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Rizification revisited
Re-examining the rise of rice in Indonesia with special reference to Sulawesi

> Of all the plants which afford a supply of nutritious farina for human aliment, the sago affords at once the most obvious, easy, and abundant one. The pith of the tree, when ground down in a mortar, deposites the farina, at once, without difficulty. Unlike, also, to the other great sources of farinaceous food, it exists in nature in great abundance […]. (Crawfurd 1820, I:386.)

> No country has produced a great or civilized race, but a country which by its fertility is capable of yielding a supply of *farinaceous* grain of the first quality. Man seems never to have made progress in improvement, when feeding on inferior grains, farinaceous roots, on fruits, or on the pith of trees. (Crawfurd 1820, I:14-5.)

> The best soils, indeed, are perhaps necessary for raising in perfection the higher descriptions of the *Cereal gramina*, particularly rice […]. Such is the paramount importance and value of the rice culture [in Indonesia], that all lands bear a value in reference to their capacity of producing this grain. This is the constant test applied to them. (Crawfurd 1820, I:345-6.)

There is an influential theory that in eastern Indonesia the rise of rice to the status of a major foodcrop has taken place only within the last 500 years, prior to which taro, yams, bananas, sago and 'archaic' cereals were much more important. Gorman (1974) long ago cast doubt on the applicability of a comparable model to Thailand, and Boomgaard (2003) has questioned the idea that rice emerged as the victor in a 'battle between cereals and roots' on Java. In the present piece I provide further critical re-examination of evidence for a historical transition from non-rice to rice farming in Indonesia – this time with special reference to Sulawesi and its outlying islands, but also incorporating brief excursions to Java, Borneo and the Moluccas. My argument is essentially threefold. Evidence for such a transition, firstly, is more difficult to find, and more localized, than much existing literature suggests or assumes. Where it does exist, secondly, it usually reflects not the diffusion of rice cultivation from some areas to others, but an increased emphasis on this crop within di-

Figure 1. Talaud farmer in his taro field, with tuber. Photo by Alex Ulaen, from the collection of the Yayasan Mitra Budaya, Jakarta.

versified local farming systems which already included it. The typical reasons for this change, thirdly, were increased use of irrigated farming techniques as a result of political or population pressure, or, more commonly, an increase in the trade in foodstuffs, usually as part of a more general movement from subsistence-orientated to commercialized economic conditions.

Rizification: the history of an idea

The history of rizification as an idea forms part of the history of evolutionary or *Stufen* (staircase) theories of social and economic change in Southeast Asia, of which something has already been said in the introduction to this volume. Elements of an evolutionary interpretation of Southeast Asian agricultural patterns, in which root crops or sago represent the most primitive and wet rice the most advanced stage, can be found in many works of scholarship on the region from the nineteenth century onward. Perhaps the clearest and most complete exposition was given in 1927 by C. Lekkerkerker, a prolific Dutch academic writer on Indonesia, in an article entitled 'The developmental stages of native agriculture in connection with the vegetable foods of the Indian Archipelago'.

> We can […] schematize the agricultural development of the Indian archipelago (leaving aside animal foods) in terms of five phases, each with its own characteristic crops:
> 1. the period of hunting or gathering natural products;
> 2. that of tuber, vegetable and fruit cultivation;
> 3. that of cultivation of indigenous grain crops (species of 'millet');
> 4. that of cultivation of indigenous grains and rice on temporary and permanent fields;
> 5. that of cultivation of rice on permanent fields, with progressively greater use of irrigation […].
>
> (Lekkerkerker 1927:600.)

Lekkerkerker identified these 'levels of development' (*ontwikkelingstrappen*) in agriculture with progressively higher 'levels of civilization' (*beschavingstrappen*) in society. He was also inclined to associate them with the racially distinct waves of immigration from the Asian mainland which at that time were thought to have been responsible for the peopling of Indonesia and the making of its culture. Rice, in his view (Lekkerkerker 1927:607), must have been introduced to the archipelago by the 'Deutero-Malays', a hypothetical race first distinguished from the ancient 'Proto-Malays' (putative ancestors of the Dayak, Toraja and other 'primitive' Indonesian agriculturalists) by the Swiss explorer and anthropologist Fritz Sarasin (1906:141-2) at the beginning of the twentieth century.

Similar ideas continued to resonate down the following decades. In the 1950s, the agricultural scientist Terra (1958:175-6) characterized the 'Polynesian farm system' based on tubers and bananas as an ancient and primitive 'substratum' of Indonesian agriculture associated with matrifocal kinship systems and 'Veddoid' racial characteristics. In the 1960s the geographer J.E. Spencer (1963:88) insisted that the terraced wet rice landscapes of Indonesia and the Philippines were 'rather recent developments in which rice agriculture often is not yet really mature', and produced elaborate maps (1966:112-3) showing the historical 'retreat of taros' and 'retreat of yams' from Southeast Asia, the whole of which he regarded as having been a zone of 'taro staples' at an indeterminate period in the distant past. In the 1970s Metzner (1977:116), like Ormeling (1955:106) before him, cited Lekkerkerker by name to the effect that the Timorese had eaten root crops prior to the arrival of rice and maize – although he also noted that there was 'no agreement among anthropologists as to the exact time of introduction of these two cereals into Timor'. In the 1980s Macknight (1983:97), in an article entitled 'The rise of agriculture in South Sulawesi before 1600', effectively equated agriculture with wet rice cultivation, which he supposed had spread in Sulawesi not long before 1600 at the expense of a more primitive mode of subsistence featuring some gathering and 'more stress on roots and fruits than rice'. Ulrich Scholz, in his

otherwise admirable *Agrargeographie von Sumatra* (1988:181), opined that the Mentawai islands, where sago and taro are the staple foods, stand 'at the foot of the developmental ladder' in agricultural terms. One reason for this, Scholz added in what could almost have been a quotation from Sarasin, was geographical isolation, as a result of which Mentawai 'remained almost completely untouched by the various waves of civilization [*Zivilisationswellen*] which have passed over the Indonesian archipelago in the past centuries' (Scholz 1988:183).

In the 1990s the 'waves of migration' interpretation of Indonesian prehistory, if not the idea of waves of civilization, was at last undermined by the consolidation of a new orthodoxy according to which almost the whole population of island Southeast Asia (and a large part of the Pacific) is descended from a single racial and linguistic group. Called the Austronesians after the family of languages spoken by its descendants, this was a farming people which completely displaced most pre-existing non-agricultural populations as it dispersed (according to the most widely accepted view) from its earliest known homeland in Taiwan into the Philippines, Indonesia and Oceania beginning in around 3,000 BC (Bellwood 1997:118). Comparative linguistic studies, meanwhile, had long supported the idea that rice was among the original Austronesian foodcrops: words for rice, husked rice, cooked rice, and rice straw have all been reconstructed in the hypothetical ancestor of all the Austronesian languages (Blust 1976:21-2). Yet even Peter Bellwood (1997:245), the foremost proponent of the idea that the earliest Austronesian colonists of Indonesia were already rice-growers, attempts to reconcile this with Spencer's 'rizification' thesis by proposing that they subsequently 'dropped rice to the scale of a very minor crop' in Sulawesi and the eastern part of the archipelago, gradually reverting to rice cultivation only after 1500 AD at the expense of other staples such as yams, taro, bananas, sago, and foxtail millet.

Has rice replaced other crops in Sulawesi?

In 1500, according to Spencer, Sulawesi (and the Philippines) still belonged to the zone in which both taro and yams were staple crops; the 'primary western limit of taro as a staple' also encompassed Borneo. In 1950, by contrast, neither crop was said to be important anywhere to the west of New Guinea. Isolating the basis for these claims is somewhat difficult because Spencer's argument, as he put it himself (1966:111), was 'screened from my whole pattern of reading' rather than justified in bibliographic detail. As far as Sulawesi is concerned, however, his sole historical source (Spencer 1966:117), quoted at second hand from Burkill's *Dictionary of the economic products of the Malay peninsula* (1935, I:828), appears to have been the seventeenth-century bota-

nist Rumphius (1627-1702), who stated simply that '*ubi* [tuber] cultivation begins in earnest in Celebes [Sulawesi] and Buton, stretching on through the Moluccas, Ambon, Banda, and all the southeastern islands to New Guinea' (Rumphius 1747:347).

Historical sources not available to Spencer make it clear that in many parts of Sulawesi, rice was already important long before Rumphius' time. On the populous southwestern peninsula, where remains of rice husks which appear to be more than a thousand years old have been found by archaeologists (Glover 1985:272), rice was definitely 'the principal product of the country', exported to markets as distant as Malacca, when the first Portuguese visitors arrived in the early sixteenth century (Pelras 1981:156). On the east coast of Central Sulawesi in Tobungku, likewise, it was being grown on a large scale in the 1540s (Abendanon 1917-18:1768). On Siau in the Sangir islands north of Manado, it is reported by a Jesuit missionary source from the 1580s (Jacobs 1974-84, II:262). In the immediate hinterland of Manado, Minahasa, rice was the most important crop in both ritual and commercial terms at the beginning of the seventeenth century (Godée Molsbergen 1928:14; Pérez 1913-14, IV:433). Later in that century the inhabitants of the short northeastern (Luwuk) peninsula of the island were described as 'diligent farmers who have a great deal of *padi* and rice', some of which they exported to Ambon (Valentijn 1856:221). In 1682 a knowledgeable Dutch official in Ternate, Robert Padtbrugge, reported that 'an abundance of rice' was also being grown in the upland interior of Central Sulawesi (Van Dam 1931:93).

A look at sources referring to the period around 1950, conversely, reveals a much closer similarity than Spencer assumed to the situation sketched by Rumphius more than 250 years earlier. In the Banggai archipelago just off the east coast of Central Sulawesi, taro and yams were still the most important foodcrops (Schrader 1941:125), as were taro, sweet potato, bananas and sago on Sangir in the north (Blankhart 1951:86, 95), unspecified tubers on the Tukang Besi islands off Buton (Schoorl 1993:67), and bananas on the Mandar (Majene-Mamuju) section of the west coast (Terra 1958:177). In more recent times tubers and sago have continued to play important roles alongside rice on the Sangir and Talaud islands (Plates 1-3). In Luwu on the Gulf of Bone in the south, sago remained the staple food until the 1970s (Furukawa 1982:38). In some parts of Central Sulawesi, including the interior of the Mandar area (George 1996:44) and the neck of the northern peninsula (Kartawinata 1993:181-2; Li 1991:39), taro and sago dominated local food production in the 1990s.

Not all early descriptions of North and Central Sulawesi, admittedly, mention rice. A brief Portuguese account from 1561, firstly, lists only bananas (*figos*, literally 'figs'), coconuts and yams (*ynhames*) as foodcrops in the 'Celebes' (De Sá 1955:328). In the sixteenth century, however, the term Celebes referred to an area stretching from North Sulawesi to Mindanao (Abendanon 1917-

Figure 2. Extraction of sago pulp from trunks of *Metroxlyon microcarpa* on Talaud. The canoe hull to the right is being used as a settling tank for collecting the edible starch after the fibres have been kneeded and sieved out of a mixture of pulp and water (see Ellen, this volume). Photo by Alex Ulaen, 1979, from the collection of the Yayasan Mitra Budaya, Jakarta.

18:1896-8), and this source probably refers to the Sangir archipelago, where rice cultivation is still limited today. A Dutch report from 1670, secondly, states that the inhabitants of Buol and Tolitoli, on the northwestern hook of the northern peninsula, are 'sago-eaters, for they have no rice' (Noorduyn 1983:117). But this remark, once again, concerns an area where sago was still the staple food in much later times (Riedel 1872:191, 200). Most of the recorded variation in farming systems within Sulawesi, in other words, is geographical rather than chronological. In Sangir, Talaud and Banggai, a large part of the food supply has always come from root crops: yams (*Dioscorea* species), taro (*Colocasia esculenta*), the giant aroid *Alocasia macrorrhizos*, and (in parts of Talaud) the 'swamp taro' *Cyrtosperma merkusii*. Another important non-grain food at all historical periods was sago, the starch extracted from the trunks of certain (wild or cultivated) palms: the true sago palm (*Metroxylon sagu*), the sugar or *aren* palm (*Arenga pinnata*), and on Sangir and Talaud *Arenga microcarpa*, the *sagu baruk* or 'Magindanao sago tree' (Steller 1866:17). Although the primary use of sago in most areas was as a fallback or emergency food, there

were some localities where in late colonial times it provided the mainstay of the diet. Besides coastal Buol and Tolitoli, these included the Togian islands in the Gulf of Tomini, parts of the Tobungku coast, Tonsawang in the south of Minahasa, and Manganitu on Greater Sangir. *Aren* sago also seems to have been very important, alongside rice and maize, in Bolaang Mongondow (on the northern peninsula to the west of Minahasa) during the nineteenth century (De Clercq 1883:122; Riedel 1864:276).

What Rumphius had to say about the so-called 'archaic grains' is more instructive than the scanty details which he gives regarding the geography of root crop cultivation, and leads to similar conclusions. Job's tears, he reported, was planted 'along the edges of the ricefields' on Sulawesi and Java, and 'in the gardens [swiddens] among other crops' in Ambon, where it was valued mainly for its sweet taste when the roasted, stamped, and soaked grains were cooked as a porridge with coconut milk (Rumphius 1747:193-4). Sorghum, according to Rumphius (1747:195), was grown 'everywhere in the Indies', but again mainly around the borders of swiddens, and this time 'not so much as a source of human food as to feed the birds which otherwise would do great damage to the ricefields; for which reason they call this crop the mother of the rice'. Foxtail millet, described by Rumphius (1747:202) under the name *Panicum indicum* (Heyne 1950, I:237), was likewise sown 'on the edges of the ricefields which lie in dry places' in South Sulawesi, Bali, and parts of the Moluccas, but 'nowhere in large quantities'. Cooked in the same way as sorghum, it was said to provide 'a poor fare, most drying and conducive to constipation' – although well suited, Rumphius quipped, 'for feeding to small birds'. If his *Amboinsch kruid-boek* offers little evidence for a recent displacement of tubers by rice, for Lekkerkerker's age of millet and other 'indigenous grains' it provides next to none.

Given that the sources dating from before Rumphius arrived in the Moluccas in 1654 are limited, it remains possible that sorghum (*Andropogon sorghum*), foxtail millet (*Setaria italica*) and Job's tears (*Coix lachryma-jobi*), all of which were still grown in small quantities on Sulawesi in colonial times (Koorders 1898:273, 278; Tergast 1936:136), were somewhat more important there in the distant past. If these were indeed displaced, however, the evidence suggests that it was not by rice but by maize, an early American introduction which had apparently reached Sangir from the Philippines by the 1580s (Wigboldus 1979:23). Like foxtail millet and sorghum, but unlike rice, maize is a crop well adapted to arid conditions and poor soils. But its productivity is considerably higher, so that in some climatically dry parts of Indonesia, including Gorontalo (Reinwardt 1858:513), the Palu area (*Landschap Donggala* 1905:516) and the tip of the south-western peninsula (Furukawa 1982:29, 62) in Sulawesi, it ultimately became the staple food. In the Philippines it was in the Visayas (Hill 1998:4), particularly in areas of limestone geology with thin, porous soils on Cebu, Negros and Bohol

Figure 3. Weeding a ricefield on Talaud. Photo by Alex Ulaen, 1979, from the collection of the Yayasan Mitra Budaya, Jakarta.

(Kolb 1942:194), that maize came to dominate foodcrop agriculture. The earliest Spanish accounts of the Visayas indicate that millet is second only to rice in 'importance and esteem' as a food, and even that in 'some islands' it is 'the main crop, with rice not being grown at all' (Scott 1994:39). In the languages of Timor and neighbouring islands in the Lesser Sundas, maize often seems to have taken over names originally applied to sorghum (Fox 1992:76-8); in Central Sulawesi, its indigenous names are variants on those for Job's tears (Adriani and Kruyt 1950-51, III: 147; Kruyt 1938, IV:271).

There is history, and there is oral history

In so far as it has been justified in a systematic way, the rizification theory has rested less on historical sources than on the interpretation of recent folkloric, ethnographic and linguistic data (Dove 1999:51-8; Lekkerkerker 1927:592-3). When the Dutch missionary Albert Kruyt (1924:33-9), an authority referred to repeatedly by Lekkerkerker, concluded that rice had originally been unknown in Central Sulawesi, his evidence came almost exclusively from ritual

and legend: the use of yams in sacrificial offerings to the dead despite their lack of prestige as food for the living, stories of ancestral mortuary feasts at which only taro was consumed, and the existence of a taboo on rice consumption in the days immediately following the death of a relative. The interpretation of such indirect evidence was often imaginitive to say the least: the fact that the word for 'millet' also meant 'riddle' in one of the local languages, for instance, was cited by Kruyt's missionary colleague Adriani (1909:370-2) as evidence for a past epoch of millet cultivation, on the peculiar grounds that in his time, local people believed the telling of riddles to have a beneficial effect on the rice harvest. The 'heavenly beings' (*hemelingen*) credited in local mythology with the introduction of rice, meanwhile, were interpreted as an immigrant race of human 'rice-bringers' (Kruyt 1924:35-6).

In my view it goes almost without saying that for the purposes of reconstructing long-term agricultural change, oral traditions like this mostly have little or no value. In the mythology of Minahasa (North Sulawesi), rice was stolen from the gods by an ancestral thief-hero (Schefold 1995) at a time when the staple food was the fruit or nut (Verheij and Coronel 1992:340) of the liana *Gnetum latifolium* (Schwarz 1907:244). Nobody, to my knowledge, has attempted to take the latter statement any more literally than the former, and neither would it be sensible to do so; but if the myth had happened to figure sago or yams in the logically necessary role of the pre-rice food, it would undoubtedly have been seized on as an informative piece of 'oral history'. Folkloric evidence lends itself dangerously well to selective deployment in support of a preconceived argument. If the prominence of origin myths for rice, for instance, has been interpreted by some as evidence that this crop was a late introduction, it was precisely the absence of such myths in the case of maize which the ethnographer Schröder (1917:29), working on Nias, saw as consistent with the known circumstance of 'introduction from elsewhere in relatively recent times'.

Local rizification on Sulawesi: irrigation, politics and demography

All this is not to argue that no evidence exists in the historical record proper for episodes in which rice cultivation became more important on a local scale. Two quite well documented early examples took place during the late seventeenth and early eighteenth centuries in the Palu (Kaili) valley of western Central Sulawesi and the Limboto depression of Gorontalo, North Sulawesi. When the Spanish priest Domingo Navarrete visited Kaili in 1657, its population appeared to live on bananas, 'without sowing Rice or any other Grain' (Cummins 1962:110), but just 25 years later the Dutch writer Padtbrugge reported that the Palu valley contained 'a multitude of fertile [wet] paddy fields

which are worked using buffalo, and not in the way that is customary on the stony soils in those parts' – that is, not by means of swidden cultivation (Van Dam 1931:91). Travelling from Limboto to Gorontalo in 1677, secondly, Padtbrugge wrote in his diary that although the land was 'everywhere entirely suitable for the cultivation of rice', none was grown, the only 'properly tended' crops being banana trees (Van der Aa 1867:164); but in the first half of the eighteenth century, irrigated ricefields were laid out in the same area on a large scale (Riedel 1870:110; Tacco 1935:107-8).

At no stage were the Palu or Limboto areas, both located in areas of unusual climatic aridity but also subject to violent flooding by river runoff, favoured as sites for dry rice cultivation. 'On the valley floor', observed a Dutch *controleur* of Palu in the 1930s, 'rice can be grown only on *sawah* [wet ricefields]' (Vorstman 1935:19). From the fact that no rice was seen in these lowland areas prior to the spread of irrigation, then, it does not follow that none was present in the adjacent hills. In a later report, Padtbrugge himself concedes that Gorontalo farmers are not entirely without rice after all, but 'prefer to plant the little *padi* which they grow on the slopes of the mountains in the Moluccan fashion' – that is, in swidden fields (Van Dam 1931:97). Whereas maize, tubers and vegetables were always planted on dry fields even where rice was the main crop, irrigated fields mostly produced only rice: nineteenth-century observers in Minahasa attributed the general local preference for swidden over irrigated farming partly to the fact that 'the dry fields, besides *padi*, also give many other products including firewood, vegetables, pumpkins, *patatas* [sweet potato], and above all maize' (Wilken 1870:374). Any increase in the area under pond-fields, then, automatically led to a greater emphasis on rice relative to other crops.

Although wet rice farming is indigenous to Sulawesi and was practiced on a small scale in many upland areas as a complement to swidden farming (Kruyt 1938, IV:18-227; Woensdregt 1928), the irrigaton of flood-prone lowland valleys was rare in most parts of the island until recent times because it required the more laborious construction of larger water control structures. Where it did occur, it generally reflected two mutually related circumstances: political centralization, and population growth. In eighteenth-century Gorontalo increasingly powerful indigenous polities, founded in the first place on the control of gold exports and supported by the Dutch (Henley 1997:424-5), endeavoured to concentrate their subject population in their immediate vicinity 'in order to control and exploit it better' (Van Hoëvell 1891:32). In that part of the Limboto depression closest to Gorontalo, consequently, 'a constant shortage of farmland' arose (CV Gorontalo 1867, in ANRI Manado 3). Under these conditions the high areal productivity of wet rice cultivation, in accordance with the Boserup (1965) model of agricultural intensification discussed in the introduction to this volume, made it a virtual necessity. The political leaders

who benefited most directly from the concentration of the population were also directly involved in organizing the provision of the irrigation infrastructure which made it possible: in 1744, for example, a major canal was excavated under their direction (NA VOC 2649:111). In the case of the Palu valley, for which historical documentation is less complete, the spread of irrigation between 1660 and 1680 seems to have been associated with the immigration of Bugis settlers from South Sulawesi (Acciaioli 1989:66; Metzner 1981:47), as a result of which the local population density rose and centralized polities similar to those of Gorontalo were created (Kruyt 1938, I:26).

The Dutch colonial state, in later times, had the same interest as its indigenous forerunners in promoting concentrated settlement patterns and intensive wet rice cultivation. The most rigorous application of this policy occurred in eastern Central Sulawesi immediately following its military conquest in the years 1905-1908.

> In the old days, people only lived permanently in the village if their farmland happened to be very nearby. For most of the year they lived in their houses on the swiddens, visiting the village only for festivities and meetings, or when there were rumours of war. Now, however, this freedom was gone, since in the new villages everybody was under regular supervision. If the old type of agriculture had been continued, the now much larger villages would obviously have required a very great area of farmland around them. Naturally, there could be no more question of moving constantly to and fro; the houses were now more solidly built, the plots of land around them well planted, most villages had a school and a teacher's residence, and it was desirable to concentrate the farmland in their immediate vicinity. It is, therefore, very fortunate that the Government has forced the Toraja [uplanders] to lay out irrigated ricefields. (Adriani 1915:470.)

Here, then, is a classic example of the kind of intensification process modelled by Dove (1985) in which the state, partly by direct means, and partly by concentrating the population in settlements so large that swidden farming is no longer practical, brings about a shift to permanent-field cultivation which facilitates taxation and political control. It is worth emphasizing that neither rice nor wet rice farming as a technology were introduced by the Dutch: although farmers in this particular part of Sulawesi had never made wet ricefields themselves, they had always planted rice as one of their swidden crops and also 'knew perfectly well what was involved in wet rice cultivation' as a result of long contact with neighbouring groups which already practiced it (Adriani 1915:470). By promoting the use of flooded fields, nevertheless, the colonial state favoured the ascendancy of rice over other foodcrops.

Countervailing trends were not unknown. In the Napu valley of Lore in western Central Sulawesi, the importance of tubers relative to rice seems to have increased in the late nineteenth century when rice cultivation was 'neglected' as a result of emigration. 'Ultimately', reported Adriani and Kruyt

(1912-14, II:203), 'rice was eaten only by the elite, and the common people and slaves had to make do with root crops'. Here again the crucial proximate variable was irrigation, the extent of which declined more sharply than that of swidden cultivation in Napu during the period of demographic decline (Kruyt 1908:1313). Intensification and disintensification of agriculture under the influence of demographic and political change were not the only reasons, as we shall see below, for changes in the relative importance of rice and other crops. Their demonstrable importance on Sulawesi in some times and places, however, underlines the general point that rizification, where it did occur, was not usually a matter of migration, diffusion, or cultural evolution, but rather a rational response by local people to changes in local conditions.

Borneo and the Moluccas

Partly due to the presence in Borneo of a small number of sago-eating hunter-gatherers, the Punan, scholars of this island have been especially inclined to view its history as a microcosm of the whole ascent of man from forest forager, via 'horticulturalist', to irrigator and commercial farmer. Sellato (1989:227-30), for instance, has argued (again largely on the basis of oral tradition) that until recent times a 'Barito complex' of egalitarian tuber-farming cultures ('non-stratified horticulturalists') occupied a large part of the Borneo interior. Dove (1999:51), citing Spencer (1966) along with 'mythological evidence', also believes in a 'historical transition between tuber cultivation and grain cultivation' on Borneo. In his recent book on the environmental history of Southeast Borneo, Han Knapen (2001:218), while conceding that 'hard historical evidence is still lacking', agrees that 'the existing material seems to lend support to the thesis that rice gradually displaced root crops and sago as the primary source of starch'. Yet only two contemporary written sources, out of the hundreds inspected by Knapen in the course of his research, are cited in support of his claim that many farmers in Southeast Borneo grew little or no rice before the twentieth century.

The first is a statement by the explorer Carl Bock, apparently based on information provided by an Indonesian (but non-local) informant during an expedition to Borneo in 1879 and 1880. The Bukit people of the Meratus mountains, Bock wrote (1881:244), were 'poor and indolent in the extreme, troubling themselves little with the cultivation of their *ladangs* (rice-fields), but preferring to grow djagong (maize), nangka [jack fruit], kladi [taro], katjang [pulses], &c'. Suspiciously, however, Bock, although he saw some Orang Bukit, never visited their country himself. The second written source mentioned by Knapen, an eyewitness account of the Ot Danum area in 1859 by the Dutch government official H.G. Maks, can be dismissed with less hesitation.

Far from stating that the Ot Danum were 'unskilled as rice farmers and depending largely on roots and tubers' (Knapen 2001:218), Maks (1861:525, 530) recounts that his party was 'abundantly supplied with rice' by these people, that 'the harvest has been quite favourable and the rice is among the best in this division', and that the grain is customarily stored as *padi* 'and hulled whenever it is to be consumed'. His complaint about Ot Danum farmers concerns not what they grow, but how much: they spend, he alleges, 'more time on war than on farming', and 'one sees here extensive and fertile hills on which little or nothing has so far been planted due to the natural indolence and ignorance of the population'.

These are no more than the stereotypical judgements of a nineteenth-century colonial official on a warlike stateless people and an area-extensive swidden farming system. That an expert like Knapen could interpret them as evidence for a pre-rice stage of agricultural development in the interior of Borneo during the nineteenth century is doubly surprising given that archaeological evidence for rice cultivation on the island dates back more than 4,000 years, and that by the early seventeenth century, 'all considerable places of southern Borneo' were exporting rice produced upriver by Dayak swidden farmers (Knapen 2001:216-7). The power of the old assumption that rice cultivation must have become widespread only in recent times is also reflected in the literature concerning another area where sago has remained an important foodstuff up to the present day, the Moluccan islands (Ellen 1979; Stark and Latinis 1996). Yet Antonio Galvão's 1544 treatise on the North Moluccas, one of the earliest European historical sources for any part of Indonesia, already describes a diverse agricultural system in which rice, grown on swidden fields by methods familiar from descriptions four centuries younger, plays a major if not central role:

> [T]he fields are […] so poor that, when they sow them one year, they have to allow them a two years rest if they want another harvest. […] They make clearings, which they burn off; and with pointed sticks they make holes in them, in which they put two or three grains […]. They sow the *padi*, which is rice, from the end of August until that of September; also other vegetables, as there are broad beans, grain, lentils, sesame, beans, long pepper, Indian corn, yams, and peas.' (Jacobs 1971:133.)

While the extraction and processing of sago are also described at length in the same account, the observation that 'those who buy it store it in jars or in pits in the houses' (Jacobs 1971:135) suggests that in sixteenth-century Ternate, sago was more often a commercial than a subsistence product – a point to which I will return below.

Figure 4. Borobudur relief (detail), showing standing grain crop attacked by rats.
Source: Krom 1920, Plate O.IX.65

Figure 5. Borobudur relief (detail), showing standing grain crop.
Source: Krom 1920, Plate O.XVI.121

Figure 6. Borobudur relief (detail), showing sheaves of grain on shoulder pole.
Source: Krom 1920, Plate I.b.XXI.41

A pre-rice era on Java?

The great drawback of the European historical sources, of course, is that they cannot take us back any further in time than the sixteenth century. In this context, great interest attaches to an old controversy regarding some fragments of much earlier archaeological evidence for the agricultural history of Indonesia. Among the stone relief scenes on the Buddhist monument of Borobudur in Central Java, built between 775 and 860 AD, are two which show a standing grain crop and one which depicts harvested grain being bundled into sheaves and transported (Plates 4-6). Krom (1927:85, 89), in his inventory of the Borobudur reliefs, identified the crop depicted in the two field panels as maize. Lekkerkerker (1927:609), however, pointed out that maize was a much later introduction from the New World, arguing instead that the Borobudur grain 'can hardly represent anything other than millet, the Javanese *jawawut* [foxtail millet, *Setaria italica*]'. This identification received strong support from other writers: Bakhuizen van den Brink (1931:186), who provided photographs of *padi* and *jawawut* sheaves for comparison with the harvest scene (Plate 7), Steinmann (1934:584), and later also Bernet Kempers in his standard work *Ageless Borobudur*:

> The peasants kneeling on the ground [in Plate 6] seem to be […] binding rice ears into bushels. In the Borobudur reliefs, however, no fields or bushels of rice (*padi*, 'paddy') are to be found. Rice is represented only as an ingredient of meals. The ears [in the same plate] are those of *jawawut*, 'Italian millet' (*Setaria italica*), treated in the same way as rice, bound into bushels and carried away on a pole (*pikulan*). (Bernet Kempers 1976:242-3.)

In 1954, the distinguished American botanist E.D. Merrill had been even more definite about the identity of the grain crops shown on Borobudur and their implications for the agricultural history of Java.

> It has been noted that there are three excellently executed panels depicting *Setaria italica* on the eighth and ninth century Buddhist stupa of the Borobudur in Java. The identifications are positive ones, and the forms depicted cannot be mistaken for any other plant. Therefore, we may infer that this particular cereal was the most important source of food in eighth and ninth century Java. As no rice was depicted on the Borobudur, we are justified in asking whether its cultivation had just commenced or was very limited in Java at that time, even though this cereal was cultivated in Asia from the early times. (Merrill 1954:364-5.)

Hill (1977:21), in *Rice in Malaya*, took Merrill at his word, as did Mabbett (1977:11) in a survey of the 'Indianization' of Southeast Asia. Similar statements continue to appear in the more recent literature, especially in works of a semi-popular nature (Piper 1993:14; Whitten, Soeriaatmadja and Afiff 1996:564).

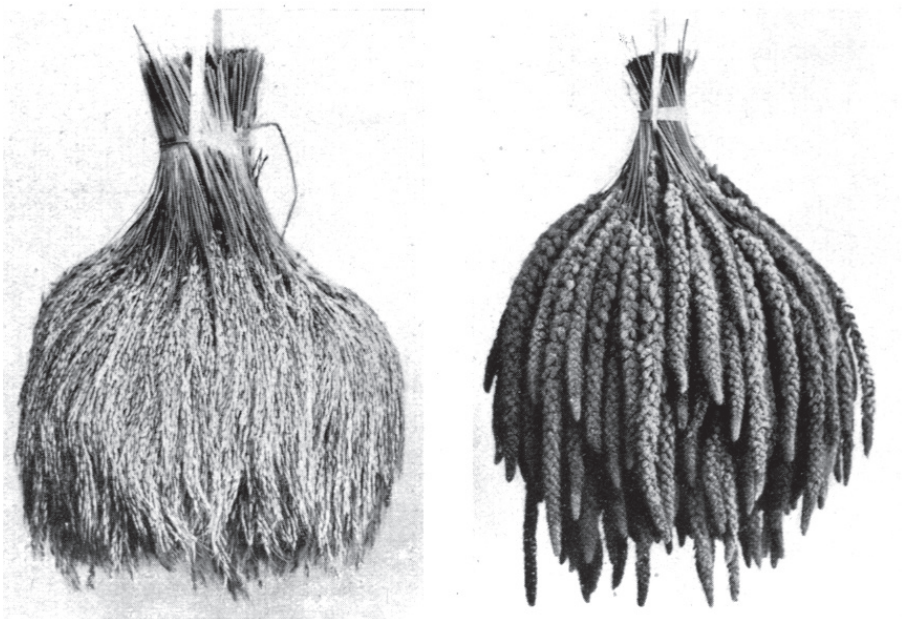

Figure 7. Sheaves of harvested grain. Left: rice (*Oryza sativa*). Right: foxtail millet (*Setaria italica*). Source: Bakhuizen van den Brink 1931:186

That their accuracy is not beyond doubt, however, is already indicated by the fact that the first expert to inspect the Borobudur in search of information on past flora and fauna, the naturalist H. Cammerloher (1923:228; 1931:150), unhesitatingly identified the crop being sheaved and carried (Plate 6) as rice. Krom (1927:270), interestingly, initially tended toward the same opinion as far as the grain depicted here was concerned, commenting: 'probably it is rice but it looks also somewhat like maize'. Christie, in this volume, concludes that while the standing crop which appears to be growing at the edge of a forest (Plate 4) 'may represent foxtail millet', the other (Plate 5) is certainly rice. Given that all of the Borobudur reliefs are heavily stylized, and that the artists may well have exaggerated the size of the ears of grain, any definite botanical identification seems difficult to justify: Steinmann (1934:581), despite his confidence in the case of millet, noted that even for botanists it was 'often extremely difficult to guess which plant species could be meant by the vague and sometimes arbitrary illustrations' on the monument. Another source of confusion is the possibility that the agricultural scenes on the Borobudur were inspired more by Indian than by Javanese conditions (Bakhuizen van den Brink 1932:11).

These questions are unlikely to be resolved. A more significant point, however, is that no proponent of the millet theory has gone so far as to claim that

rice was not yet cultivated in Java at the time when Borobudur was built. Rice chaff, as Christie points out both in this volume and elsewhere (1992:11), was used as temper in bricks dating from the eighth and ninth centuries, and early Javanese epigraphy includes frequent references to irrigation. An inscription from 804, for example, already attests to the construction of substantial dams and channels for that purpose in East Java (Van Setten van der Meer 1979:8), and *sawah* or wet ricefields are the 'most frequently mentioned type of land' in inscriptions from the early tenth century – although these also contain references to taro, Job's tears, and possibly the now even more unusual grain crop eleusine (Barrett Jones 1984:53, 55, 142). Even if one of the Borobudur reliefs does depict millet rather than rice, then, what it undoubtedly reflects is not a farming system based on millet, but a situation of what Brookfield (2001) has dubbed 'agrodiversity'.

Rizification as a change of emphasis in diversified farming systems

A high level of diversity was a feature of the earliest Austronesian agriculture: reconstruced Proto-Austronesian vocabulary includes terms for *Alocasia*, breadfruit, banana, yam, sago, taro and millet as well as rice (Blust 1976:21). W.H. Scott's reconstruction of Visayan agriculture at the time of the Spanish contact specifies the typical role of rice within this broad crop assemblage:

> The staple crops of the Visayans were rice, millet, taro, yams, and bananas grown in swiddens (*kaingin*), wild yams and sago. Rice was grown everywhere and was the preferred food. But since only in a few places could a year's supply of rice be produced, root crops were therefore the most common food for part of the year, or all of the year for part of the people. (Scott 1994:35.)

In many areas a very similar situation, apart from the addition of some New World crops, continued to exist until recent times. Compare, for instance, what the anthropologist Harold Conklin saw in one part of the Visayas (the interior of Mindoro) four centuries later:

> In terms of annual food consumption, three kinds of starch-staple-producing plants are of paramount importance: grains, bananas, and root crops. […] In quantity, vegetatively reproduced plants (bananas and root crops) furnish about 60 percent (33 and 27 percent respectively) of all the food eaten but, qualitatively, seed grains (furnishing about 34 percent) receive far greater attention in Hanunóo swidden cultivation. Rice is the crop of greatest concern to all. It is the most highly valued real food. (Conklin 1957:30.)

In Sulawesi, as already noted, wet rice farming, where it was not promoted as something approaching a monoculture by political elites, was often present

on a smaller scale as component of local agrodiversity. On the lower slopes of upland valleys (Plate 8), as Reid (1997:78) has observed of comparable systems in Sumatra, wet ricefields and swidden farming 'operated together as part of a spectrum of different agricultural strategies'. The two rice crops were often staggered such that the wet rice was planted and harvested later in the year, a practice which, together with the additional diversity provided by the double system itself, reduced the risk of food shortages as well as making for an efficient calendrical distribution of labour. Farming systems featuring the simultaneous or staggered cultivation of many different foodcrops are associated with situations in which surplus production is limited and the control of risk a high priority: if some crops or varieties fail due to pests or adverse weather, others are likely to be less affected (Marten and Saltman 1986:41-2).

> In the first instance they plant rice, often mixed with some maize and sorghum; frequently bananas are also planted out at the same time. In some cases a second rice crop follows, but the usual practice after the first harvest of rice and maize is to plant a jumbled mixture of all possible crops, including sweet potato, bananas, *Colocasia* [taro], cassava, peanuts, *kacang ijo* [mung beans], maize, sorghum; sometimes also *wijen* [sesame], sugar cane, various vegetables (such as *sesawi* [*Brassica* species], *bayem* [*Amaranthus* species], onions, chilli peppers, *kacang panjang* [long beans, *Vigna sinensis*] and brown beans [*Phaseolus vulgaris*]), and papaya. (Tergast 1936:136.)

Despite its qualitatively important role as the first crop to be planted on newly cleared swiddens, the quantitative significance of rice in subsistence-oriented systems like the one described here from Sangir and Talaud tends to be limited by the fact that as Conklin (1957:30) long ago pointed out, rice 'is particularly sensitive to fluctuations in rainfall, to weed penetration, and to destruction by pests'. Subsistence swidden cultivators who abandon root crops in favour of grains, Spencer (1966:125) also noted, 'become distinctly seasonal in their cropping cycle, and suffer from periods of want, hunger and starvation when the annual weather cycle is bad'. This suggests that where rice accounts for a larger proportion of food production, its shortcomings as a subsistence crop must be compensated by increased opportunities for exchange.

Rizification and commercialization

The geographer G.J. Missen (1972:75) once proposed that in those parts of Indonesia where foodcrop agriculture had recently come to focus more heavily on rice, this was usually because farmers were also growing cash crops which enabled them to offset the additional risks involved by means of exchange and purchase. An even more interesting possibility is that rice itself was often in the first place a commercial product (Knapen 2001:225). Certainly

there are several historical examples of Indonesian groups which exported most of their rice while subsisting mostly on other foods. At the beginning of the nineteenth century, for example, the inhabitants of Nias, off the west coast of Sumatra, grew rice in both dry and wet fields. 'The greater part of the rice', wrote Raffles (1991:488-9) in 1821, 'is raised for exportation, the inhabitants raising but little for themselves, and preferring sweet potatoes, yams, plantains &c. for their own consumption'.

If this reflected a transition from tuber-based to rice-based farming, then it was an extremely gradual one: although Marsden (1975:476), writing in 1783, believed that rice cultivation on Nias had become extensive only 'in modern times', a piece of VOC correspondence from 1756 already identifies Nias as a *spijskamer* or source of exported food, presumably rice (Schröder 1917:708), and earlier documentation is too scanty to justify interpreting its silence on the matter as indicating that this trade had not yet begun. Nor did the dietary situation seem to have changed very much a century after Raffles, when Schröder (1917:23) observed that although rice was the most prestigious food on Nias, 'it is *ubi* [tubers] which the greater part of the population must eat during the greater part of the year'. What does stand out here, nevertheless, is the role of rice as an item of trade. Marsden (1975:476) agreed with Raffles that rice was grown on Nias 'rather as an article of traffic than of home consumption', the 'principal food of the common people' being sweet potato.

In nineteenth-century Minahasa, returning to Sulawesi, one ethnic group, the Tonsawang, reportedly fed itself mainly with sago while at the same time growing irrigated rice which was destined almost exclusively for export (De Clercq 1873:262; Jansen 1861:233). More than three quarters of the rice produced in other parts of Minahasa, admittedly, was by this time consumed locally, and there is no sure evidence that the proportion sold for export was higher in earlier periods. Minahasa, as I noted above, is already growing (and exporting) much rice when it first appears in European sources at the beginning of the seventeenth century. It is interesting to observe, nevertheless, that an increase in the price paid by the VOC for Minahasan rice in the 1670s reportedly had the effect that 'everyone went most industriously to work making ricefields', and that a temporary ban on private (non-VOC) exports from Minahasa in the 1750s allegedly led to a reduction in the amount of rice planted as well as sold (Godée Molsbergen 1928:30, 122). Despite what I have said about the doubtful value of indigenous oral sources, it is perhaps also worth adding that one local tradition, committed to writing at the beginning of the twentieth century, held that rice had initially became popular because it could be used to purchase foreign textiles and firearms (Worotikan 1910:157). While there is no reason to interpret this as information on the actual origins of rice cultivation in Minahasa, it is consistent with the written sources which associate increased rice production with increased commerce.

Another example of the cultivation of rice as a commercial specialization comes from the north coast of New Guinea, where at the beginning of the twentieth century the population of the Amberbaken area was said to feed itself with tubers while selling its whole harvest of swidden rice to members of a neighbouring group (*Landschap Amberbaken* 1906:143-4). The Sahu of Halmahera, a little further west, later claimed that as sago-eaters by preference in the past, they were 'forced to plant rice' by the sultanate of Ternate (Visser 1989:40); given, however, that 'tributary' payments to Ternate were typically made in the context of reciprocal trade (Andaya 1993:92, 97), it seems likely that this too was in the first place a case of rice production for commercial export. Even in areas where little rice was actually exported, finally, it was often a common currency in local exchange, used to purchase both utility and prestige goods from neighbours (Adriani and Kruyt 1912-14, II:301; Freeman 1955:103). Conditions of intensive local commerce probably stimulated rice production partly by enabling individual producers to concentrate more exclusively on that single crop without jeopardizing their own food security.

The idea that rice was often valued more as a trade item than as a means of subsistence would at first sight seem to resolve the paradox that it was always widely and enthusiastically grown in Southeast Asia despite being generally more labour-intensive to cultivate, as well as more demanding of its environment and less reliable and continuous in its yields, than other sources of carbohydrates. Field studies confirm that sago is more energy-efficient to produce, and far less susceptible to climatic variations or pests, than rice or any other annual crop (Ellen 1979:49-50; Strickland 1986:131-3). To a lesser extent the same is true of cultivated tubers, especially taro (*keladi*): 'any lazy person', according to a Mentawai proverb recorded by Kruyt (1923:125), 'can eat *keladi*'. Under irrigation, as already noted, rice produces very high yields per hectare of land (Bray 1986:13-16), making it well suited for areas of high population density where areal productivity is important and much labour is available for investment in the 'landesque capital' (Blaikie and Brookfield 1987:9) of irrigation infrastructure. The cultivation of taro, on the other hand, is also amenable in principle to the same kind of intensification (Kirch 1994), which may in fact have been applied to it in some parts of Indonesia in the past (Kruyt 1938, IV:279; Maaß 1910:297). And there is no doubt that in the absence of pressure to raise areal yields, rice would never be chosen for cultivation on a large scale if either labour-efficiency or yield reliability, as opposed to economic profitability, was a major consideration. At another level, however, the commercial 'explanation' for its popularity simply begs the further question of how the special commercial demand for rice originated.

Some open questions

While the portability and good storage properties of rice grain undoubtedly favour its use as a trade item, the same is also true of sago when baked into the dry, hard biscuit which, as Galvão noted in the sixteenth century, 'lasts ten or twelve years' (Jacobs 1971:135). Within the Moluccas, as Ellen notes elsewhere in this volume, sago has in fact been a major item of interisland trade, and even in Sulawesi the trade in sago was still important locally in the early twentieth century (Boonstra van Heerdt 1914:741; Kruyt 1932:257). Durability and portability, then, cannot provide a complete explanation for the prominence of rice in commerce elsewhere. The good nutritional characteristics of rice compared to sago and tubers may conceivably have played a role (Seavoy 1986:149; Terra 1958:180). It is also prudent, however, to consider the possibility that considerations of taste and prestige were decisive (Avé 1977:28; Gourou 1947:83). In Sulawesi, certainly, rice is identified even in early sources as the most socially prestigious food (NA VOC 1359:153v; VOC 1775:110). In mountain Luzon at the end of the nineteenth century, the Dominican friar Juan Villaverde was surprised by the diligence with which Ifugao farmers pursued its cultivation simply for their own consumption.

> What a price the little rice they eat costs them! And after spending the greater part of the year for it, it does not suffice for their maintenance and they supply this lack by making loans at frightful interest. The poor and those of the more precipitous mountains live solely off camotes; but, in compensation, the labor – which is usually done by the women – is incomparably less. The camote [sweet potato], which is produced everywhere, is also the refuge of the lazy. [...] Myself, I am amazed how these people devote themselves to such hard labor and pains for a bit of rice, when they could so easily live off camotes, *gave* [yams], or corn [maize]. This habit of labour stands out conspicuously among their more than barbarous customs and gross vices, since it is a matter of shame among them not to eat rice, and one who has it is considered to have demeaned himself if he plants camotes. (In: Scott 1974:323.)

An established association of rice with trade and the outside world could, of couse, have contributed to its preference for status reasons even in relatively non-commercialized contexts. The very arduousness and riskiness of producing rice – that is, its expense – no doubt also enhanced its reputation as food fit for the illustrious, and thereby the (domestic, commercial, and fiscal) demand for it. Cultural and economic factors, in short, were interrelated here. Nevertheless the prominence of rice in the agricultural history of Southeast Asia, and the concentration of the region's population in areas of labour-intensive rice production rather than in those places where natural sago stands provide an easy and abundant food source, continue to present challenges to the economic or environmental determinism of writers like Weischet and Caviedes (1993) and Jared Diamond (1998) who see both food technologies

Figure 8. Upland irrigation in Kulawi (western Central Sulawesi), with swidden-fallow vegetation in the foreground, around 1920.
Source: Kaudern 1925:12-3

and population geography essentially as reflecting the availability of natural resources. In view of the evidence that demand for labour in local economies can itself evoke population growth (Henley 2004; White 1973), it is even possible that the distribution of the population often reflected the difficulty, rather than the ease, of food production.

Concluding remarks

My brief search through the historical record has revealed both greater complexity and greater continuity in agricultural history than the evolutionary rizification model would imply. On Sulawesi, for instance, there is no evidence in the rather long historical record for any era in which rice was not cultivated, and in those particular localities where other crops overshadowed it according to the earliest European sources, they have generally continued to do so up to recent times. Where rice has indeed become more important with respect to other foodcrops, this has tended to reflect either an increase in irrigated farming (in which rice is almost always predominant) under conditions of political and/or population pressure, or an increase in trade: market integration and economic development, generally speaking, boosted the demand for what in poorer and more isolated communities was essentially a luxury food, while at the same time reducing the need for local self-sufficiency which otherwise made a crop as temperamental as rice too risky to grow in large quantities. Since commercial expansion, in Indonesian history, is often associated both with political centralization (Houben 2002:41-4) and with population growth (Reid 2001:51), and since a high population density is in turn favourable to commerce in so far as it reduces transport costs, en-

larges markets, and strengthens property rights in land (Platteau 2000:31-92), the economic, political and demographic preconditions for rizification have no doubt often coincided. Rizification, however, is also reversible, and it is reasonable to suppose that rice cultivation in many parts of Indonesia was more extensive during the early modern era (1450-1680) identified by Reid (1988-93) as Southeast Asia's 'Age of Commerce' than in the immediately following period.

As with any historical generalizations of this kind, there were of course exceptions. On the Sangir islands, for instance, rapid commercial (and demographic) growth after 1860 actually reinforced the position of tubers in foodcrop agriculture, since this particular export boom was based on copra production and root crops, unlike rice, could be grown under the partial shade of the coconut palms which gradually came to blanket all but the least accessible parts of the landscape (Tergast 1936:131, 135). Whether the idea of rice cultivation as a measure of commercial orientation, demographic concentration and political centralization is sufficient to explain the complete absence of rice until recently from the Mentawai islands, not to mention the Austronesian Pacific, is also doubtful. Probably the conventional environmental hypotheses, emphasizing the rather exacting requirements of rice in terms of soil quality (Scholz 1988:183) and climatic conditions (Bellwood 1997:242-5), remain helpful here, and it is worth adding that abandonment of comparably important items of technological capital is known to have occurred among other small, isolated human populations even in the absence of any clear environmental incentive to do so (Diamond 1998:257-8). The contribution of culturally determined taste preferences to the widespread association between rice, wealth, exchange, and prestige which developed at an early stage in the Indonesian world, finally, also remains open to debate. At least as far as the documented historical period is concerned, nevertheless, it is clear that the complex history of foodcrop agriculture in Indonesia is better analysed in relation to changing economic conditions than in a framework of cultural evolution.

Abbreviations

ANRI	Arsip Nasional Republik Indonesia
CV	Cultuur Verslag
MvO	Memorie van Overgave
NA	Nationaal Archief
NA VOC	Nationaal Archief (Den Haag), collectie VOC overgekomen brieven en papieren
VKI	Verhandelingen van het Koninklijk Instituut voor Taal-, Land- en Volkenkunde

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