

- Færøernes Landsstyre et. al.*: Årbog for Færøerne, div. yrs. København.
- Guttesen, R. (1970): Færøernes migrationer 1961-65, med kort befolkningsbeskrivelse. G.T. 69. 1-27.
- Guttesen, R. (1971): Útlitið fyri áhaldandi vøkstri í fólkatali Føroya. Fróðskaparrit 19. bók, 132-146. Tórshavn.
- Guttesen, R. (1980): Færøernes fiskeri og fiskeindustri i 70'erne. Geografisk Institut. København.
- Guttesen, R. (1980a): Recent development in the faroese fishing industry. G.T. 80, 102-108. København.
- Guttesen, R. (1982): Bygdeproblematikken på Færøerne. pp 45-58 in: Simonsen et al.: Lokalsamfund og sociale bevægelser. Roskilde.
- Guttesen, R. (1983a): Udvikling og problemer i færøsk fiskeri. Geografisk Orientering vol. 13, 17-22. Brenderup.
- Guttesen, R. (1983b): Fiskeflådens udvikling og strukturtilpasning. G.O. vol. 13, 23-26. Brenderup.
- Guttesen, R. (1983c): Den færøske fiskeindustri. G.O. vol. 13, 27-30. Brenderup.
- Guttesen, R. (1983d): Kaos, regulering eller planlægning. G.O. vol. 13 31-44. Brenderup.
- Landsfólkayvirlitið*: Manntal. div. yrs. Tórshavn.
- Lee, Ewerett (1966): A Theory of Migration. *Demography* 3, 47-57.

## Field studies of land use under *chitemene* shifting cultivation, Zambia

Peter Strømgaard

Strømgaard, Peter: Field studies of land use under *chitemene* shifting cultivation, Zambia. *Geografisk Tidsskrift* 84: 78-85. Copenhagen, January 1984.

*Land use aspects of shifting cultivation was studied with chitemene shifting cultivation of Northern Zambia as an example. An area of 250 ha was mapped. Apparently, cultivation follows a cycle over time, where new gardens are only opened in alternating years. Selected, single households were studied for land use and hectarage of all cultivated fields.*

Peter Strømgaard, Ph.D., research scholarship, Geographical Institute, University of Copenhagen, Haraldsgade 68, 2100 Copenhagen Ø.

Keywords: *shifting cultivation, Zambia, land use, air-photo interpretation, chitemene*

For any description of a shifting cultivation system, the use of land is an important factor – the constantly changing area under crop and the likewise changing fallow area constitute the backbone of the system. The mapping of land use always presents a problem in the study of agriculture, either the changing land use is strictly connected to the agricultural potentialities of the soil (the Yatanga, Upper Volta; Marchal, 1977), the crops grown (Nigeria; Uzozie, 1971) or the exchange between farmers, herdsman and fishermen (West Africa; Scott, 1979). The changing land use is moreover often obscured by complicated fragmentations, reflecting social structures in the society (Ghana: Hunter, and Ntiri, 1978); the last situation, however, mostly found in the more semi-permanent types of agriculture.

Traditional agricultural systems are often described with little emphasis on the actual extent of the land utilized, which is quite understandable, as rather detailed field work is necessary to reveal this. Mostly the descriptions cover agricultural economy, soil fertility and production only (Kunstader et al., 1978; Thailand), and the land use is – if it is introduced – only characterized by the stage of regrowth or age of fields, with no connection to any specific farmer (Axelsen, 1978; Botswana). This type of study, where a whole village is studied as a unit, with the surrounding fields characterized only by their land use, might be useful for a description of the society, but not of the single farmer.



Fig. 1A The branches lopped and chopped (chitemene, Bemba: to cut) from the surrounding vegetation stacked, ready for burning. A total of 66 metric tons were piled on the future field (0.47 ha), equivalent to 140 tons per ha. The trees are not felled but chopped, and sprouting has already started – the Bemba in this way accelerate the regeneration of the vegetation.

*Fig. 1A. Grene beskåret (chitemene, Bemba: at beskære) fra et omliggende, større områdes vegetation samlet, klar til brænding. Grenenes samlede vægt fandtes at være 66 tons, svarende til 140 tons per ha. Træerne er ikke fældet, og har allerede etableret topskud – Bembaerne forkorter på denne måde vegetationens regenerationsperiode.*



Fig. 1B. The burning of the stacked branches immediately before the rains. In the old days the firing was started off by a sign from the Chief. Today, the timing of the burn is the decision of the individual cultivator, but still some religiously inspired rites were observed. The ancestral spirits were called for, and the blessing of the burn was accompanied by prayers to the ancestral spirits for prosperity during the coming year.

*Fig. 1B. Brænding af den indsamlede vegetation umiddelbart før regntiden. Tidligere bestemtes tidspunktet af landsbyens høvding, mens det nu er den enkelte bondes afgørelse. Selve brændingsprocessen er af stor vigtighed og ledsages af forskellige religiøst inspirerede ritualer og bønner til forfædrene.*



Fig. 1C. The ash-field, characteristically circle-shaped, shortly after the burn. This small field, (0.1 ha), was rather well burned – no logs or branches were left only partly burned, and ash was evenly distributed. Soil and ash analyses revealed, that the combined effect of ash and heat was equivalent to a release of 346, 433 and 308 kg P,K and Ca per ha. in the upper 50 cm of the soil. (Strømgaard, 1984b).

*Fig. 1C. Den askedækkede svedjemark, karakteristisk cirkelformet, umiddelbart efter brændingen. Aske- og jordbundsundersøgelser viste, at den kombinerede effekt af aske og brænding svarede til en frigørelse af 346, 433 og 308 kg P,K og Ca per ha i de øverste 50 cm af jordoverfladen (Strømgaard, 1984b).*



Fig. 1D. The fence around the cultivated field of cassava. 2 m fence removed weighed 73 kg, i.e. for a typical garden 10 tons of wood are used. The fence is made during the rainy season from February to April. The fence is a rather costly labour investment, work input in the making of the fence was found to be around 100 man-hours per year. This is one way the local peasant is able to »intensify« the agricultural system of shifting cultivation.

*Fig. 1D. Den dyrkede mark med cassava omgivet af et hegn. Der medgår 73 kg per 2 m hegn, svarede til 10 tons vegetation for en typisk mark. Konstruktionen er ret arbejdskrævende – 100 mande-timer per år – og en af de måder den traditionelle bonde »intensiverer« dyrkningssystemet.*

Detail from ZA 81/2 044 airphoto CHISIMBA FALLS 1:12500 7/1981

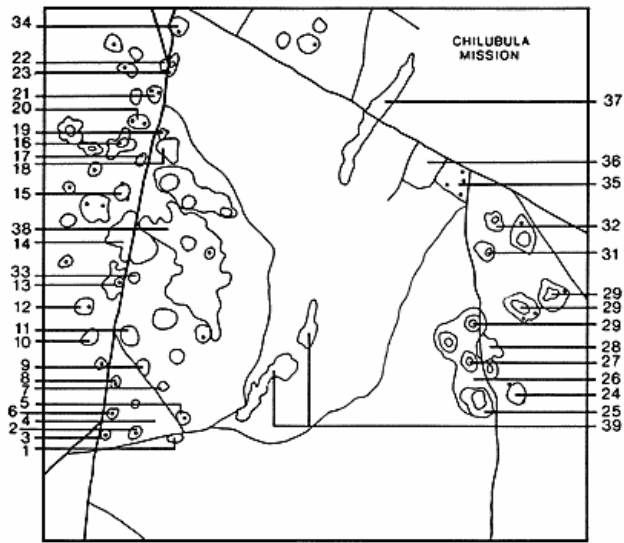


Fig. 2. Air-photo interpretation. Air-photo from July 1981, ground truth observations and associated key legend.

Fig. 2. Flyfoto-fortolkning. Flyfoto fra juli 1981, feltobservationer og tilhørende fortolkningsnøgle.

Air-photo interpretation. Air-photo No. 81/2, Chisimba Falls, July 1981.

Area Age and description

- 1 3-year-old garden, bare with cassava.
- 2 3-year-old garden
- 3 1-year-old garden
- 4 Regrowth vegetation, 3m high, *Brachystegia longifolia* and *Julbernardia paniculata*.
- 5 9-year-old fallow, bare with new beds for cassava
- 6 6-year-old fallow
- 7 2-year-old garden, bare, with cassava and remnants of groundnuts

- 8 3-year-old garden with cassava
- 9 2-year-old garden with remnants of cassava, regrowth of *Marquesia acuminata* and *Julbernardia paniculata*.
- 10 3-year-old garden with cassava
- 11 11-year-old fallow, covered with regrowth vegetation
- 12 11-year-old fallow, 2 m regrowth
- 13 1-year-old garden with remnants of groundnuts
- 14 Recently chopped area
- 15 3-year-old garden
- 16 Recently cleared area with branches stacked in a circle, ready for burning
- 17 1-year-old garden
- 18 Vegetation, uncut at the time of the aerial photo, but chopped 3 months later, at the time of the ground-truth observations.
- 19 2-year-old garden
- 20 1-year-old garden
- 21 10-year-old fallow, 3 m regrowth of *Brachystegia spiciformis*, *Marquesia acuminata* and *Brachystegia taxifolia*.
- 22 Branches stacked, ready for burning
- 23 Branches stacked, ready for burning
- 24 1-year-old garden, remnants of millet
- 25 Very large circle of collected, stacked branches, ready for burning
- 26 Recently chopped and cut vegetation of *Julbernardia angolensis* and *Brachystegia taxifolia*, 2 m high
- 27 Small circle of collected, stacked branches
- 28 Partly chopped, 20 m high. *Marquesia acuminata*
- 29-32 Circles of collected, stacked branches surrounded by corresponding chopped areas.
- 33 2-year-old garden, groundnuts harvested
- 34 Recently dug field, where vegetative material is hoed down and allowed to wilt, grass-turf are turned inwards and the rotting vegetation is dug in and buried.
- 35 Cleared and harvested maize-field
- 36 6 m high vegetation, *Julbernardia paniculata* and *Uapaca benguelensis*
- 37 Evergreen vegetation, near riverside
- 38 Dense vegetation, *Brachystegia spiciformis*.
- 39 Evergreen vegetation

In the case of shifting cultivation, most studies of land use has taken this direction – simply because of the difficulties of finding and measuring the fields of single farmers. In some studies, from areas where fallows are short and fields are rather close, more detailed land use classifications are possible (de Schlippe, 1956; Christiansen, 1975; Tuthill et al., 1968), but for shifting cultivation systems with long fallows and a regrowth of up to 20 years of age, virtually no studies have been made of the land use of single households.

### CHITEMENE SHIFTING CULTIVATION

Chitemene shifting cultivation is the traditional agricultural system of the Bemba in northern Zambia. It is an agricultural system, where crops are grown in the ash after burning a pile of collected, stacked branches, lopped and chopped from trees of an area 5 to 8 times the size of the

LAND USE, BWACHA VILLAGE 1966

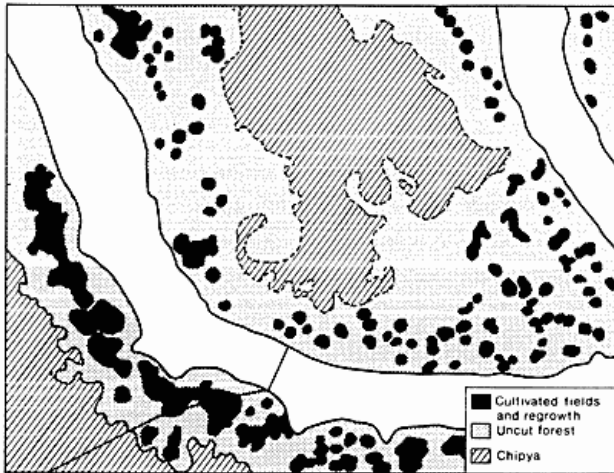


Fig. 3A. Chitemene land use around Bwacha village, 1966. Classification (top) based on 1966 aerial photo (bottom).

*Fig. 3A. Arealanvendelse under chitemene flyttemarksbrug. Klassifikationen (overst) baseret på 1966 flyfoto (nederst).*

cultivated garden. After some years the field is abandoned, and new gardens opened, fig. 1a, b, c, and d.

This method of cultivation includes the use of natural forest or woodland as fallow – true chitemene systems are cut-and-burn shifting systems that exploit the »banked« fertility of the natural woodland. The rotation of fields is typical for shifting cultivation, but the chitemene system is unique in its transfer of fertilizing material – the vegetation to be burned – from a larger surrounding area to the field. It is in this respect close to infield-outfield systems described in other parts of the world, where similar transfers have been recorded. Even in Scandinavia evidence

Fig. 3C. Change in chitemene land use 1966-74. Based on classifications in figs 3A and B.

*Fig. 3C. Ændringer i arealanvendelse under chitemene flyttemarksbrug. Baseret på klassifikationerne i figurerne 3A og B.*

LAND USE, BWACHA VILLAGE 1974

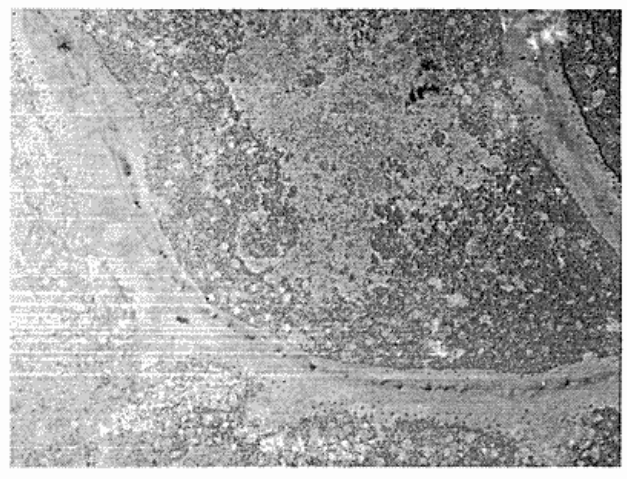
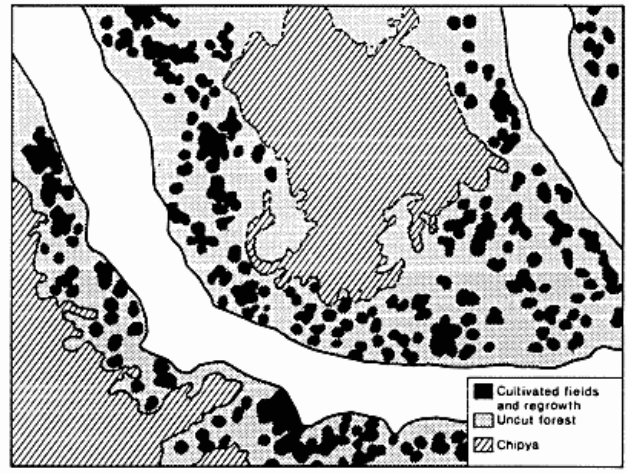
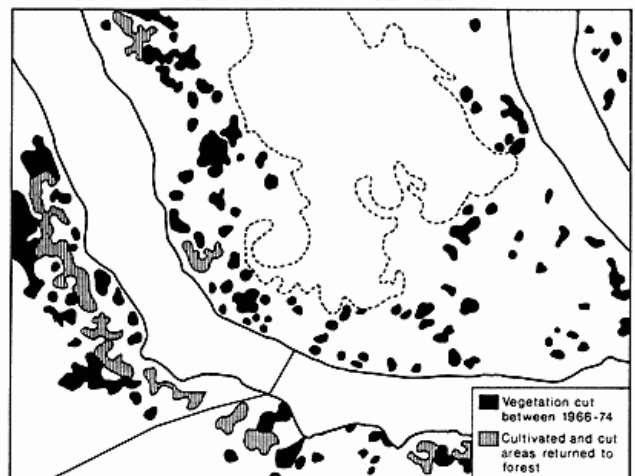


Fig. 3B. Chitemene land use around Bwacha village 1974. Classification (top) based on 1974 aerial photo (bottom).

*Fig. 3B. Arealanvendelse under chitemene flyttemarksbrug. Klassifikationen (overst) baseret på 1974 flyfoto (nederst).*

LAND USE CHANGE BWACHA VILLAGE 1966-74



BWACHA VILLAGE, CHITEMENE LAND USE

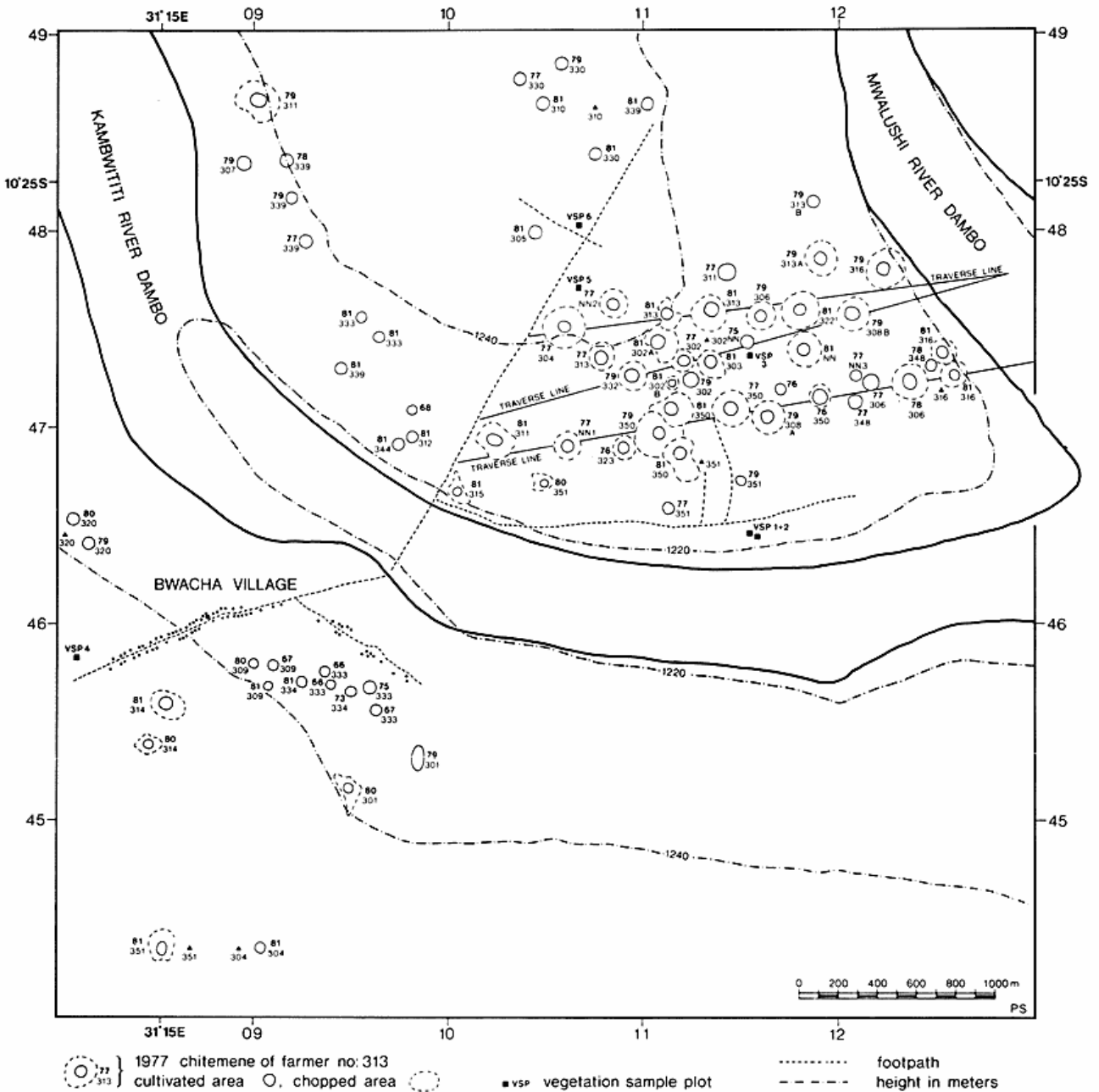


Fig. 4. Detailed study of chitemene land use around Bwacha village. As many as possible chitemene gardens were localized and age and ownership were determined. Based on field-studies late 1981.

Fig. 4. Detailleret undersøgelse af arealanvendelse under chitemene flyttemarksbrug. Så mange markfelter som muligt lokaliseredes og alder og tilhørsforhold fastlagdes. Baseret på feltstudier i slutningen af 1981.

produced by archaeology and palaeobiology has shown neolithic systems of similar kind.

In this survey, the land use of chitemene shifting cultivation has been studied both from aerial photos and in the field. Air photo interpretation from areas of shifting cultivation has been reported before (Koch, 1970 and

1971; Mahncke, 1973), but for the study of chitemene shifting cultivation little has been published. As a first step therefore, some ground-truth observations were important. Fortunately, it was possible from an area close to the study area to achieve aerial photos from same year, 1981. During the field-work it was therefore possible in

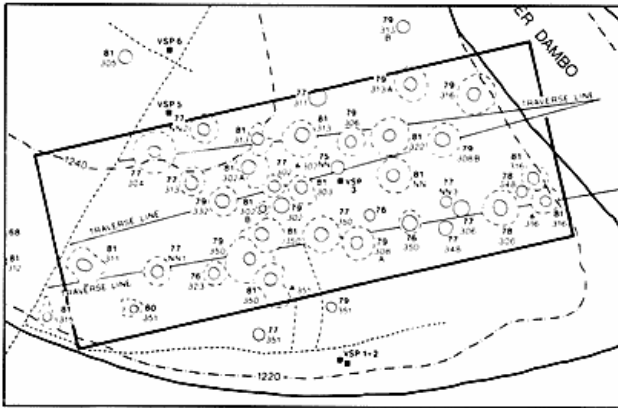


Fig. 5. Detail from fig. 4. 250 hectares were intensively studied and all chitemene cultivation recorded, table 1. Scale 1:35700.  
 Fig. 5. Detalje fra fig. 4. 250 hektar undersøgtes intensivt og alle tegn på flyttemarksaktiviteter registreredes, se tabel 1.1:35700.

this area to give a detailed identification key for typical features on aerial photos from a Zambian chitemene shifting cultivation area. The air-photo used and the accompanying key legend are shown in fig. 2.

In the study area, 20 km south of Kasama, Northern Province, a more detailed photo-interpretation combined with field survey was carried out. First, with the use of the key legend described in fig. 2, it was possible by stereoscopic interpretation of aerial photos from 1966 and 1974 to deduce land use for those two years. The land classification was rather simple, only distinguishing between cultivated fields, fallows and regrowth in various stages, as contrasted to undisturbed vegetation. Figs 3a, b, and c give an impression of the increased utilization of the forest for cultivation from 1966 to 1974. Also the dynamics of the forest ecology is illustrated, as it appears that some areas, originally cultivated and in 1966 in various stages of regrowth, had returned to forest in 1974.

In order to get a more detailed picture of the land utilization of the whole village, the surrounding area was rather carefully investigated. As many as possible chitemene fields in the forest were localized and mapped. Fig. 4 shows the resulting land use map of the area around Bwacha village. Since it was not possible to cover the land use of the whole village, it was decided to investigate in detail a limited part of the forest for all signs of cultivation. Fig. 5 shows the area selected, 250 ha of the most intensively utilized part of the forest. The 3 traverse lines cut in the forest served as base lines, from which distances at right angles to the various fields were measured. All fields were carefully measured, and table 1 shows the results. 36 chitemene circles were found, covering 4% of the area, and 31% of the total area had been cut in the formation of these gardens. This means that one third of the area had been utilized recently, quite a high per cent for a forest shifting cultivation system.

Year	Area, %	
	Cultivated	Cut
1981	1.40	10.90
1980	0.02	0.18
1979	1.20	8.54
1978	0.16	1.06
1977	1.04	7.83
1976	0.40	1.60
1975	0.11	0.75
Total	4.33	30.86

Table 1. Land utilization in chitemene shifting cultivation. Detailed investigation of all cultivated and associated cut areas in a selected area of 250 ha, fig. 5. Of this area 4% are cultivated and new areas are apparently opened in alternating years.

*Tabel 1. Arealanvendelse under chitemene flyttemarksbrug. Resultatet af den detaljerede undersøgelse af 250 ha, fig. 5. 4% ses at være opdyrket, og nye arealer inddrages tilsyneladende hvert andet år.*

Interestingly, when table 1 is observed, are the fluctuations in land use. In 1977, 1979, and 1981 8%, 9%, and 11% respectively of the total 31% were chopped. It seems that new chitemene gardens are cut only in alternating years, a pattern not observed previously. Both Richards (1939), Trapnell (1953), Peters (1950), and Allan (1949) – the only four works on chitemene cultivation based on field studies – assumed new gardens to be opened every year.

This fluctuating land use of opening new gardens in alternating years, also observed when all fields of selected farmers are measured (fig. 7), might be an adaptation to the diminishing forest resources. Fewer gardens are established and those in function are more carefully utilized. Also, it was found (Strømgaard, 1984a), that the Bemba to a high degree resort to non-agricultural activities through the year, possibly mainly in those years where no new gardens are opened.

The land use of a single, selected household is shown in fig. 6, and illustrates the chitemene cultivation as an in-field-outfield system. The surrounding outfield is chopped, and vegetation carried to the infield for burning. For selected farmers in the area, 16 chitemene circles were measured and ratio of chopped to cultivated area established. Interestingly, the ratio is apparently constant, around 7, and not changing with the size of the garden.

The pattern observed of changing use of chitemene gardens might be explained by the more intensive use of the land close to the houses, the village gardens. Fig. 6 shows typical village gardens in a household. A new village garden is opened nearly every year, most often an *ibala*, a garden with cassava grown in mounds.

It is interesting to observe the variation in size and age of the two types of garden: the chitemene ash-field and the village garden. Fig. 7 shows average variation over time for 4 selected households.

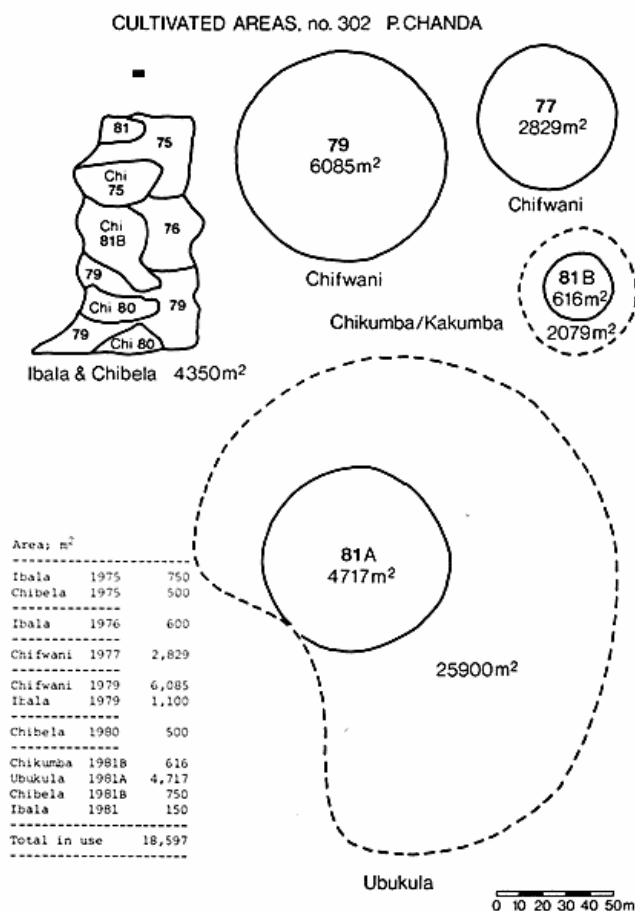


Fig. 6. Cultivated areas of a selected farmer. Break-down of all areas under cultivation (inserted). Local names shown for chitemene-fields and village gardens. Ubukula is the first year ash garden, large size; chikumba or kakumba very small first year ash gardens. Chifwani is any old ash garden, still under crop. Ibala is mound cultivation of cassava near the village while in chibela, also close the village, fresh vegetative material is hoed down and allowed to wilt, grass-turf are turned inwards and the rotting vegetation is dug in and buried. The figures show year of establishment and area in m<sup>2</sup>. Data collected 1981.

Fig. 6. Samtlige markfelter dyrket af en enkelt bonde. I tabellen (indsat) ses arealerne opregnet. Lokale navne er anført for de forskellige marktyper: ubukula er første-års askemarken, stor størrelse; chikumba og kakumba er meget små første-års askegødede marker. Chifwani er enhver ældre askegødete mark. Ibala er tuer med cassava nær landsbyen, mens chibela er navnet på en dyrkningsform hvor cassavaen dyrkes i græstørv. Tallene angiver markfelternes størrelse og etableringstidspunkt. Data samlet 1981.

Obviously, the knowledge of either village garden area or chitemene area is of lesser importance in the study of single households. The area of both types, i.e. all cultivated areas should be known. For the 4 households studied especially careful, the total area was found to vary from 1.5 ha to 2.7 ha per household, which is close to figures observed elsewhere under shifting cultivation;

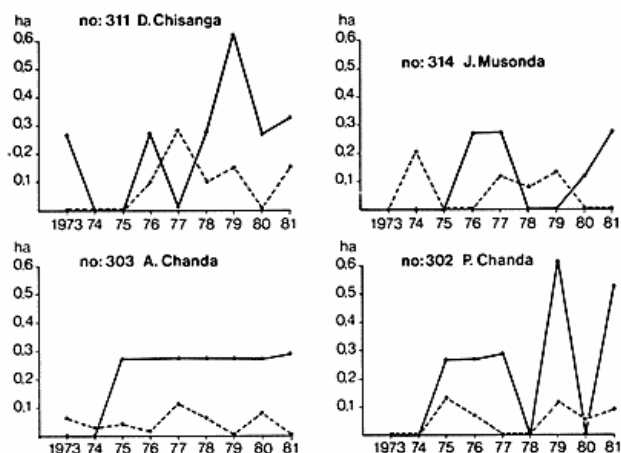


Fig. 7. Change in land use over time, 4 farmers. The curves show newly opened chitemene area (full line) and area of newly opened village garden (broken line) through the years. New areas are not opened for cultivation every year – significant fluctuations are taking place.

Fig. 7. Ændringer i arealanvendelse gennem tid. Kurverne viser tidspunkt for og størrelse af nye arealer ryddet og opdyrket. For de 4 bønder ses at nye marker ikke etableres hvert år – markante fluktuationer finder sted.

Kunstadter et al. (1978) recorded in Thailand 1.7 ha/family. When the areas utilized by the 4 households are compared to the family structure, the land use per household, per capita, per consumer equivalent (CE) and per worker (ME) shows the following pattern, table 2.

These figures are almost identical with those observed among the Lua and Karen of Thailand (Kunstadter et al., 1978), and only slightly smaller than the one acre per garden family assumed by Allan (1949) in his thirty-year old study, also from Zambia. Among the Ibans in Sarawak, Freeman (1955) found an average felled area per head of 0.8 acre equivalent to 1.3 acres per worker, and Baum (1968) in Tanzanian mountain rice holdings found 1.5 acre/ME.

Considering the man-land relationships, the area under crop becomes especially interesting when compared to the

	302 P. Chanda	311 D. Chisanga	313 E. Kasonde	314 J. Musonda
Hectares, total per family	1.85	2.66	3.49	1.53
No. of persons/family	6	8	7	7
ME, man-equivalents	2.4	4.0	3.2	2.1
CE, consumer equivalents	4.0	6.1	5.0	3.9
ha per capita	0.31	0.33	0.49	0.21
ha per ME	0.77	0.66	1.09	0.73
ha per CE	0.46	0.44	0.69	0.39

Table 2. Land use per household, per capita, per consumer (CE) and per worker (ME), 1981 Bwacha Village. Household no. 313 consisted of two wives. The calculation of CE and ME slightly modified after Lagemann, 1977.

Table 2. Arealanvendelse opregnet pr. familie, pr. capita, pr. konsument (CE) og pr. arbejdsækvivalent (ME) for fire husholdninger, 1981.

number of consumers living from it. The harvested area was found to vary from 0.3 to 1.0 ha per household per year, averaging 0.8 ha per household in the whole village. Taking the number of consumers per household into consideration, rather large differences are revealed among the households: the number of consumers per harvested ha apparently varies significantly. This might reflect differences in social status, poor households have many consumers per household hectare. The only other explanation, differences in the intensity of utilization of the land, is hardly appropriate, as the chitemene cultivation gives little extra production with extra input of labour. When the traditional agricultural system has reached its absolute producing limit, processes will start working: the increasing poverty will be shared, alternative agricultural practices will be sought for, maybe settlements will be relocated, or people even outmigrate.

### Resumé

Det er ofte vanskeligt at beskrive arealbenyttelsen under flyttemarksbrug hvor brakperioden er lang og markerne spredte og vanskelige at lokalisere i skov-genvæksten. I det nordlige Zambia er et område under flyttemarksbrug af chitemene typen blevet undersøgt; her tilføres svedjemarken godskning i form af ved og blade fra omkringliggende arealers træer. Tilførslen fra de omkringliggende arealer af godskning kan sammenlignes med et indmark-udmarksystem, og systemet adskiller sig også fra andre flyttemarksbrug ved at træerne ikke dræbes, men tophugges.

Ved anvendelse af 3 måneder gamle flyfotos i felten var det muligt at udarbejde en detaljeret fortolkningsnøgle til typiske, ofte observerede flyttemarksstadier. Denne anvendtes senere ved sammenlignende studier af ældre flyfotos fra undersøgelsesområdet. I felten undersøgte samme område for alle tegn på tidligere flyttemarksaktivitet, og alle tidligere marker blev lokaliseret og aldersbestemt. Resultatet af denne arealkartering viste omkring en tredjedel af arealet beskåret fornylig. Yderligere konstateredes en interessant dyrkningscyklus, hvor nye chitemene-marker tilsyneladende kun etableredes hvert andet år, muligvis en tilpasning til det stigende befolkningspres og mindre mængde tilgængelig sekundærskov.

Enkelte bonders arealudnyttelse undersøgte; det totale areal dyrket varierede fra 1.5 til 2.7 ha per familie. Antal konsumenter per høstet ha varierede betragteligt – en illustration af subsistensbrugs forsyningsspredning: chitemene-markerne suppleres med jagt og fiskeri.

### References

- Axelsen, B.*, 1978: Shifting cultivation and land capability in a semiarid environment. Two examples from Botswana. *Norsk Geogr. Tidsskrift*. Vol. 32: 1-13.
- Allan, W.*, 1949: Studies in African land usage in northern Rhodesia. The Rhodes-Livingstone Papers No. 15. Institute for Social Research (1969). Manchester University Press.
- Baum, E.*, 1968: Land use in the Kilombero valley. In: Ruthenberg, H. (ed): *Smallholder farming and smallholder development in Tanzania*. Weltforum Verlag, München.
- Christiansen, S.*, 1975: Subsistence on Bellona Island (Mungiki). *Folia Geographica Danica*, Tom XIII, Det kgl. danske geografiske Selskab.
- Freeman, J. D.*, 1955: Iban agriculture, Colonial Research Studies No. 18, H. M. Stationary Office, London.
- Hunter, J. M. and G. K. Ntiri*, 1978: Speculations on the future of shifting agriculture in Africa. *Journ. of Developing Areas* 12, No. 2, p. 183-203.
- Koch, P.*, 1970: Die Shifting cultivation und ihre Luftbildauswertung. Eine vergleichende Übersicht zur »Shifting cultivation« und Luftbildauswertung in den humiden Tropen mit einer agrargeographischen Luftbildauswertung aus dem Hinterland von Monrovia (Liberia). Zürich.
- Koch, P.*, 1971: Interpretation of air photographs of shifting cultivation, Liberia. The World Land Use Survey: Occasional Papers No. 10: Contribution to land use survey methods. Geographical Publications Ltd., England.
- Kunstadter, P., E. C. Chapman and S. Sabhasri*, 1978: Farmlts in the forest. Economic development and marginal agriculture in Northern Thailand. University Press of Hawaii.
- Lagermann, J.*, 1977: Traditional African farming systems in Eastern Nigeria. IFO-Institut für Wirtschaftsforschung. Africa Studien 98. München.
- Mahncke, K. J.*, 1973: Methodische Untersuchungen zur Kartierung von Brandrodungsflächen in Regenwaldgebiet von Liberia mit Hilfe von Luftbildern. Münchener Geographische Abhandlungen, Band 8.
- Marchal, J. Y.*, 1977: The evolution of agrarian systems: the example of the Yatenga (Upper Volta). *African Environment*, Vol. II, 4 and III, 1, p. 72-85.
- Peters, D. V.*, 1950: Land usage in Serenje District. Rhodes-Livingstone Papers, No. 19. The Institute for African Studies (1974). University of Zambia. Manchester University Press.
- Richards, Audrey I.*, 1939: Land labour and diet in Northern Rhodesia. An economic study of the Bemba tribe. International African Institute. Oxford University Press.
- Schlippe, de P.*, 1956: Shifting cultivation in Africa, the Zande system of agriculture. Routledge and Paul Kegan, London.
- Scott, E.P.*, 1979: Land use change in the harsh lands of West Africa. *African Studies Review*, 12,1, p. 1-21.
- Strømgaard, P.*, 1984a: Prospects of Improved Farming Systems in a Shifting Cultivation Area in Zambia. *Quarterly Journal of International Agriculture*, 23, No. 1, p. 38-50.
- Strømgaard, P.*, 1984b: The immediate effect of burning and ash-fertilization. *Plant and Soil*, in press.
- Strømgaard, P.*, 1984c: A Subsistence Society under pressure – the Bemba of Northern Zambia. *Africa*, Vol. 54, No. 4.
- Trapnell, C. G.*, 1953: The soils, vegetation and agriculture of North-Eastern Rhodesia. Lusaka, Government Printer.
- Tuthill, D. F., J. A. Williams and P. W. Foster*, 1968: The structure of shifting agriculture in two Chewa villages. Miscellaneous Publication. Agricultural Experiment Station. University of Maryland. No. 629.
- Uzozie, L. C.*, 1971: Patterns of crop combination in three eastern states of Nigeria. *Journal of Trop. Geography*, Vol. 33, p. 62-72.



number of consumers living from it. The harvested area was found to vary from 0.3 to 1.0 ha per household per year, averaging 0.8 ha per household in the whole village. Taking the number of consumers per household into consideration, rather large differences are revealed among the households: the number of consumers per harvested ha apparently varies significantly. This might reflect differences in social status, poor households have many consumers per household hectare. The only other explanation, differences in the intensity of utilization of the land, is hardly appropriate, as the chitemene cultivation gives little extra production with extra input of labour. When the traditional agricultural system has reached its absolute producing limit, processes will start working: the increasing poverty will be shared, alternative agricultural practices will be sought for, maybe settlements will be relocated, or people even outmigrate.

### Resumé

Det er ofte vanskeligt at beskrive arealbenyttelsen under flyttemarksbrug hvor brakperioden er lang og markerne spredte og vanskelige at lokalisere i skov-genvæksten. I det nordlige Zambia er et område under flyttemarksbrug af chitemene typen blevet undersøgt; her tilføres svedjemarken godskning i form af ved og blade fra omkringliggende arealers træer. Tilførslen fra de omkringliggende arealer af godskning kan sammenlignes med et indmark-udmarksystem, og systemet adskiller sig også fra andre flyttemarksbrug ved at træerne ikke dræbes, men tophugges.

Ved anvendelse af 3 måneder gamle flyfotos i felten var det muligt at udarbejde en detaljeret fortolkningsnøgle til typiske, ofte observerede flyttemarksstadier. Denne anvendtes senere ved sammenlignende studier af ældre flyfotos fra undersøgelsesområdet. I felten undersøgte samme område for alle tegn på tidligere flyttemarksaktivitet, og alle tidligere marker blev lokaliseret og aldersbestemt. Resultatet af denne arealkartering viste omkring en tredjedel af arealet beskåret fornylig. Yderligere konstateredes en interessant dyrkningscyklus, hvor nye chitemene-marker tilsyneladende kun etableredes hvert andet år, muligvis en tilpasning til det stigende befolkningspres og mindre mængde tilgængelig sekundærskov.

Enkelte bønders arealudnyttelse undersøgte; det totale areal dyrket varierede fra 1.5 til 2.7 ha per familie. Antal konsumenter per høstet ha varierede betragteligt – en illustration af subsistensbrugs forsyningsspredning: chitemene-markerne suppleres med jagt og fiskeri.

### References

- Axelsen, B.*, 1978: Shifting cultivation and land capability in a semiarid environment. Two examples from Botswana. *Norsk Geogr. Tidsskrift*. Vol. 32: 1-13.
- Allan, W.*, 1949: Studies in African land usage in northern Rhodesia. The Rhodes-Livingstone Papers No. 15. Institute for Social Research (1969). Manchester University Press.
- Baum, E.*, 1968: Land use in the Kilombero valley. In: Ruthenberg, H. (ed): *Smallholder farming and smallholder development in Tanzania*. Weltforum Verlag, München.
- Christiansen, S.*, 1975: Subsistence on Bellona Island (Mungiki). *Folia Geographica Danica*, Tom XIII, Det kgl. danske geografiske Selskab.
- Freeman, J. D.*, 1955: Iban agriculture, Colonial Research Studies No. 18, H. M. Stationary Office, London.
- Hunter, J. M. and G. K. Ntiri*, 1978: Speculations on the future of shifting agriculture in Africa. *Journ. of Developing Areas* 12, No. 2, p. 183-203.
- Koch, P.*, 1970: Die Shifting cultivation und ihre Luftbildauswertung. Eine vergleichende Übersicht zur »Shifting cultivation« und Luftbildauswertung in den humiden Tropen mit einer agrargeographischen Luftbildauswertung aus dem Hinterland von Monrovia (Liberia). Zürich.
- Koch, P.*, 1971: Interpretation of air photographs of shifting cultivation, Liberia. The World Land Use Survey: Occasional Papers No. 10: Contribution to land use survey methods. Geographical Publications Ltd., England.
- Kunstadter, P., E. C. Chapman and S. Sabhasri*, 1978: Farmlts in the forest. Economic development and marginal agriculture in Northern Thailand. University Press of Hawaii.
- Lagermann, J.*, 1977: Traditional African farming systems in Eastern Nigeria. IFO-Institut für Wirtschaftsforschung. Africa Studien 98. München.
- Mahncke, K. J.*, 1973: Methodische Untersuchungen zur Kartierung von Brandrodungsflächen in Regenwaldgebiet von Liberia mit Hilfe von Luftbildern. Münchener Geographische Abhandlungen, Band 8.
- Marchal, J. Y.*, 1977: The evolution of agrarian systems: the example of the Yatenga (Upper Volta). *African Environment*, Vol. II, 4 and III, 1, p. 72-85.
- Peters, D. V.*, 1950: Land usage in Serenje District. Rhodes-Livingstone Papers, No. 19. The Institute for African Studies (1974). University of Zambia. Manchester University Press.
- Richards, Audrey I.*, 1939: Land labour and diet in Northern Rhodesia. An economic study of the Bemba tribe. International African Institute. Oxford University Press.
- Schlippe, de P.*, 1956: Shifting cultivation in Africa, the Zande system of agriculture. Routledge and Paul Kegan, London.
- Scott, E.P.*, 1979: Land use change in the harsh lands of West Africa. *African Studies Review*, 12,1, p. 1-21.
- Strømgaard, P.*, 1984a: Prospects of Improved Farming Systems in a Shifting Cultivation Area in Zambia. *Quarterly Journal of International Agriculture*, 23, No. 1, p. 38-50.
- Strømgaard, P.*, 1984b: The immediate effect of burning and ash-fertilization. *Plant and Soil*, in press.
- Strømgaard, P.*, 1984c: A Subsistence Society under pressure – the Bemba of Northern Zambia. *Africa*, Vol. 54, No. 4.
- Trapnell, C. G.*, 1953: The soils, vegetation and agriculture of North-Eastern Rhodesia. Lusaka, Government Printer.
- Tuthill, D. F., J. A. Williams and P. W. Foster*, 1968: The structure of shifting agriculture in two Chewa villages. Miscellaneous Publication. Agricultural Experiment Station. University of Maryland. No. 629.
- Uzozie, L. C.*, 1971: Patterns of crop combination in three eastern states of Nigeria. *Journal of Trop. Geography*, Vol. 33, p. 62-72.