searching effort are likely to be quite low, given the missionaries' basic focus on harvesting souls rather than crops.

Published works before the nineteenth century

As has been alluded to already, most of the region's epigraphs have been recorded and translated into one or other western language. A trickle of new finds keeps epigraphers busy but their main activity is in seeking more refined understandings of existing material. The heyday of finds and recording was in the 1920s and 30s with notable activity by the Ecole francaise d'Extreme Orient in Indochina with some work in Thailand and by scholars in Burma, especially on Pagan (Luce, 1940, 1969; Aung-Thwin, 1982-3, 1985). Epigraphs in Sanscrit, Old Khmer, Cham and Old Burmese were published in annotated editions often with accompanying translations. Notable are the many epigraphs recording temple foundations and donations. These list, for example, the numbers of workers and their tasks, the location and areas of agricultural land and in many instances at least some of the crops grown upon them. One technicality that needs to be borne in mind in using these sources is that modern meanings of crop names are not necessarily those of the past.

For the Malay world, most epigraphs, many in Old Javanese and occasionally in other now-extinct languages, have also been recorded and translated though the body of work is somewhat smaller than for Indochina and the inscriptions are often less detailed. Used

with care, as Vickery has shown, the epigraphic sources offer much in agricultural history.

As with inscriptions, so with major Chinese sources. Chou Ta Kuan on Cambodia is a basic source though limited in both time and space (Chou Ta-Kuan, 1987). Ma Huan, Admiral Cheng He's scribe, records in the *Ying-yai Sheng-lan* (1433/1970), brief descriptions of agriculture in the places visited. Chau Ju-Kua's account of the region is also a basic early source (Hirth and Rockill,1911). Berthold Laufer and W.P. Groeneveldt long ago provided compilations of Chinese accounts of the region and these contain scattered references to agricultural matters (Laufer, 1919; Groeneveldt, 1960). Laufer, incidentally, also has a useful set of materials on the Chinese in the Philippines and was also interested in the spread of American crops in the region, especially tobacco (Laufer, 1907/1967; 1924, 1938/1968).

A major consideration in respect of things Chinese in this context is the question of interpretation. Some would see much of traditional Southeast Asian agricultural technology as of Chinese inspiration, if not of actual introduction. The question of current-driven waterwheels has been mentioned previously - some think that they are 'Chinese' - but other machines may be involved. One such seems to be the Chinese endless chain pump. This was certainly introduced into the Malay Peninsula by the early nineteenth century for the purpose of dewatering tin mines but so far as can be determined it was never used for agricultural purposes in that region. However, it did survive as a tool for irrigation on the Chao Phraya plain well into the 1960s. The gate-harrow widely used to reduce flooded padi fields to a fine tilth seems to be of Chinese inspiration and possibly of their introduction though the matter remains open.

As sources for agricultural history, it must be admitted that indigenous histories are a disappointment though to suggest this is to reflect a misunderstanding as to their purpose. This was substantially to serve as documents to legitimize whichever regime happened to be in power, to record meritorious works and to record genealogies, true or otherwise. Thus works such as the Burmese *Glass palace chronicle* (translated by Pe Maung Tin and G.H. Luce, 1923/1976) the *Padaeng chronicle* (translated by Sao Saimong Mangrai, 1981) plus the many *Hikayat* of various parts of the Malay world, though mostly translated, contain rather little material related to agriculture.

Indigenous legal texts are another matter. Though political power and social influence stemmed from the control of people rather than upon the control of land as such, as the contributors to Tony Reid's 1983 collection of studies of slavery and other forms of dependence show, land matters nevertheless figure fairly prominently in traditional legal codes (Reid, 1983). King Mangrai's code for the Lanna kingdom of northern Thailand contains much regulating land matters. The *Undang undang Melaka* has detailed provisions on land, tenure and use rights, on mortgages and on inheritance (Liaw, 1976). Hoadley and Hooker (1981) have a commentary and translation of the Javanese *Agama*, while Korn covered Balinese law in his *Het adatrecht van Bali* (1932), translated into Indonesian as *Hukum adat Bali* and published some time between 1972 and 1982 (Korn, 1932, 1972-82?).

The body of western sources is considerable but most suffer from the fact that most accounts were written by voyagers who penetrated little, if at all into agricultural hinterlands. This is less true for early accounts of the old Siamese capital at Ayuthia for

this is located well inland. One exception was Wuysthoff's account of his penetration as far up the Mekong as Luang Prabang but he says little enough of agricultural matters (Lejosne, 1993). Many of these accounts have been translated from Portuguese, Spanish, Dutch, sometimes French and German, into English, often with scholarly annotations, which however, should not be totally relied upon. The Hakluyt Society, London, has published and continues to publish a notable series of such accounts. As with other translations some care needs to be taken. A particular difficulty is that then-contemporary observers naturally used some version of local terms for such things as they saw for which there was no equivalent term in their own language. Such renderings do not normally find their way into standard dictionaries and this can lead to some difficult-to-resolve puzzles.

The Dutch, in particular, were remarkable recorders in their administration. Thus the Batavia *Daghregister*, a monumental collection of records of ships and their cargoes, was published from 1887 to 1931. A similar record at Melaka remains in manuscript but has been partly worked through by Radin Fernando. Valuable as these are for the history of trade, for agriculture they suffer from the fact that although the records usually report the immediate port of departure before entry at the point of record, the provenance of their cargoes is not recorded. Such ship' ladings are thus suggestive rather than definitive, and of course, are silent on other commodities not entering by way of trade.

One perhaps unsuspected source is botanical floras. These include accounts of crop plants and sometimes say something about the manner in which they are cultivated and always something of the habitat in which they were found, 'in hortis', in gardens, for example. Noteworthy here are various works by Rumpf (Rumphius) at Amboina in the 17th century and Father Loureiro's *Flora cochinchinensis* published at Lisbon in 1790 (Rumpf, 1741-56; Loureiro, 1790). The former are in Dutch and Latin, though a modern translation and commentary in English exists, while the latter is entirely in not-too-difficult Latin.

Published sources, 19th to 20th centuries

From about the middle of the 19th century, the number of sources containing agriculturally-relevant materials grew exponentially, accompanying western penetration. This is particularly true of travel writing abetted by an interest not only in the 'exotic east' but also by purely pragmatic interests in furthering trade and making money in the developing colonial economies. Descriptive accounts proliferated. As imperial administrations were established, government officers usually reported extensively upon their districts and many of such reports were published. Many continued to be for such officials were usually required to report annually upon their charges. Thus there exist shelves full of district reports for Burma and British Malaya, many containing much detail on agricultural matters.

Newly acquired territory also provoked interest. Thus, Stamford Raffles' brief stint as Lieutenant-Governor of Java produced the monumental compendium that is the *History of Java* (Raffles, 1817/1988). Even the prospects of territory or of trade were enough to stimulate interest. Marsden's *History of Sumatra* appeared at the very end of the 18th

century though actual British control of territory, at Bencoolen (Benkulu) was politically and economically insignificant (Marsden, 2nd edition, 1811/1966).

Territorial acquisition, or the prospect of it, sparked a great deal of important exploration. The account of the Garnier and de Lagree expedition up the Mekong, seeking a 'river road to China', (the phrase is Osborne's) contains many observations of local economic activities and many were agricultural (Garnier1873) Osborne, 1975). The voluminous account, long available only in the original French, has recently been published in English in an excruciatingly bad translation by Walter Tips (Garnier, 1996). Henri Mouhot (d. 1861 near Luang Prabang), in part financed by British interests, not only rediscovered Angkor but also recorded much of the agriculture of the areas through which he passed (Mouhot, 1868/1989). Jules Harmand also made a number of epic journeys in the region (Harmand, 1876, 1877a, 1877b, 1878-9, 1879.) The French, having acquired a protectorate over Laos in 1893, must needs discover what they had obtained. The result was a series of journeys, mainly on foot, by Auguste Pavie and a considerable group of young Frenchmen under his direction, beginning at the end of the 19th century and continuing into the 20th. Their very detailed accounts of Laos, Cambodia, the Vietnamese highlands and parts of northwestern Siam remain in French (Pavie, 1900-19).

British explorers were active in the borderlands of Burma with India, notably in their search for the source of the Brahamaputra and in their exploration of the overland pack routes eastwards from northern Burma. Many of their accounts are preserved in publications of the Royal Geographical Society, London. Notable too are accounts by colonial administrators, especially J.G. Scott (see, for example, Scott, 1891). The works of the veritable man-mountain Christoph von Furer-Hamendorf represents early 20th century ethnology and travel (Furer-Haimendorf, 1938, 1946,1955, 1983). The uplands of southwestern China were explored from the late 19th century and by the 20th, the region had become a field for western missionary endeavour, especially by the China Inland Mission whose associates provide interesting accounts of the region. Amongst the many foreigners to journey in the region was Hosie, the British consul at Shanghai (Hosie, 1883, 1897/1972). On a smaller scale were explorations in the Malay Peninsula to which a noteworthy expedition was mounted by Annandale and his colleagues in the early years of the 20th century (Annandale, 1900, 1904, Annandale and Robinson, 1902). The uplands of southwestern China were explored from the late 19th century.

In Sumatra notable journeys were undertaken by John Anderson, the splendidly-named Frenchman, Brau de Saint-Pol Lias, who also explored for minerals in Perak (Peninsular Malaysia), and P.J. Veth (Anderson, 1826/1971, 1840/1971; Brau de Saint-Pol Lias, 1883,1884, 1885; Veth and Kan 1878; Veth, 1878-9). The Norwegian Carl Bock made notable journeys in southwestern Borneo and in the Lao states (Bock, 1882/1985, 1882/1988). The Italian botanist Beccari worked further north, in Borneo (Beccari, 1902/1989). Some of his botanical observations are recorded in his *Malesia; raccolta di osservazioni botaniche…*of 1877-1890. Nieuwenhuis's traverse eastwards up the Kapuas river was an epic journey, one not lightly to be undertaken even today (Nieuwenhuis, 1898, 1904-07). Alfred Russel Wallace, the noted biologist made many valuable observations in the Malay Archipelago and these were extended by other naturalists in the 20th century such as Burbidge and Forbes (Wallace, 1860, 1869/1962; Burbidge, 1880; Forbes, 1884, 1885).

The work of field biologists is particularly important because their professional skills leave no doubt as to the accuracy of their observations, particularly in respect of the identification of crop plants. Isaac Henry Burkill, noted earlier as the compiler of the *Dictionary of economic products of the Malay Peninsula*, was also a field botanist and, as Director of the Singapore Botanic Gardens, had a strong interest in crop plants (Burkill, 1952/1962). He also made noteworthy studies of the Old World yams, *Dioscorea* species (Burkill, 1951, 1952). Blanco, in the Philippines was an earlier student of both cultivated and uncultivated plants while Elmer Drew Merrill made notable contributions in the study of crops as well as in the taxonomic field (Blanco,1877-83); Merrill, 1912, 1917, 1920/1946, 1937). The early work of Rumpf and of Loureiro has already been mentioned. For the Dutch East Indies, the much later work of Ochse is noteworthy (Ochse, 1931/1977). Amongst the many modern floras of the region, that of Java by Backer and Bakhuizen van den Brink (1963-8) may be consulted, but there are many others, including some on line.

For the historian, using botanical materials poses two problems. First is the unfamiliar nomenclature. Fortunately, for most crops, this has not changed significantly for several centuries and many bear their original Linnean epithets. Second is the unfortunate fact that many compilers of floras fail to distinguish between cultivated and wild plants. Some, the guava is one, may be both. The historian must therefore have prior knowledge of which is which before some floras can be used.

Linguistic lines of evidence for the history and prehistory of agriculture have long existed in the form of vocabularies the collection of which has extended over several centuries. Some include brief comments pointing to the sometimes remarkable similarities of crop terms in various languages. Not until the middle of the 20th century, however, were the basic language relationships worked out in detail. Paul Benedict was a noted contributor in this area. The basic idea is that terms may indicate origins. For example, in Malay the American introduction manioc, is known as *ubi belanda* or *ubi castela*, respectively the Dutch or Castillian (i.e. Spanish) tuber, probably reflecting the proximate source of planting material. Two other American crops, pineapple and cocoa, are termed respectively *nanas*, clearly from *ananas* or some variant thereof, and *koko* or *coklat*, probably ultimately derived from the Olmec term for the crop. If a language lacks its own word for a plough, for instance, it is likely that its speakers did not know the implement. Little has yet been done to examine agriculturally related terms in a systematic way. A notable exception is Waruno Madhi's recent work on some Austronesian maverick proto-forms with cultural and historical implications (Waruno Mahdi, 1994). Revel's recent *Le riz en Asie du Sud-est* also shows what can be done in this field (Revel, 1988).

The work of learned societies and museums has contributed much to the supply of source materials. In 19th century Europe many cities supported geographical societies. In France, there were major groups in Paris, especially the *Societe de geographie commerciale*, at Bordeaux and Marseille, cities to a degree dependant on overseas trade and thus foreign intelligence. In London, the Royal Geographical Society filled the same function. Its publication *Geographical journal* and its earlier congeners contain many first-hand reports of places and peoples. Similar organizations existed in Germany, at Berlin and Hamburg for instance, and in the Netherlands. and their publications remain of

interest. The same cannot be said of smaller geographical societies in Spain, Portugal and Italy whose publications contain little about the region. In the 20th century, geographical publications include the *Annals of the Association of American Geographers*, founded in 1911, the *Geographical review* begun five years later, and *Economic geography* from 1925.

Ethnographic reports are also a basic source of information. Many found their way to the Ethnographical Society in London or to similar societies in the Netherlands, Germany and Austria (Vienna). At Hamburg, the Gesellschaft fur Natur- und Volkerkunde Ostasiens and at Dresden the Museen fur Tierkunde und Volkerkunde made significant collections, like museums elsewhere including artifacts related to agriculture. In the United States, the now-prestigious *American anthropologist* began in 1888 as the *Transactions of the Anthropological Society of Washington.* Within the region, the *Sarawak museum journal* began remarkably early and contains considerable material. In Peninsular Malaysia the *Federated States museums journal* began later but contains little on agriculture.

Specifically agricultural journals in the Philippines began in the early years of the 20th century, mainly at the initiative of the new American government and the Faculty of Agriculture and Forestry at the University of the Philippines, Los Banos. The *Malayan agricultural journal* began in the 1920s, but from the outset, its main focus was upon commercial crops, especially tree-crops such as rubber. In the 1930s, the *Office du riz* at Saigon, the outlet for commercial rice production in Cochinchina, produced a number of valuable economic and technical studies. Overall, though, most of the articles in agricultural journals were written for other professional agriculturalists, certainly not for local farmers. They are an invaluable source for the history of agricultural science in Southeast Asia, a history that is largely yet to be written, but they are rather less valuable for the generalist.

The colonial era also saw a proliferation of general journals initially aimed mainly at the educated expatriate population. Though very heterogeneous in content, these remain an invaluable series of sources. For Indochina, the *Bulletin de l'Ecole francaise d'Extreme Orient* remains a basic source, despite its bias towards cultural history, archaeology and language. The *Bulletin economique de l'Indochine* contains a great deal about indigenous agriculture while the *Bulletin de la Societe des Amis de Vieux Hue* cast its net much wider than its title suggests. Of a more popular nature are the *Revue indochinoise* and its companions *Extreme asie, Extreme asie – revue indochinoise, La revue indochinoise juridique et economique.* For Burma the *Journal of the Burma Research Society* from 1911, is fundamental as is the *Journal of the Siam Society* from Bangkok, commencing in 1904.

In insular Southeast Asia, an early publication from Singapore was the *Journal of the Indian Archipelago*, sometimes called *Logan's journal* after its publisher, though this was rather short-lived. The *Journal of the Straits' Branch, Royal Asiatic Society*, later the *Malayan* and the *Malaysian Branch*, remains a basic source for that part of the region. Journals on the Netherlands East Indies were quite numerous and included the *Indische Gids*, the *Tijdschrift voor Nederlandsch Indie* from 1871, the *Bijdragen voor Taal-, Land- en Volkenkunde* from 1853, and the long-running *Tijdschrift voor indische Taal-, Land- en Volkenkunde* from 1852. Virtually all the articles in the East Indian journals

were in Dutch, as all those from Indochina are in French and those from Malaysia are in English. That language is also the predominant language of the Siam Society publications and of the Burma Research Society, though there are occasional articles in them in Thai and Burmese respectively.

Research aids

As yet there is no bibliography for the history of Southeast Asian agriculture. Hill has been working on one such for several decades. This is currently a working list in electronic form, now containing some 12 500 entries, about a third of which are for titles now known not to contain relevant materials. At the time of writing there remain to be consulted some 150 titles in the Library of Congress, the British Library, the Bibliotheque nationale and in a number of U.S. university libraries. This list is almost entirely of published materials and includes articles in a number of major journals in English readily accessible on line via JSTOR. This listing does not include Dutch language materials. These are very voluminous. Colleagues at the KITLV are well placed to provide a bibliography at some future date and are working through such materials, as a considerable list of publications by Boomgaard, Henley and their colleagues testifies.

There are, however, many hard copy bibliographies for the region as a whole or for its major constituent parts though the listing for Indochina are now old as are those for Burma. With current advances in electronic technology, it is likely that the day of the hard-copy bibliography is over. For one thing electronic lists, because they can easily be searched using built-in search engines, avoid the many problems of structuring and indexing lists. It is likely therefore, that hard-copy lists will become increasingly obsolete. However, for older materials they remain useful. Here mention should be made of Hill's French and English index to the *Revue indochinoise* and its associated titles, published in 1983 under the title *Index indochinensis* (Hill, 1983). (It is a matter of personal regret that among the 15 million titles listed in the on-line *Catalogue collectif de France* this book does not appear!). Many other journals remain incompletely indexed and, so far as is known, none of the major regional journals has back runs available on line, a serious deficiency.

What historians of Southeast Asian agriculture need to have

The obvious need is a good knowledge of what has already been written. This is not an easy task for primary materials, even those published are very scattered and in many languages. The electronic bibliography in preparation by Hill at the University of Hong Kong will be a considerable aid here though it currently lacks materials in Dutch. Helpfully it is accompanied by an archive, for the moment only in hard copy. This comprises copies of published materials, notes and translations and can be accessed on request.

Without a good working knowledge based upon field observation, the historian may fall into serious error. Remote places still preserve the old ways to some degree and are increasingly accessible for study. As always though, care needs to be taken in projecting present practice backwards in time. Agricultural change has not proceeded at the same

pace as urbanization, but it has its own rhythms. It is clear, for instance, that in the region generally crop assemblages have changed through time. American crops seem to have expanded them considerably. (Imagine Southeast Asian cuisine without tomato and chilli!). Nevertheless, there is evidence, albeit fragmentary, that crops have dropped out of the repertoire all together or have become much less common than once they were.

The historian also needs knowledge of the scholarly consequences of getting things wrong. The assumption that the shifting cultivation of rice on hill slopes represents a very early stage of cultivation is demolished by a simple fact of plant physiology, as has been mentioned already. The general question of why land-rich societies would wish to intensify production by multiplying crops on the same land has not been fully addressed. The assumption that brilliant civilizations, like Angkorean Cambodia, were necessarily supported by equally brilliant agricultural technology as most members of the French School of prehistorians seem to think, can equally be challenged. The irrigated terraces of Bontoc and Banaue in the Philippines, or of the Nagas of the Assam-Burma border area, are technically brilliant in the understanding of construction methods and water control they display. But there is no high civilization in either region. Necessary and sufficient conditions are easily confused.

At the detailed level error is also perilously easy. David Chandler, in his excellent *History of Cambodia*, notes Chou Ta Kuan's account of the place in the 12th century. Chou says that the people 'one time plant, three time harvest'. From this Chandler concludes that the land was of exceptional fertility, which it is not, with three or four crop cycles annually. Just how such could have been fitted into a year even with a continuous water supply, that is not likely to have existed, and with the kinds of rice varieties available then, long-term rather than short term, Chandler does not explain. The simplest explanation and thus the one most likely to be correct, is that the people indeed did exactly as Chou recorded. That is they planted their rice in one year, harvested it and then left it for another two years to provide two more ratoon harvests before tilling and planting again. Translations too, have their perils. The value of Alcina's *History* for the history of agriculture in the Visayas has already been mentioned, but the translation is defective in places because of a lack of understanding of what the holy father was talking about. George Coedes's estimable *Inscriptions du Cambodge* is a fundamental source for the period. But even Homer can nod for Coedes has guava, an American crop, in 8th century Cambodia. Clearly, he has assumed that a word now applied to this fruit was also applied in the past. A similar error occurs in the modern translation of the Javanese *Pararaton.* Current scholarly opinion holds that there were no crops of American origin in Asia until after Columbus, though it is just possible that amongst the Americans, the sweet potato did in fact reach the Pacific earlier.

Conclusion

Clearly there remains much to be done. Prehistorians have very firmly put present-day political boundaries, even modern cultures, aside in developing whole-region syntheses. Not so most historians. For example, the idea that there are homologies between the agricultural systems of aboriginal peoples of southern China, the Indo-Burmese borders and the Ryukyus and those of the core of the region is not new but has never been adequately researched. More generally, it must be said that while there is abundant

opportunity for comparative studies amongst countries, cultures and regions, for the most part those opportunities have been wasted. Valuable as they are, the books listed earlier are not comparative at the larger scale. If historians are really serious about the unity of Southeast Asia as a distinctive region, for all its internal diversity, then they need to set about casting their net more widely than has generally been the case. True, there are practical difficulties - the many languages of the source materials, their inaccessibility, the lack of adequate indexes, the poor conditions of many archives. None are insurmountable. The amount of published material alone is very large. Some of it, particularly the botanical material, has scarcely been used by historians.

At the same time, materials exist for accounts at much finer scales. The Malaysian archives, for example, contain colonial-era detail right down to particular administrative districts, even single villages. The published Burmese district reports are sufficiently detailed to permit the tracing of the evolution of agriculture at that fine level of detail. They have been drawn upon in part by Hill in his *Rice in Malaya* and by Adas in his *Burma delta*, but those works have by no means exhausted their potential.

Language problems have also led to the under-use of untranslated materials, notably in Chinese, Japanese and German. While many of the earlier Chinese accounts have been translated, there remain significant materials in the original language. The Institute of Southeast Asian Studies in Xiamen, Fujian province, has some of these and there may well be other materials elsewhere. Most of the Japanese materials are secondary, the result of work by generations of Japanese nationals in the region and especially in Taiwan. That of Kano is only one example (Kano, 1995, Kano and Segawa 1956). Much of the work done at the Institute of Southeast Asian Studies, Kyoto University, has been published in English, usually within a short time of its appearance in Japanese, but not all of it.

The German material dates mostly from the late 19th century down to the Second World War but is rarely cited. The German periodical literature is far from negligible. Larger contributions have been made by people such as Blumentritt, incidentally the confidant of Jose Rizal, Semper, whose travels are a mine of information, and the splendidly-named ethnologist Freiherr Egon von Eickstedt (Blumentritt, 1882; Semper, 1869, Eickstedt 1940, 1944). The geographer Wilhelm Credner worked in Siam and Yunnan (Credner, 1935a, 1935b, 1942). Another important German geographer is Albert Kolb whose magisterial book on the Philippines was published as late as 1942 (Kolb, 1942). His posthumously published monograph on Yunnan is also of interest (Kolb, 1992).

The history of agricultural technology in the region scarcely exists. There has never been a Southeast Asian equivalent of the work done by Joseph Needham and his many collaborators who have covered the topic so well for China. The degree to which local crops and methods of cultivation may owe something to Chinese farmers has never been systematically investigated though there are tantalizing hints that indigenous farmers have taken up some of both from the Chinese. The many Chinese Brassicas (cabbage group) and the gate harrow are examples.

Like the Chinese, it seems likely that foreign missionaries were also the source of new crops and improved methods. The original published materials on foreign missions are substantial. Both the Spanish and the Portuguese have had active programmes to transliterate letters and reports and to provide the necessary scholarly supporting

apparatus. Much relevant material probably remains in church archives scattered across the globe. This writer's experience, however, is that the returns to the effort of searching are likely to be low. Published materials are usually indexed, of course, but from experience, indexes are not always reliable.

Perhaps the largest hindrance to a major thrust in writing the histories of agriculture in the region are the perceptions that economic history is a bit dull and that agricultural history is even more so or that it is 'too technical'. Techniques, like languages, can be understood with a bit of effort. The dullness, if it exists, lies within the minds of the beholders. Without history, present-day patterns of agricultural activity cannot be understood. But more, agricultural history is the history, often the recent history, of millions of families across the region. Most Southeast Asians remain only a generation or two away from the field and the garden.

Acknowledgments

This paper is an expanded and revised version of an oral presentation given in the Department of History at the University of Hong Kong in March 2006. Thanks are due to the Head of that Department, Dr Peter Cunich, who also provided some information on Church archives. It was written in the Department of Ecology and Biodiversity of the same institution. The support of Prof. David Dudgeon, its then Head, for my investigations into what is, in part, environmental history, is gratefully acknowledged.

The Hang Seng Bank Golden Jubilee Fund, Centre of Asian Studies, University of Hong Kong provided a small grant to enable the acquisition of certain difficult to obtain materials.

Dr Tom Stanley of the Department of History, University of Hong Kong, kindly assisted with a number of Japanese language materials. Professor Norman Owen, lately of the same Department, also generously allowed access to his personal library.

References

In compiling this list, I have deliberately tried to be as eclectic as possible, as a means of illustrating the wide range of materials available to the researcher.

Adas M. 1974 *The Burma delta, economic development and social change on an Asian rice frontier, 1852-1941* University of Wisconsin Press, Madison.

Anderson J. 1826/1971 *Mission to the East Coast of Sumatra in MDCCCXXI…including historical and descriptive sketches of the country…and a visit to the Batta cannibal states in the interior,* William Blackwood, Edinburgh. Reprinted Oxford University, Press Kuala Lumpur as *Mission to the East Coast of Sumatra in 1823,* with an introduction by Nicholas Tarling.

Anderson J. 1840/1971 *Acheen, and the ports of the north and east coasts of Sumatra…,* W.H. Allen, London. Reprinted Oxford University Press, Kuala Lumpur, with an introduction by A.J.S. Reid.

Annandale N. 1900 'The Siamese Malay states', *Scottish geographical magazine,* 16, 505-523.

Annandale N. 1904 'The peoples of the Malay Peninsula', *Scottish geographical magazine,* 20, 337-343.

Annandale N. and Robinson H.C. 1902 'Anthropological notes on Sai Kau, a Siamo-Malayan village in the state of Nawnchik (Tojan)' *Man* 2 (86), 118-120.

Alcina F.A. 1668/2002 *La historia de las isles et indios de Bisayas*. Translated as *History of the Bisayan people in the Philippine Islands,* UST Publishing House, Manila.

Arcilla J.S. (ed.) 1990- *Jesuit missionary letters from Mindanao*, Publications of the Archives of the Philippine Province of the Society of Jesus, Quezon City. Five volumes published to date.

Aung-Thwin M. 1982-3 'Burma before Pagan: the status of archaeology today', *Asian perspectives* 25(1), 1-21.

Aung-Thwin M. 1985 *Pagan; the origins of modern Burma,* University of Hawaii Press, Honolulu.

Backer C.A. and Bakhuizen van den Brink R.C. 1963-8 *Flora of Java,* Noordhoff, Groningen, 3 vols.

Barrau J. 1970 'La region Indo-Pacifique comme centre de mise en culture et de domestication des vegetaux', *Journal d'agriculture tropicale et de botanique appliquee* 17(12) 487-503.

Barrau J. 1972 'Origines de l'agriculture, domestication des vegetaux et milieux contrastes', in J. Thomas and L. Bernet (eds) *Langues et techniques, nature et societe,* Klincksieck, Paris, vol. 2, 305-310.

Barrau J. 1974 'L'Asie du Sud-Est, berceau cultural', in J. Barrau, L. Bernot, I. Chiva and G. Condominas (eds) *Agricultures et societes en Asie du Sud-Est,* Mouton, Paris, 17-40.

Beccari O. 1902/1989 *Wanderings in the great forests of Borneo, travels and researches of a naturalist in Borneo,* Archibald Constable, London. Reprinted Oxford University Press, Singapore with an introduction by the Earl of Cranbrook.

Beccari O. 1877-1890 *Malesia: raccolta di osservazioni botaniche…*,Tip. Del R. Instituto sordo-muti, Geneva, 3 vols.

Bellwood P. 1980 'Plants, climate and people in the early horticultural prehistory of Austronesia', in J.J. Fox (ed.) *Indonesia; the making of a culture,* Research School of Pacific Studies, Australian National University, Canberra, 56-74.

Bellwood P.S. 1985/1997 *Prehistory of the Indo-Malaysian Archipelago,* Academic Press, Sydney. Second edition, University of Hawaii Press, Honolulu.

Bellwood P. 1987 'The prehistory of island Southeast Asia', *Journal of world prehistory,* 1(2) 171-224.

Bellwood P. 1996 'Early agriculture and the dispersal of the southern Mongoloids', in T. Azakawa and E. Szathmary (eds) *Prehistoric Mongoloid dispersals,* Oxford University Press, Oxford, 287-302.

Blanco M. 1877-83 *Flora de Filipinas,* Establecimiento Tipografica, Manila, 4 vols. Text in Spanish and Latin.

Blumentritt F. 1882 'Die Kiangen (Luzon)…' *Ausland,* 118-120, 129-132.

Bock C. 1882/1988 *The head-hunters of Borneo: a narrative of travel up the Mahakkam and down the Barito; also journeyings in Sumatra,* Sampson Low, London. Reprinted Graham Brash, Singapore.

Bock C. 1884/1985 *Temples and elephants: a narrative of a journey of exploration through Upper Siam and Lao,* Sampson Low, London. Reprinted Oxford University Press, Singapore.

Brau de Saint-Pol Lias X. 1883 *Perak et les orangs-sakeys,* E. Plon, Paris.

Brau de Saint-Pol Lias X. 1884 *Ile de Sumatra. Chez les Atches,* E. Plon, Paris.

Brau de Saint-Pol Lias X. 1885 'Les Battaks' *Revue d'ethnographie* 3, 227-248.

Burbidge F.W. 1880 *The gardens of the sun; or a naturalist's journal on the mountains and in the swamps of Borneo and the Sulu Archipelago,* John Murray, London.

Burkill I.H. 1935/1966 *A dictionary of the economic products of the Malay Peninsula,* Crown Agents for the Colonies, London. Republished Ministry of Agriculture and Co-operatives, Kuala Lumpur.

Burkill I.H. 1951 'The rise and decline of the greater yam in the service of man', *Advancement of science,* 7(28), 443-448.

Burkill I.H. 1952/1962 'Habits of man and the origins of the cultivated plants of the Old World', *Proceedings of the Linnean Society, London,* 164, 12-42. Reprinted in P.L.

Wagner and M.W. Mikesell (eds) *Readings in cultural geography*, University of Chicago Press, Chicago, 248-281.

Burkill I.H. 1960 'The organography and evolution of Dioscoreaceae, the family of yams', *Journal of the Linnean Society, London (Botany)* 56(367) 319-412.

Chou Ta-Kuan (posth.) 1987 *The customs of Cambodia,* Siam Society, Bangkok. There are many other editions of this title.

Clarke G.W. (transl.) 1883 'Translation of a [Chinese] manuscript account of Kwei-chau Miao-tzu written after the subjugation of the Miao-tzu, about 1730', appendix to A.R. Colquhuon, *Across Chryse,* Sampson Low, Marston, Searle, and Rivington, London, vol.2, 363-394.

Coedes G. 1924/1961 *Recueil des inscriptions du Siam, pt 2 . Inscriptions de Dvaravati, de Crivijaya et de Lavo,* Bangkok Times Press, Bangkok. Reprinted Piyarangsit Rangsit, Bangkok.

Coedes G. 1930 'Les inscriptions malaises de Crivijaya', *Bulletin de l'Ecole francaise d'Extreme Orient,* 30 29-80.

Coedes G. 1937-66 *Inscriptions du Cambodge,* Ecole francaise d'Extreme Orient, Hanoi, 8 vols.

Courtenay A.A. 1988 'Farm size, out-migration and abandoned padi land in Mukim Melekek, Melaka (Peninsular Malaysia)' *Malaysian journal of tropical geography,* 17 18-28.

Credner W. 1935a *Siam, das Land der Thai,* Stuttgart.

Credner W. 1935b *Cultural and geographical observations on the Tali (Yunnan) region with special reference to the Nan-chao problem,* Siam Society, Bangkok.

Credner W. 1942 'Hinterindien als Rassenwanderungsraum', *Zeitschrift fur Rassenkunde* 13, 324-333.

Daghregister, 1887-1931 *Daghregister gehouden int Casteel Batavia vant Passerende daer ter Plaetse als over geheel Nederlandts-India. Anno 1624-1682,* Den Haag, 31 vols.

Delvert J. 1961/1994 *Le paysan cambodgien,* Mouton, Paris. Reprinted L'Harmattan. Paris.

Eickstedt E. von 1940 'Forschungen in Sud- und Ostasien' *Zeitschrift fur Rassenkunde* 11.

Eickstedt E. von 1944 *Rassendynamik von Ostasien, China, und Japan, Tai und Kmer von Urzeit bis Heute,* de Gruyter, Berlin.

Elson R. 1984 *Javanese peasants and the colonial sugar industry: impact and change in an East Indian Residency, 1830-1940,* Oxford University Press, Singapore.

Elson E. 1997 *The end of the peasantry: a social and economic history of peasant livelihood 1800-1910s,* Macmillan, Basingstoke.

Flenley J. 1988 'Palynological evidence for land use changes in Southeast Asia', *Journal of biogeography* 15 185-197.

Forbes H.O. 1884 'Three month's exploration in the Tenimber Islands, or Timor Laut', *Proceedings of the royal geographical society* 6 113-129.

Forbes H.O. 1885 *A naturalist's wanderings in the Eastern Archipelago: a narrative of travel and exploration from 1878 to 1883,* Harper & Brothers, New York.

Fraser J.D. 1896 *Account of dyes and dyeing in Burma,* Superintendent, Government Printing, Rangoon.

Furer-Haimendorf C. von 1938 'Through the unexplored mountains of the Assam-Burma border', *Geographical journal* 91 201-219.

Furer-Haimendorf C. von 1946/1978 *The naked Nagas,* Thacker, Spink & Co, Calcutta. Reprinted AMS Press, New York.

Furer-Haimendorf C. von 1955 *Himalayan barbary,* Murray, London.

Furer-Haimendorf C. von 1971 "Comparisons between mountain peoples of the Philippines and some tribes of northeast India', *Geographical journal* 137 339-348.

Furer-Haimendorf C. von c.1983 *Himalayan adventure: early travels in north-east India,* Sterling, New Delhi.

Garnier F. 1873 *Voyage d'exploration en Indo-Chine, effectue pendant les annees 1866, 1867, 1868,* Hachette, Paris.

Garnier F. (posth.) 1996 *Travels in Cambodia and part of Laos,* White Lotus, Bangkok. This is said to be a translation (by Walter Tips) of the Mekong Commission *Report* of 1866-68. It is actually a compilation from articles in *Tour du Monde,* 1869-71 and Garnier's *Voyage* of 1885.

Garnier F. (posth.) 1996 *Further travels in Laos and in Yunnan*, White Lotus Press, Bangkok. Like the preceding title, this is a compilation. Both titles must be used with care as the translation is faulty in many places.

Geertz C. 1966 *Agricultural involution: the process of ecological change in Indonesia*, University of California Press, Berkeley.

Gourou P. 1936 *Les paysans du delta tonkinois*, Les Editions d'art et d'histoire, Paris.

Grist D.H. and Abdul Rahman S. 1921 'The cultivation of tenggala padi', *Malayan agricultural journal* 9 5-257.

Grist D.H. 1959 *Rice*, Longmans, London.

Groeneveldt W.P. 1960 *Historical notes on Indonesia and Malaya compiled from Chinese sources*, C.V. Bhratara, Djakarta.

Harmand J. 1876 'Voyage au Cambodge', *Bulletin de la societe de geographie de Paris*, 6 ser. 12 337-367.

Harmand J. 1877a 'Excursion de Bassac a Attopeu', *Bulletin de la societe de geographie de Paris* 6 ser. 14 239-247.

Harmand J. 1877b 'Notes sur les provinces du bassin meridional du Se Moun (Laos et Cambodge siamois)', *Bulletin de la societe de geographie de Paris* 6e ser. 14 225-238.

Harmand J. 1878-9 'Notes de voyages en Indo-Chine', *Annales d'extreme orient* 1 329-337, 360-379.

Harmand J. 1879 'Exploration du Cambodge a l'ouest du Me-kong', *Revue de geographie internationale* 4(44) 137-140.

Higham C. 1995 'The transition to rice cultivation in Southeast Asia', in T.D. Price and A.B. Gebauer (eds) *Last hunters – first farmers, new perspectives on the prehistoric transition to agriculture*, School of American Research Press, Santa Fe NM, 127-155.

Higham C. 1996 *The Bronze Age of Southeast Asia*, Cambridge University Press, Cambridge.

Higham C.F.W. and Kijngam A. 1985 'New evidence for agriculture and stock-raising in monsoonal Southeast Asia' in V.N. Misra and P. Bellwood (eds) *recent advances in Indo-pacific prehistory*, Oxford and IBH publishing Co., New Delhi, 419-423.

Higham C. and Lu T. L.-D. 1998 'The origins and dispersal of rice cultivation' *Antiquity* 72 867-877.

Hill R.D. 1976 'On the origins of domesticated rice', *Journal of oriental studies* 14(1) 35-44.

Hill R.D. 1977 *Rice in Malaya, a study in historical geography,* Oxford University Press, Kuala Lumpur.

Hill R.D. 1983 *Index indochinensis,* Centre of Asian Studies, University of Hong Kong, Hong Kong.

Hill R.D. 2004 'Towards a model of the history of 'traditional' agriculture in Southeast Asia', in P. Boomgaard and D. Henley (eds) *Smallholders and stockbreeders. Histories of foodcrop and livestock farming in Southeast Asia,* KITLV Press, Leiden, 19-45.

Hirth F. and Rockill W.W. (transl.) 1911 *Chau Ju-Kua: his work on the Chinese and Arab trade in the twelfth and thirteenth centuries entitled Chu-fan-chi,* St. Petersburg, Imperial Academy of Sciences.

Hoadley M.C. and Hooker M.B. 1981 *An introduction to Javanese law: a translation of and commentary on the* Agama, University of Arizona Press, Tucson.

Hosie A. 1883 *Report on a journey through Ssu-chuan, Yunnan and Kuei chou,* Great Britain, Foreign Office, London.

Hosie A. 1897/1972 *Three years in western China: a narrative of three journeys in Ssu-ch'uan, Kuei-chow, and Yun-nan,* Philip, London. Reprinted Ch'eng Wen, Taipei.

Hutterer K.L. 1983 'The natural and cultural history of Southeast Asian agriculture: ecological and evolutionary considerations', *Anthropos* 78 169-212.

Hutterer K.L. 1984 'Ecology and the evolution of agriculture in Southeast Asia', in A.T. Rambo and P.E. Sajise (eds) *An introduction to human ecology research on agricultural systems in Southeast Asia,* University of the Philippines, Los Banos, 75-97.

Ishii Y. 1978 'History and rice-growing', in Y. Ishii (ed.) *Thailand; a rice-growing society,* University Press of Hawaii, Honolulu, 15-39.

Ismail Hussein (ed.) 1979 *Hikayat Negeri Johor,* Malaysian Branch, Royal Asiatic Society, Kuala Lumpur.

Kano T. 1946/1995 'Bashi kaikyo o chushin to seru Taiwan to Firippin no bunka kankei – doshokubutsu goi yori mitaru' [Cultural relations between Taiwan and the Philippines as viewed from plant and animal names]', *Tonan Ajia minzokugaku senshigaku kenkyu,* Nan Tian Shu Ju, Taipei, vol. 1 , 113-161. First published by Yajima shobo, Tokyo.

Kano T. 1952/1995 'Senshigaku yori mitaru Tonan Ajia ni okeru Taiwan no ichi' [The place of Taiwan in the prehistory of Southeast Asia] *Tonan ajia minzokugaku senshigaku kenkyu,* an Tian Shu Ju, Taipei, vol. 2, 89-186. First published Yajima shobo, Tokyo.

Kano T. 1952/1995 'Taiwan genju minzoku no busshitsu bunka to sono ruien – Tonan Ajia tairiku to Tonan Ajia shoto ryo bunka no Taiwan ni okeru sesshoku ni tsuite', [Material culture of the Taiwan aborigines and its affinities. Taiwan as a contact point of the continental and insular culture of Southeast Asia] *Tonan Ajia minzokugaku senshigaku kenkyu,* Nan Tian Shu Ju, Taipei, vol. 2 218-253. First published Yajima shobo, Tokyo.

Kano T. and Segawa K. 1956 *An illustrated ethnography of Formosan aborigines, I, the Yami,* Maruzen, Tokyo, with an introductory text by Toichi Mabuchi.

Kolb A. 1942 *Die Philippinen,* K.F. Koehler Verlag, Leipzig.

Kolb A. (posth.) 1992 *Yunnan, Chinas unbekannter Suden* Institut fur Geographie der Technischer Universitat, Berlin.

Koninklijk Institut voor de Taal-, Land-, en Volkenkunde 1910-55 *Adatrechtbundels,* KITLV, Leiden.

Korn V.E. 1984 *Hukum adat Bali* (microform), Library of Congress Office, New Delhi. Originally published at Denpasar, between 1972 and 1982.

Laufer B. 1919 *Sino-iranica: Chinese contributions to the history of civilization in ancient Iran…,* Field Museum of Natural History, Chicago. Actually also covers Southeast Asia.

Laufer B. 1907/1967 *The relations of the Chinese to the Philippine Islands,* Smithsonian Institution, misc. ser. Vol. 50. Republished in *Philippine Historical Society history bulletin* 11(1) 1-38.

Laufer B. 1924 *Tobacco and its use in Asia,* Department of Anthropology, Field Museum of Natural History, Bull. 18, Chicago.

Laufer B. 1938/1968 'The American plant migration', *Field Museum of Natural History anthropological series,* 28(1) 9-132. Reprinted Kraus Reprint Corporation, New York.

Lejosne J.-C. (ed.) *Le journal de voyage de Gerrit van Wuysthoff et de ses assistants au Laos (1641-1642)* Centre de Documentation et d'Information sur le Laos, Paris.

Liaw Yock Fang (ed.) 1976 *Undang-undang Melaka,* Nijhoff, The Hague.

Loureiro J. de 1790 *Flora Cochinchinensis,* Ulyssipone [Lisbon].

Luce G.H. 1940 'Economic life of the early Burman', *Journal of the Burma Research Society* 30(1) 283-335.

Luce G.H. 1969 *Old Burma – early Pagan,* J.J. Augustin, Locust Valley NJ, 3 vols.

Ma Huan 1433/1970 *Ying-yai Sheng-lan 'The overall survey of the ocean's shores',* Hakluyt Society, Cambridge.

Maloney B.K. 1991 'Rice agricultural origins: recent advances', GeoJournal 23(2) 121-124.

Maloney B.K. 1994 'The prospects of using palynology to trace the origins of tropical agriculture: the case of Southeast Asia', in J. Hather (ed.) *Tropical archaeobotany,* Routledge, London, 139-171.

Maloney B.K. 1996 *New perspectives on possible early dry land and wet land rice cultivation in highland north Sumatra,* Centre for South-East Asian Studies, University of Hull, Hull.

Marsden W. 1811/1966 *History of Sumatra,* author, London. Reprinted Oxford University Press, Kuala Lumpur.

McLennan M.S. 1980 *The Central Luzon plain: land and society in the inland frontier,* Alemar-Phoenix, Quezon City,

McLennan M.S. 1981 'Changing human ecology on the Central Luzon Plain: Nueva Ecija, 1705-1939' in A.W. McCoy and E.C. de Jesus (eds) *Philippine social history,* Allen & Unwin, Sydney, 57-90.

Merrill E.D. 1912 'Notes on the flora of Manila with special reference to the introduced elements', *Philippine journal of science* 7 145-208.

Merrill E.D. 1917 *An interpretation of Rumphius's* Herbarium Amboinense, Philippine Islands, Bureau of Science, Manila.

Merrill E.D. 1920/1946 'Comments on Cook's theory as to the American origin and prehistoric Polynesian distribution of certain economic plants, especially *Hibiscus tiliaceus* Linnaeus', *Philippine journal of science* 17 377-384. Reprinted C*hronica botanica* 10 193-198.

Merrill E.D. 1937 'On the significance of certain Oriental plant names in relation to introduced species', *Proceedings of the American philosophical society 78(1) 111-146.*

Merrill E.D. 1938 'Domesticated plants in relation to the diffusion of culture', *Botanical review* 4 1-20.

Moore E. 1989 'Water management in early Cambodia', *Geographical journal* 155(2) 204-214.

Moore E. 1997 'The East Baray: Khmer water management at Angkor (a field report on recent imaging radar findings)', *Journal of southeast asian archaeology* 1 91-98.

Mouhot H. 1868/1989 *Voyage dans les royaumes de Cambodge, de Laos et autres parties centrales de l'Indochine,* Editions Olizane, Geneve. First published in *Tour du Monde.*

Nieuwenhuis A.W. 1898 'La recente expedition scientifique dans l'ile de Borneo', *Tijdschrift voor Indische Taal- Land- en Volkenkunde* 40 508-541.

Nieuwenhuis A.W. 1904-07 *Quer durch Borneo,* E.J. Brill, Leiden.

Nieuwolt S. 1984 'The water balance and agricultural land use in Peninsular Malaysia', in M.M. Yoshino (ed.) *Climate and agricultural land use in Monsoon Asia,* University of Tokyo Press, Tokyo, 255-274.

Nieuwolt S. 1986 'Etudes agroclimatiques en Malaysie', in P. Pagney and S. Nieuwolt (eds) *Etudes de climatologie tropicale,* Masson, Paris.

Ochse J.J. 1931/1977 *Vegetables of the Dutch East Indies* Department of Industry, Agriculture and Commerce, Buitenzorg. Reprinted Asher & Co., Amsterdam.

Osborne M.E. 1975 *River road to China,* Liveright, New York.

Overton J. 1994 *Colonial green revolution? Food, irrigation and the state in colonial Malaya,* CAB International, Wallingford.

Owen N.G. 1982 'Abaca in Kabikolan: prosperity without progress', in A.W. McCoy and E.C. de Jesus (eds) *Philippine social history: global trade and local transformations* Ateneo de Manila University Press, Manila 191-216.

Owen N.G. 1986 'A subsistence crisis in the provincial Philippines 1845-1856', *Kinaadman* 8 35-46.

Owen N.G. (ed.) *Death and disease in Southeast Asia: explorations in medical and demographic history,* Oxford University Press, Singapore.

Owen N.G. 1999 *The Bikol blend. Bikolanos and their history,* New Day Publishers, Quezon City.

Pavie A. 1900-19 *Mission Pavie, Indo-Chine, 1879-1895: geographie et voyages,* Leroux, Paris, 7 vols.

Pe Maung Tin and Luce G.H. (translators) 1923/1976 *The Glass Palace chronicle of the kings of Burma,* H. Milford, London. Reprinted AMS Press, New York.

Pham Cao Duong 1985 *The Vietnamese peasant under French domination 1861-1941,* University Press of America, Lanham MD.

Playfair G.M.H. 1876 'The Miaotzu of Kweichou and Yunnan from Chinese descriptions', *China review* 5 92-108.

Purseglove J.W. 1972 *Tropical crops,* Longman, London, 2 vols.

Raffles T.S. 1817/1988 *The history of Java,* Black, Parbury & Allen, London. Reprinted Oxford University Press, Kuala Lumpur.

Reid A. 1983 'Introduction; slavery and bondage in Southeast Asian history' in A. Reid (ed.) *Slavery, bondage and dependency in Southeast Asia* University of Queensland Press, St. Lucia 1-43.

Revel N. 1988 *Riz en Asie du Sud-Est: atlas du vocabulaire de la plante,* Editions de l'Ecole des hautes etudes en sciences sociales, Paris, 3 vols.

Rumpf G.E. 1741-56 *Herbarium amboinense,* M. Uytwerf, Amsterdam.

Saenluang Ratchsompahan (posth.) 1966 *The Nan chronicle,* Southeast Asia Program, Department of Asian Studies, Cornell University, Ithaca NY.

Sao Saimong Mangrai (transl.) 1981 *The Padaeng chronicle and the Jengtung state chronicle,* Center for South and Southeast Asian Studies, University of Michigan, Ann Arbor.

Sauer C.O. 1952/1969 *Agricultural origins and dispersals,* American Geographical Society, New York. Reprinted as *Seeds, spades, hearths, and herds, the domestication of animals and foodstuffs,* MIT Press, Cambridge, Mass.

Scott J.G. 1891 *Memorandum by Mr J.G. Scott…on a visit to the Kyaington-Chiengmai boundary to Meung Hsing and to Chieng Hung,* Superintendent, Government Printing. Rangoon.

Scott W.H. 1958/1969 'A preliminary report on upland rice in northern Luzon', *Southwestern journal of anthropology* 14 87-105. Reprinted in his *On the Cordillera* MCS Enterprises, Manila 1-28.

Scott W.H. 1990 'Sixteenth-century Visayan food and farming *Philippine quarterly of culture and society* 18 291-311.

Semper C. 1869 *Die Philippinen und ihr Bewohner,* A. Stubers Buchhandlung, Wurzburg.

Short D.E. 1980 'Irrigation development in Malaya in the late colonial period 1931-1957', *Malaysian journal of tropical geography* 1 34-42.

Smartt J. and Simmonds N.W. (eds) 1995 *Evolution of crop plants,* Longman, London.

Solheim W.G. II 1972 'An earlier agricultural revolution', *Scientific American* 222(4) 34-41.

Solheim W.G. II 1994 'South-East Asia and Korea from the beginnings of food production to the first states', in S.J. de Laet (ed.) *History of humanity, I. Prehistory and the beginnings of civilization,* Routledge and UNESCO, London and Paris, 468-481.

Teeuw A. and Wyatt D.K. (eds) *Hikayat Patani. The story of Patani,* M. Nijhoff, The Hague.

Veth P.J. 1878-9 'Les Gayos (tribu de l'interieur d'Atchin)' *Annales d'extreme orient* 1 22-23.

Veth P.J. and Kan C.M. 1878 'Voyages of the steamer *Egeron* in the Indian Archipelago…' *Journal of the royal geographical society* 48 294-301.

Vickery M. 1998 *Society, economics, and politics in pre-Angkor Cambodia: the 7th and 8th centuries* Toyo Bunko, Centre for East Asian Cultural Studies, Tokyo.

Wallace A.R. 1860 'Notes of a voyage to New Guinea' *Journal of the royal geographical society* 30 172-177.

Wallace A.R. 1968/1962 *The Malay Archipelago…,* Macmillan, London. Reprinted Dover Publications, New York.

Waruno Mahdi 1994 'Some Austronesian maverick protoforms with culture-historical implications' *Oceanic linguistics* 33 167-229, 431-490.

Watson J.B. 1968 'Pueraria: names and traditions of a lesser crop of the central highlands, New Guinea', *Ethnology* 7 268-279.

Yen D.E. 1977 'Hoabinhian horticulture? The evidence and the questions from northwest Thailand', in J. Allen, J. Golson and R. Jones (eds) *Sunda and Sahel: prehistoric studies in Southeast Asia, Melanesia and Australia,* Academic Press, London.

Zingg R.M. 1934 ‘American plants in Philippine ethnobotany’, *Philippine journal of science* 54(2) 221-274.