LAND USE MAP OF ZAMBIA*

With 2 figures and 4 maps (supplements V–VIII)

JÜRGEN SCHULTZ

Zusammenfassung: Landnutzungskarte von Zambia

Die Kartierung der Landnutzung in Zambia wurde zwischen 1970 und 1972 auf Anregung und mit finanzieller Unterstützung der zambischen Regierung durchgeführt.

Die Verbreitung der folgenden Einheiten wurde erfaßt: Städtische Siedlungen, Gebiete mit hoher ackerbaulicher Nutzungsdichte *(Cropland)*, Waldreservate, Aufforstungen, Nationalparks, Seen, Sümpfe, Überschwemmungsflächen und bergig/hügelige Gebiete.

Nach Ausdehnung und wirtschaftlicher Bedeutung, gemessen an der Zahl der beteiligten Bevölkerung, verdienen die als Cropland kartierten Räume besondere Aufmerksamkeit. Sie werden zunächst nach Art der Nutzung, die (a) traditionell verhaftet, (b) privat-kommerziell oder (c) staatseigen/-gefördert sein kann, gegliedert. Die weitere Unterteilung erfolgt dann für (a) nach Besitzverfassung, Grad der Kommerzialisierung, Betriebsgröße, Produktionsrichtung (Verhältnis von Pflanzen-, Tier-, oder/und Fischprodukten), Nutzungsintensität, Werkzeug der Bodenbearbeitung, Maßnahmen zur Erhaltung der Bodenfruchtbarkeit und Art der Nutzflanzen und -tiere. Danach lassen sich 20 Nutzungssysteme unterscheiden, die sich zu 5 Gruppen ordnen lassen: Brandrodungs-Wanderfeldbau, semi-permanenter Hackbau, semi-permanenter Hackbau mit Fischfang, semi-permanenter Hack- und Pflugbau mit Rinderhaltung, semi-kommerzieller Ochsen- und Traktorpflugbau. Die privat-kommerziellen Betriebe (b) werden nach der vorherrschenden pflanzlichen und tierischen Produktion gegliedert. Die einzelnen traditionell verhafteten Nutzungssysteme und die Gesamtheit der privat-kommerziellen Betriebe *(Commercial farming on State Land)* besitzen größere und meist zusammenhängende Verbreitungsgebiete, die Farmregionen.

Dies gilt nicht für die staatseigenen/-geförderten Unternehmen (c), die in allen Landesteilen zu finden sind. Die erste Unterteilung richtet sich hier nach der besonderen Zielsetzung, die sich entweder auf die Entwicklung von rückständigen Räumen richtet *(settlement schemes)* oder auf die Steigerung der nationalen Produktion *(direct production schemes)*. Ebenfalls entziehen sich die sog. *emergent farmers* der Regionalisierung. Hierbei handelt es sich um einzelne semi-kommerzielle Farmer, die sich außerhalb der semi-kommerzialisierten Farmregionen überall in Zambia in wechselnder, doch immer gering bleibender Dichte finden. Ihre Betriebe gleichen sich, trotz der regional wechselnden ökologischen und historischen Bedingungen, überraschend stark.

Die Nutzungssysteme und ihre Verbreitungsgebiete, die Farmregionen, werden in ihren wesentlichen Merkmalen beschrieben (u. a. Bedeutung nach Fläche und Bevölkerungszahl, Nutzungsdichte, Nutzungsintensität, Marktproduktion). Die Angaben für die einzelnen Farmregionen beziehen die innerhalb ihrer Grenzen gelegenen Entwicklungsprojekte und *emergent farmers* mit ein. Eine Trennung ist infolge ungenügender Statistiken vorläufig noch nicht möglich.

The project for land use mapping in Zambia was initiated by the Zambian Government. Work started in 1970 and was supported by the Zambian Government and the University of Zambia. The compilation of the map was completed in early 1972.

The major land categories observed are urban areas, cropland, forest estates (i.e. forest reserves, protected forest areas, afforestations), National Parks, lakes, areas liable to flood, swamps and hilly areas. The first two of these categories form together the area of major human activity in Zambia where all settlements, cultivations and industries are concentrated. It adds up to roughly 1/4 to 1/5 of the Zambian surface area.

From the rest of Zambia, 16% is reserved for exploitation of timber (8.2% forest estates) or tourism and wildlife (7.9% National Parks). All lakes (1.2%) are used for fishing. This brings the land used in Zambia up to 40%.

Assuming that some parts of the areas liable to flood, of the hilly areas and of the "unused woodland" are used as pastures for livestock, the estimate might be justified that approximately half of Zambia is used in some form (cf. fig. 1).

The category "cropland" will be given priority in this study. This is justified by its wide distribution as well as by its overwhelming contribution to the economy with respect to the number of persons involved.

Cropland as defined in this study includes (1) land occupied by all crops, (2) land used for fallow, (3) formerly cropped land until regeneration of tree growth and (4) rural settlements and even unused land in between the fields (the areal measurements of cropland have been taken from the Land Use Map; this source does not permit more accurate figures due to the generalisation in the process of mapping).

The fact that the figures for cropland include an unknown portion of non-cultivated land has to be taken into consideration, but it does not affect their general usefulness. It can be assumed that much of the area between the present or former fields has never been cropped for economic or social reasons, i.e. there is not much space within the farmed areas as they are mapped for expansion, at least not as long as the predominant type of farming is maintained. This allows the conclusion that the figures for cropland as defined here offer more reliable information on the actual land requirements and carrying capacity than those for the field and fallow acreages.

Cropland has been divided into three main sectors, i.e. the basically traditional, the private commercial and the state-controlled (Government development projects). Each of these sectors is subdivided.

Basically traditional land use includes those systems

*) It is gratefully acknowledged that the Zambian Government has granted permission to distribute the Land Use Map of Zambia together with this article.

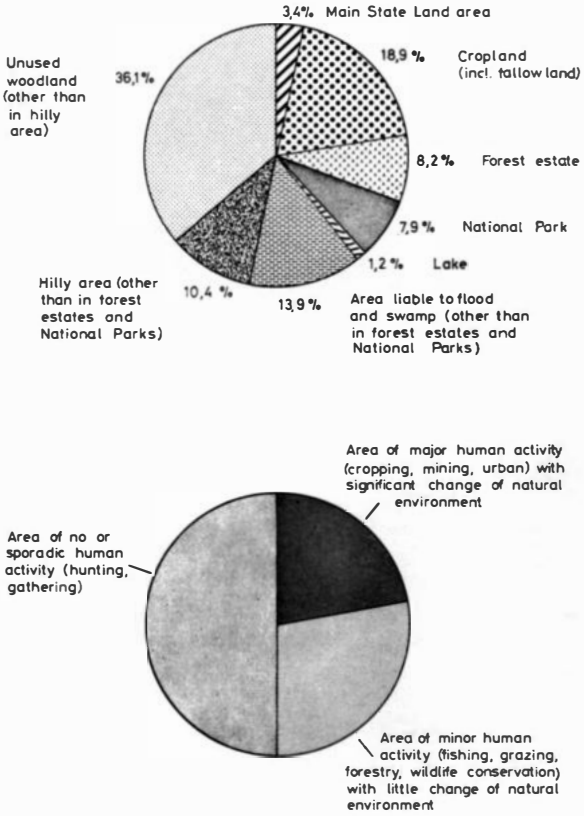


Fig. 1: Major land categories of Zambia

in which agricultural practices are largely based on local traditions and in which traditional (tribal or communal) rights to land still exist (although changes towards individual rights to land – at least as far as arable land is concerned – are visible everywhere). For a general survey of the traditional land use, the profound and still valid work of TRAPNELL and CLOTHIER during the 30's is recommended (TRAPNELL 1953, TRAPNELL and CLOTHIER 1957).

Most of the figures given in this article are derived either from the Land Use Map, the map on population distribution (JACKMAN and DAVIES 1971) or material supplied by the *Agricultural Census of Zambia* 1970/71. For the purpose of this study a reduced sample was made from the latter source, totalling some 1,100 farm households.

The subdivisions of the basically traditional land use systems, as used in this study, are defined by a limited number of diagnostic variables which are (a) land tenure, (b) degree of commercialisation, (c) size of holding, (d) orientation of production (= proportion between crop, livestock and or fish products), (e) intensity of cultivation, (f) implements of cultivation, (g) maintenance of soil fertility and (h) main crops and livestock (SCHULTZ 1975a).

The application of these criteria is aimed at defining and demarcating regions with a high homogeneity, or a distinctly recurring pattern in farming, rather than at classifying of single farms. Such regions, the "farming regions" (cf. fig. 2), fit in the general ecological context, thus representing the main natural regions of the country.

The systems/regions of basically traditional land use, totalling 20 plus 8 subdivisions, have been grouped under 5 headings as described below. Commercial farming, Government development projects and the so-called "emergent farmers" are dealt with in separate paragraphs which follow on these.

Shifting axe and hoe cultivation

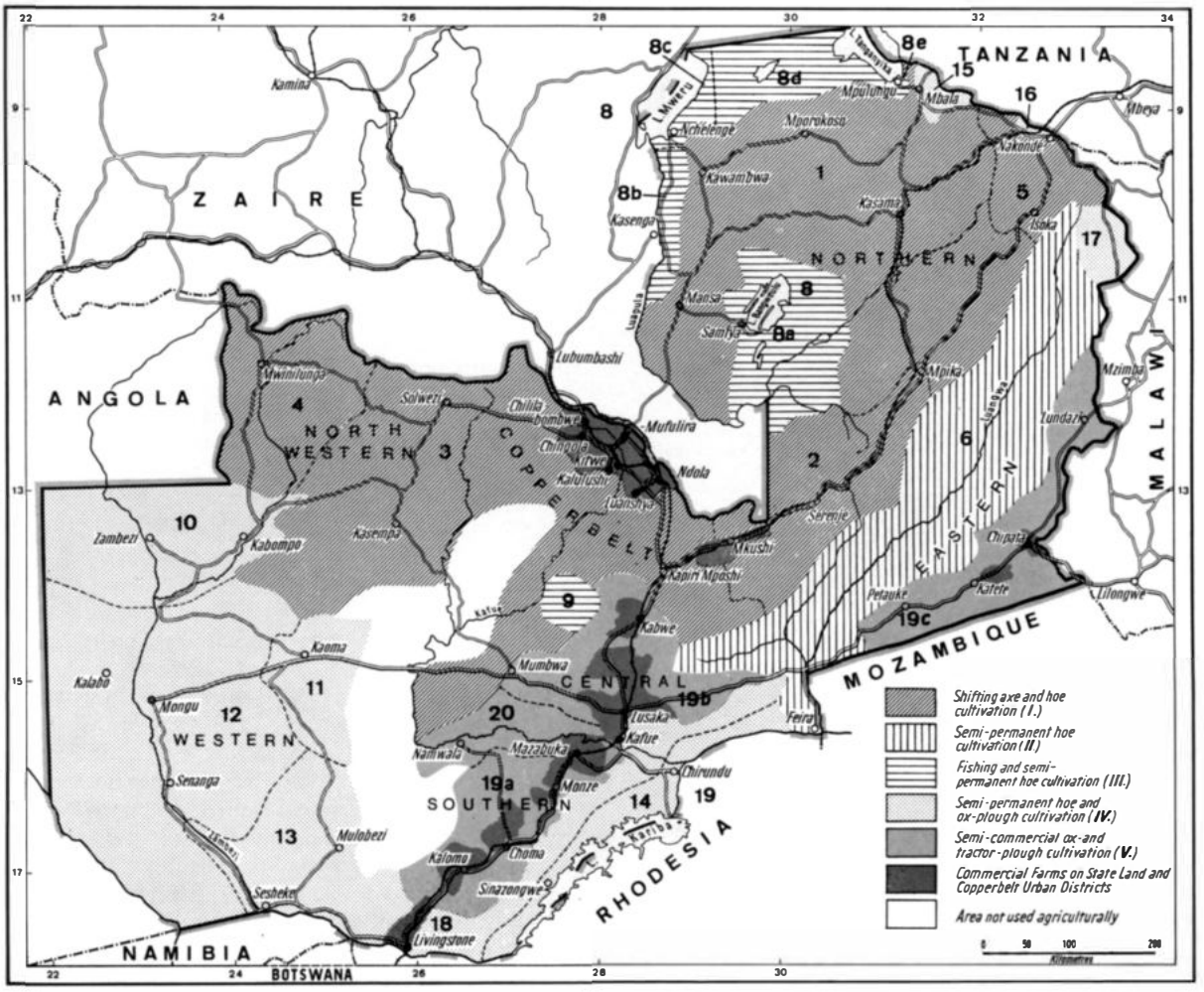
This type of farming is the most common in the north-eastern and north-western part of the country, where annual rainfall exeeds on average 1000 mm and where the soils are frequently leached heavily. Its area of distribution covers nearly two fifths of the country, with 20 per cent of total and 28 per cent of rural population.

Various studies have been made of certain aspects or regional subtypes of shifting cultivation in Zambia. The more detailed ones are those from ALLAN 1969 (2nd ed.), DOKE 1931, LONG 1968, MANSFIELD and JONES 1973, PETERS 1950, RICHARDS 1969 (4th ed.), SMYTH 1958 and TURNER 1964 (2nd ed.).

All systems of this group belong to an "intensive" type of shifting cultivation, called chitemene. Trees are lopped or cut, and the wood is piled up on smaller patches within the clearing for burning. Cultivation is mostly confined to these burnt patches where the ash layer helps to overcome the inherent low soil fertility and the heat to control weed growth. These ash gardens are supplemented by "village gardens" which are used more permanently corresponding to the higher intensity of husbandry applied to them.

The cut and burn technique of chitemene, as well as the mound cultivation with grass naturally composted inside (see below) that is practised in the village gardens and in some other farming regions, e.g. those with higher population density along the Tanzanian border, are adaptations which make these systems relatively independent of soil fertility. The same advantage is gained in other systems by the cultivation of cassava, which promises reasonable yields even in those areas where most other crops would fail. It is this advantage that backs the strong preference for cassava in the densely populated areas of Luapula Province and the spreading of cassava cultivation to the east.

The relative independence of soil fertility that is found in all systems of the wetter parts of Zambia is clearly revealed in the distribution pattern of cultivated land. No general order is easily detectable; the distribution seems "arbitrary" in respect of natural conditions. This contrasts with the valley related pattern in the drier parts of Zambia where the careful



I. 1. Large circle chitemene system
2. Small circle chitemene system
3. Block chitemene system
4. Mwinilunga system
5. Isoka system

II. 6. Luangwa system

III. 8. Fishing/cassava lake and swamp system
a) Bangweulu system
b) Lower Luapula system
c) Lake Mweru system
d) Mweru Wantipa system
e) Lake Tanganyika system
9. Lukanga Swamp system

IV. 10. Luvale system
11. Kaoma system
12. Barotse system
13. Sesheke system
14. Gwembe system
15. Mambwe system
16. Ikumbi system
17. Nyika system
18. Zambezi Escarpment system

V. 19. Maize/cattle mixed farming system
a) Southern Plateau system
b) Central Plateau system
c) Eastern Plateau system
20. Namwala mixed farming system

Fig. 2: Farming regions

selection of most suitable sites (for a given land use system) predominates over adaptations (of these systems).

Five shifting cultivation systems are to be distinguished. Two of these differ greatly from the three others, known as chitemene systems, either by the predominance of a semi-permanent hoe cultivation (Mwinilunga system), or by the raising of cattle (Isoka system).

The three chitemene systems are distinguished by

- ratio of cleared area to that of the field: It is approximately $^1/_{10}$–$^1/_{20}$ in Small circle chitemene, $^1/_5$–$^1/_{10}$ in Large circle chitemene and even less in Block chitemene.
- shape and size of cleared land and field: The shape of the fields – large circle, small circle or slightly right-angled blocks – is the most evident feature and has been used for naming of the three systems. The size of the fields is increasing in the order Small, Large and Block chitemene while the size of the clearing decreases in this order.
- period of cultivation and its relation to the fallow period: The continuous cultivation of a certain field hardly exceeds three years in Small circle and

Block chitemene, and may reach five or six years at the most in Large circle chitemene. The fallow period depends on the time required for arboreal regrowth, which is shorter in the clearing (outside the fields only) of Large circle chitemene where only the branches are lopped. At present the increasing population density has begun to reduce this minimum length of fallow period in several areas which results in a breakdown of the shifting cultivation methods.

- staple crops and rotation of crops: The main crops by frequency and area under cultivation are cassava and maize in most regions of shifting cultivation. The dominance of cassava over maize continuously reverts from the border with Zaire towards the drier eastern and southern parts of the country. The traditionally important species finger millet and sorghum have remained co-dominant in their former main distribution areas, Large circle chitemene and Block chitemene respectively. Groundnuts and beans are frequently grown in Large and Small circle chitemene systems.
  Various rotations have arisen which tend to comprise more different crops in Large circle chitemene than in the two other systems. The average number of crops per farm household is 3.8 in Large circle, 3.4 in Small circle and 2.9 (which equals the Zambian mean) in Block chitemene.

The Mwinilunga system and the Isoka system do not only contrast with the three chitemene systems but also with each other. Their grouping together with the chitemene systems is not fully justifield, however, no more satisfactory solution seems possible.

The Mwinilunga system is characterised by an advanced transitional stage towards semi-permanent hoe cultivation. The process of transition is closely related to the overwhelming preference, which is now given to cassava. More than 90 per cent of all holdings grow this crop, on average on 5.7 acres. In contrast, maize and finger millet are grown only by 50 and 25 per cent respectively, both on less than half an acre per holding. The extreme preference for cassava is also expressed by the fact that two-thirds of all holdings cultivate only one or two major field crops (average for all farms 2.1). Many characteristics of the chitemene systems have been preserved, e.g. the transformation of woodlands into arable land is done according to small circle chitemene methods.

The Isoka system is concerned with large circle chitemene cultivation and with cattle-raising. Corresponding to the fact that it is located east of the Large circle chitemene, cassava is fairly unimportant. Roughly half the holdings grow this crop. Much higher frequencies (80–100 per cent) are found for maize, finger millet, groundnuts and beans. The number of major crops per holding approaches five, and therefore is the highest of all land use systems in Zambia. Half the farmers keep cattle, on average 20 animals each.

All shifting cultivation systems have high land requirements. There are, however, significant differences which are explained by the varying ratios of field/clearing, cultivation/fallow and size of holding/persons. The highest land requirements are found in Small circle chitemene, Large circle chitemene and Isoka system (in this order decreasing), whereas those for Block chitemene and Mwinilunga system are much lower.

It is to be noted in connection with the largely varying land requirements that the first three farming regions make use of 60 per cent and more of land suitable for cropping, whereas the other two use less than 20 per cent of their suitable areas. Correspondingly, the population density per cropland (persons/sq.km) is lowest in the first group (5.6 in Small circle chitemene, 8.8 and 8.6 in the Large circle chitemene and the Isoka system respectively) and only second lowest (on a country-wide scale) in the two other shifting cultivation systems (17.6 and 18.7 in Block chitemene and Mwinilunga system respectively).

These relations show that the regions of Block chitemene and Mwinilunga system are significantly underused compared with the regions of shifting cultivation in north-easthern Zambia.

The marketed production per cropland and per capita is the lowest in the country for all shifting cultivation systems except for the mixed Isoka system. The same applies to the total crop production, i.e. home-consumed plus marketed production.

Semi-permanent hoe cultivation

Two systems are included under this heading. One is the Subsidiary garden system of urban employees which is practised beyond the outskirts of the larger towns and which serves as a secondary source of food and – sometimes – of cash. No statistical data are available.

The other is the Luangwa system which comprises the whole Luangwa Valley. The large extent of this valley – roughly 10 per cent of the Zambian surface area if the escarpments on both sides are included – contrasts with a share of only 2 per cent of the total and 3 per cent of the rural population. Marketed production has not been established but it can be expected to be low. Correspondingly, the density of cultivation is among the lowest in the country.

The dry climatic conditions (less than 800 mm annual rainfall in most parts and comparatively high temperatures) and mostly poor soil types derived from Karroo sandstone (lithosols, solonetzic soils) offer little potential for cropping. More fertile soils are restricted to the alluvial fringes of the water courses. The medium high population density (35–50 persons

per sq.km of cropland) found here indicates the higher intensity of cropping, but also suggests that not much attractive land is left for expansion of cultivation.

The main crop by frequency and acreage is maize. Finger millet and the traditionally most important sorghum become co-dominant in the northern and central part respectively. The diversity of cropping per household is on average below the Zambian mean.

Fishing and semi-permanent hoe cultivation

The potential for fishing offered by the large lakes and swamps of Tanganyika, Mweru, Mweru Wantipa, Lower Luapula, Bangweulu, Lukanga and Kafue have given rise to the development of rather uniform cassava/fishing systems. The total area used by these systems accounts for some 7 per cent and the population living here makes up 8 per cent of total and 12 per cent of rural population.

There are two major anthropological studies, one of Bangweulu Swamp by BRELSFORD 1946 and the other of Lower Luapula Valley by CUNNISON 1967 (2nd ed.). Both contain valuable information on agriculture and fishing.

In all systems fishing is the dominant activity and is carried on mainly for the cash market. The fish is generally sold sundried and/or smoked except at Lakes Mweru and Tanganyika where ice-making plants have been established.

Cassava predominates among the staple crops, except in Lukanga Swamp and on Kafue Flats (the latter area has been omitted from this study due to unpredictable changes to be expected after the Kafue Hydro-electric Scheme has come into full operation). Maize follows cassava with respect to frequency and area under cultivation. Groundnuts are co-dominant at Lake Bangweulu and in Lower Luapula Valley. Crop diversity is close to the Zambian mean except for Lake Tanganyika where a lower diversity corresponds to a larger degree in commercialisation of fishing.

The cropland follows the edges of swamps and lakes as closely as possible in order to reduce the distances to the fishing grounds. The population density which has developed here is the highest of the country's rural areas. It amounts to over 80 persons/sq.km of cropland at the Lakes Mweru, Mweru Wantipa and Tanganyika and drops to 57 and 40 at Lake Bangweulu and Lower Luapula Valley respectively, where land extensive chitemene practices are maintained in addition to the semi-permanent hoe cultivation.

The value of marketed production, i.e. almost exclusively fish, is the second highest among the five groups of basically traditional land use systems regardless whether calculated per total area, per cropland plus fishing grounds or per farming household. Corresponding to the high population density, the total crop and fish production (marketed plus home-consumed production) even equals that of some of the semi-commercial farming regions when calculated per area.

Semi-permanent hoe and ox-plough cultivation

This type of farming covers one quarter of Zambia, which is the second largest portion of the country next to shifting cultivation. The population amounts to 17 per cent of the total and 25 per cent of the rural.

The distribution is confined to areas with less than 1000 mm annual rainfall. The three systems of Mambwe, Ikumbi and Nyika close to the border with Tanzania are the only major exceptions to this rule. They form a subdivision also according to further aspects. Among the other systems, those on Barotse Sand (Luvale, Kaoma, Barotse and Sesheke systems) can be separated from the Gwembe and Zambezi Escarpment systems for various reasons.

Barotse and Gwembe systems have proved most attractive to research. Major publications for Barotseland are those by GLUCKMAN 1968 (2nd ed.), LÜTKE-ENTRUP 1969 and 1971, MACLEAN 1965, PETERS 1966, VERBOOM and BRUNT 1970; the Gwembe Valley has been studied thoroughly by COLSON 1960, 1971 and SCUDDER 1962, 1971. In addition there are two grater studies of Mambwe by ALDER 1960 and WATSON 1964 (2nd ed.) and one of Luvale by WHITE 1968 (2nd ed.).

The Mambwe, Ikumbi and Nyika systems of the first subdivision practise a distinct method of soil improvement by incorporating grass and herbs into mounds, where these plants decompose to form compost. The mounds are then used either directly for planting or are spread previous to planting. The preparation of chitemene fields which were common in the past is now being abandoned due to devastation of suitable woodland. The percentage of land that is cropped is among the highest in the country. The density of rural population per cropland is significantly higher than in the adjacent Large circle chitemene region. It corresponds more closely to the semi-permanent hoe cultivation as described. The main crops are maize, finger millet, groundnuts and beans; cassava is important in the two westernmost systems. The mean crop diversity per household is extremely high (3.8–4.8). The value of marketed production per area and farm household is slightly higher than in the Large circle chitemene which mainly results from the fact that cattle are available for sale.

The second subdivision, the farming on Barotse Sand, has a distinct distribution pattern of cropland: The poor soils developed on Barotse (Kalahari) Sands limit the potential for cropping probably more than any other factor does in the rest of the country; the denser zones of cultivation follow the floors and terraces of river valleys and the edges of flood plains, where mineral and organic content, as well as soil moisture are more favourable. But cassava and bul-

rush millet are grown on sandy soils as well. Apart from this common distribution pattern of cultivation there is, however, a marked difference in the crop choice and interest for cattle-raising between the four farming regions concerned which follows partly the declining annual rainfall and the growing liability to frost from north to south, partly the varying depth of the aeolan sand layer. The greatest dominance of cassava and fewer cattle is found in the wetter northern areas (Luvale system). Maize becomes more important in the east where sands are not as deep (Kaoma system). In the south, which is drier and where the depth of sand is also less, maize and sorghum are the main crops, and cattle-raising is a major activity, while cassava is not important (Sesheke system). The central area with its contrast of deep sands and vast flood plains is used for cattle-raising and cropping of maize, cassava and millet; a far extending cultivation on various sites of the flood plains and their edges has become possible by the application of highly adapted methods (Barotse system). The crop diversity is close to the Zambian mean. Only the Kaoma system has an exceptionally high diversity (4.1), which may be connected with the more advanced transition towards commercialisation found there. The cropped portion of the land is rather low due to the vast extent of the infertile sands. The density of population per cropland, however, approximates to that of the first subdivision. The marketed production is very low as in the shifting cultivation systems, except when related to cropland, which results from the higher intensity of semi-permanent cultivation. The relative high intensity of cultivation becomes evident further from the rather large production per cropland, which is significantly above that of the first subdivision and even more above that of most shifting cultivation systems.

The same high rank with respect to production per cropland is occupied by the third subdivision, the Gwembe Valley and the adjacent Zambezi Escarpment. Both these regions also have the "linear" distribution pattern of cropland in common with the western systems, explained here, however, by the generally hilly instead of sandy interfluves. The main crop is sorghum troughout the valley area. The second crop is either maize (in the north) or bulrush millet (in the drier south). Maize dominates also on the escarpment. Neither the cropped portion of land nor population density per cropland differ much from the foregoing subdivision. Both relationships are only slightly higher. The same applies to the – low – marketed production.

Semi-commercial ox and tractor plough cultivation

Semi-commercial farmers are found in all parts of Zambia (see below: emergent farmers). The only regions, however, with a high percentage of farmers who give priority to growing for the cash market are the systems of this farming category. Their distribution is confined to the plateau with an average annual precipitation between 800 and 1000 mm. Under these rainfall conditions more fertile ferrisols frequently replace the leached ferallitic soils of the wetter northern parts of the country. In addition, the high demand for foodstuff of the Copperbelt and the rail link which exists to this market (with the exception of Eastern Plateau) have favoured the agricultural development of these regions since many years.

The total distribution of semi-commercialised cultivation comprises 10 per cent of the country. The rural population living here, amounts to 20 per cent of the total and 28 per cent of the rural population. This relation clearly demonstrates the attraction which this part of the country possesses for farming.

The progress in farming has also attracted researchers. Major studies, mainly of transitional problems, have been carried out for Southern Plateau by ALLAN et al. 1968 (2nd ed.), ANTHONY and UCHENDU 1970, COLSON 1962, JOHNSON 1956 and MORGAN REES 1958; for Central Plateau by BESSEL et al. 1969, MORGAN REES and HOWARD 1955; for Eastern Plateau by BARNES 1967 (2nd ed.), KAY 1967, PRIESTLEY and GREENING 1956 and WHITTINGTON 1967; and for Namwala Region by MACLEAN 1962.

Common characteristics of all land use systems of the semi-commercial type are as follows: the early and widespread adoption of the tractor for ploughing; the comparatively large, rectangular fields in block or strip formation, which are linked closely together in places and exhibit a schematic pattern; the permanent cultivation made possible by the application of industrial fertilisers and cattle manure; the specialisation on one or a few crops.

Maize is dominant everywhere. Groundnuts are a subsidiary crop on Southern and Eastern Plateau, where roughly two thirds of all farmers grow this crop on 10 per cent and 30 per cent of their holdings respectively. A lower but still significant portion of farmers grow this crop in the Namwala region. Cotton is a major cash crop on the Central Plateau. Some 90 per cent of the Zambian production of 1971 was produced by semi-commercial farmers on this plateau.

The utilised portion of land is high, the population density per cropland is placed at a medium level. This relation resembles that of shifting cultivation systems but is explained quite differently. In the semi-commercial mixed farming systems, the land requirements per household are high due to a cash orientated expansion of cropping and the need of pastures for the cattle – not to extensive land use methods as in shifting cultivation. The results of this profound difference become evident from the marketing statistics, which put the semi-commercial farming regions at the top by a wide margin of all basically traditional farming systems.

There are distinct differences in commercialisation between the semi-commercial systems. The sequence according to increasing marketed production is: Eastern Plateau, Namwala Region, Southern Plateau and Central Plateau.

Commercial farming on State Land

State Land is held under grants on statutory tenure. The distribution of farmed State Land follows the line of rail. In addition, a few smaller areas on the Eastern Plateau belong to this category. The total area comprises approximately 15,000 sq.km, of which some 10 per cent have been cleared and stumped, and an even smaller portion, i.e. 800 sq.km, is under cultivation.

Originally the land had been alienated to expatriate farmers who run their farms on strictly commercial lines. After Independence, some 50 per cent of these expatriates have left the country.

The decline has resulted in larger farm sizes, but part of the land which became available after the departure of farmers has been allocated to small and medium scale settlement schemes, direct production schemes and parastatal farming enterprises. The total number of registered farm units on State Land amounted to approximately 1,200 in 1972. Estimated employment is around 20,000.

The main cash crop by acreage and value is maize. Next in value are Virginia flue-cured tobacco, sugar cane, beef and milk. The outstanding position of the State Land farming becomes evident from all marketing figures. More than half of the value of total fish and agricultural marketed production is derived from this part of Zambia, which covers only 2 per cent of Zambia's surface area. The market contribution of commercial farmers becomes even more remarkable when related to cropland and the number of farming households; both comprise less than 1 per cent of the corresponding Zambian totals (SCHULTZ 1975b).

Some types of agriculture evade the regionalization of farming as described. These are the various Government development projects and the emergent farmers. Of these, the distribution of the emergent farmers could not be shown on the Land Use Map.

Government development projects

They are either settlement schemes which aim primarily at rural development or direct production schemes which primarily aim at increasing national production. Both types are found in most parts of the country although a higher concentration – especially of the commercialised subtypes – is found along the line of rail within the semi-commercialised and commercialised farming regions. Their marketed production could not be separated from that of the farming regions, in which they are located.

The settlement schemes are characterised by the active participation of independant farmers in the production. The farmers receive advice or are supervised and controlled by a scheme "manager", but remain responsible for their plot. The Government contributes – in addition to the special extension services – in providing the infrastructure.

Production schemes are developed and operated as direct production units. It is expected they will eventually reach a level which is comparable by scale and management to the commercial farms on State Land. Some of them are devoted to special crops (e.g. coffee, tea, kenaf) to try out production on commercial lines.

It is argued that both types of schemes can function as nodes for the development of larger areas. Not much evidence is given that this is likely to arise.

Emergent farmers

The term "emergent farmer" refers to semi-commercial farmers outside the semi-commercial ox and tractor plough farming region. Their number, although varying in different parts of the country, never gains majority or even a minority of regional significance, nor do their holdings reach mappable size. Nevertheless, most of the agricultural produce bought by the marketing agencies in the outlying regions originates from these emergent farmers and not from the surplus production of the bulk of subsistence farmers.

The earlier regional interdependence between land use, ecology and tribal distribution has declined. It remains most pronounced in areas where agricultural utilisation has undergone least change. In such cases, natural environment, tribal relation and agricultural usage still coincide to a large extent. In contrast, the advanced forms of usage do not show a pronounced spatial differentiation corresponding to that of the ecology and tribe. All emergent farmers are rather uniform in their characteristic features irrespective of their location.

The major courses taken by the dispersion of modern economic forms are determined by other factors, notably by the development of communications and markets. For this reason, the current situation clearly shows a transitional character in the development of agricultural usage. It first requires the development of roads and markets etc., and thereby the possibility for the different regions to again achieve equal opportunity before a renewed productive adaptation to the natural environment can take place on a higher economic plane. It is questionable, however, whether future developments will proceed in this direction. There are tendencies indicating that there is no desire for supra-regional equal opportunity. Such tendencies are particularly noticeable in a sparsely populated and under-utilised country such as Zambia. Political rather than economic reasons are used by the opponents to such a development.

Selected bibliography

ALDER, J. R.: A report on the land usage of the Aisa Mambwe in Reserve IV, Abercorn District. Dept. of Agriculture, Abercorn 1960.

ALLAN, W. et al.: Land holding and land usage among the Plateau Tonga of Mazabuka District: a reconnaissance survey, 1945. R-L Papers 14, Manchester (2nd ed.) 1968.

– : Studies in African land usage in Northern Rhodesia. R-L Papers 15, London (2nd ed.) 1969.

ANTHONY, K. R. M. and UCHENDU, V. C.: Agricultural change in Mazabuka District, Zambia. Studies in Agric. Economics, Trade and Development 9, no. 3, 215–266. Food Research Institute, Standford University 1970.

BARNES, J. A.: Politics in a changing society. A political history of the Fort Jameson Ngoni. Manchester (2nd ed.) 1967.

BESELL, J. E., ROBERTS, R. A. J., VANZETTI, N. and ELLIOT, G. M.: Agricultural labour productivity investigation (UNZALPI). Report no. 2: Analysis of pilot year data. No. 3: Some determinants of agricultural labour productivity in Zambia. No. 4: Labour requirements for crops and livestock. No. 5: Income and expenditure patterns in relation to the age of cultivator and education of family. University of Nottingham and Zambia 1969.

BRELSFORD, W. V.: Fishermen of the Bangweulu Swamps. A study of the fishing activities of the Unga tribe. R-L Papers 12, Livingstone 1946.

COLSON, E.: Social organization of the Gwembe Tonga. Kariba Studies I, Manchester 1960.

– : The Plateau Tonga of Northern Rhodesia (Zambia). Social and religious studies. Manchester 1962.

– : The social consequences of re-settlement. Kariba Studies IV, Manchester 1971.

CUNNISON, I.: The Luapula peoples of Northern Rhodesia: custom and history in tribal politics. Manchester (2nd ed.) 1967.

DAVIES, D. H. and JACKMAN, M. E.: Atlas of the population of Zambia. Maps 1 and 2, distribution and density, Lusaka 1971.

DOKE, C. M.: The Lambas of Northern Rhodesia. London 1931.

GLUCKMAN, M.: Economy of the central Barotse plain. R-L Papers 7, Manchester (2nd ed.) 1968.

JOHNSON, C. E.: African farming improvement in the plateau Tonga maize areas of Northern Rhodesia. Dept. of Agriculture, Agric. Bulletin 11, Lusaka 1956.

KAY, G.: Changing patterns of settlement and land use in the Eastern Province of Northern Rhodesia. Occasional Papers in Geography no. 2. University of Hull 1967.

– : A social geography of Zambia. A survey of population patterns in a developing country. University of London Press 1967.

LONG, N.: Social change and the individual: a study of the social and religious responses to innovation in a Zambian rural community. Manchester 1968.

LÜTKE-ENTRUP, J.: Grenzen und Möglichkeiten einer Steigerung der Marktproduktion bäuerlicher afrikanischer Rinderhalter, dargestellt am Beispiel des Barotselandes/Zambia. Materialsammlung der Zeitschrift für ausländische Landwirtschaft, Heft 10, Frankfurt 1969.

– : Limitations and possibilities of increasing market production of peasant African cattle holders in Western Province; Zambia. Inst. for African Studies, Communication 7, Lusaka 1971.

MACLEAN, H. A. M.: An agricultural reconnaissance survey of Namwala District. Lusaka 1962.

– : An agricultural stocktaking of Barotseland. G. P. Lusaka 1965.

MANSFIELD, J. E. and JONES, J. A.: Assessment of chitemene (shifting) cultivation and allied systems in Mansa District, Luapula Province, Zambia by random dot-sampling of airphotos. Supplementary Report 10 Land Resources Division, Tolworth Tower, Surbiton, Surrey, England 1973.

MORGAN REES, A. M.: An economic survey of Plateau Tonga improved farmers. Agric. Bulletin 14, Dept. of Agriculture, Lusaka 1958.

– and HOWARD, R. H.: An economic survey of commercial African farming among the Sala of the Mumbwa District of Northern Rhodesia. Agricultural Bulletin 10, Dept. of Agriculture, Lusaka 1955.

PETERS, D. U.: Land usage in the Serenje District. R-L Papers 19, London 1950.

– : Land usage in Barotseland. R-L communication 19, Lusaka (2nd ed.) 1966.

PRIESTLEY, M. J. S. W. and GREENING, P.: Ngoni land utilization survey, 1954–1955. G. P. Lusaka 1956.

RICHARDS, A. I.: Land, labour and diet in Northern Rhodesia: an economic study of the Bemba tribe. London (4th ed.) 1969.

SCHULTZ, J.: Land Use Map of Zambia: Classification and mapping of basically traditional farming systems. In: Agricultural Typology and Land Utilisation. Center of Agricultural Geography, Institute of Agricultural Economy and Policy, University Verona 1975a.

– : The contributors to the agrarian market production in Zambia. Die Erde, Jg. 106, Heft 1–2, p. 10–20, Berlin 1975b.

SCUDDER, T.: The ecology of the Gwembe Tonga. Kariba Studies II, Manchester 1962.

– : Gathering among African woodland savannah cultivators. A case study: The Gwembe Tonga. Zambian Papers 5, Manchester 1971.

SMYTH, N. W.: Report on agriculture in the Serenje District. Lusaka 1958.

TRAPNELL, C. G.: The soils, vegetation and agriculture of North-Eastern Rhodesia. G. P., Lusaka 1953.

– and CLOTHIER, J. N.: The soils, vegetation and agricultural systems of North-western Rhodesia. G. P., Lukasa 1957.

TURNER, V. W.: Schism and continuity in African society: a study in Ndembu village life. Manchester (2nd ed.) 1964.

VERBOOM, W. C. and BRUNT, M. A.: An ecological survey of Western Province, Zambia, with special reference to the fodder resources. Land Resource Study 8, vol. I and II, Directorate of Overseas Surveys, Tolworth, Surbiton, Surrey, England 1970.

WATSON, W.: Tribal cohesion in a money economy. A study of the Mambwe people of Northern Rhodesia. Manchester (2nd ed.) 1964.

WHITE, C. M. N.: A preliminary survey of Luvale rural economy. R-L Papers, no. 29 (2nd ed.) 1968.

WHITTINGTON, G.: Tobacco production in the Eastern Province of Zambia. Erdkunde 21, p. 297–309, 1967.

Abbreviations

R-L Rhodes-Livingstone
G. P. Government Printer

BERICHTE UND KLEINE MITTEILUNGEN

GEOGRAPHISCHE ANALYSE PAZIFISCHER ÖKOSYSTEME

Gedanken zu zwei Symposien während des 13. Pacific Science Congress in Vancouver

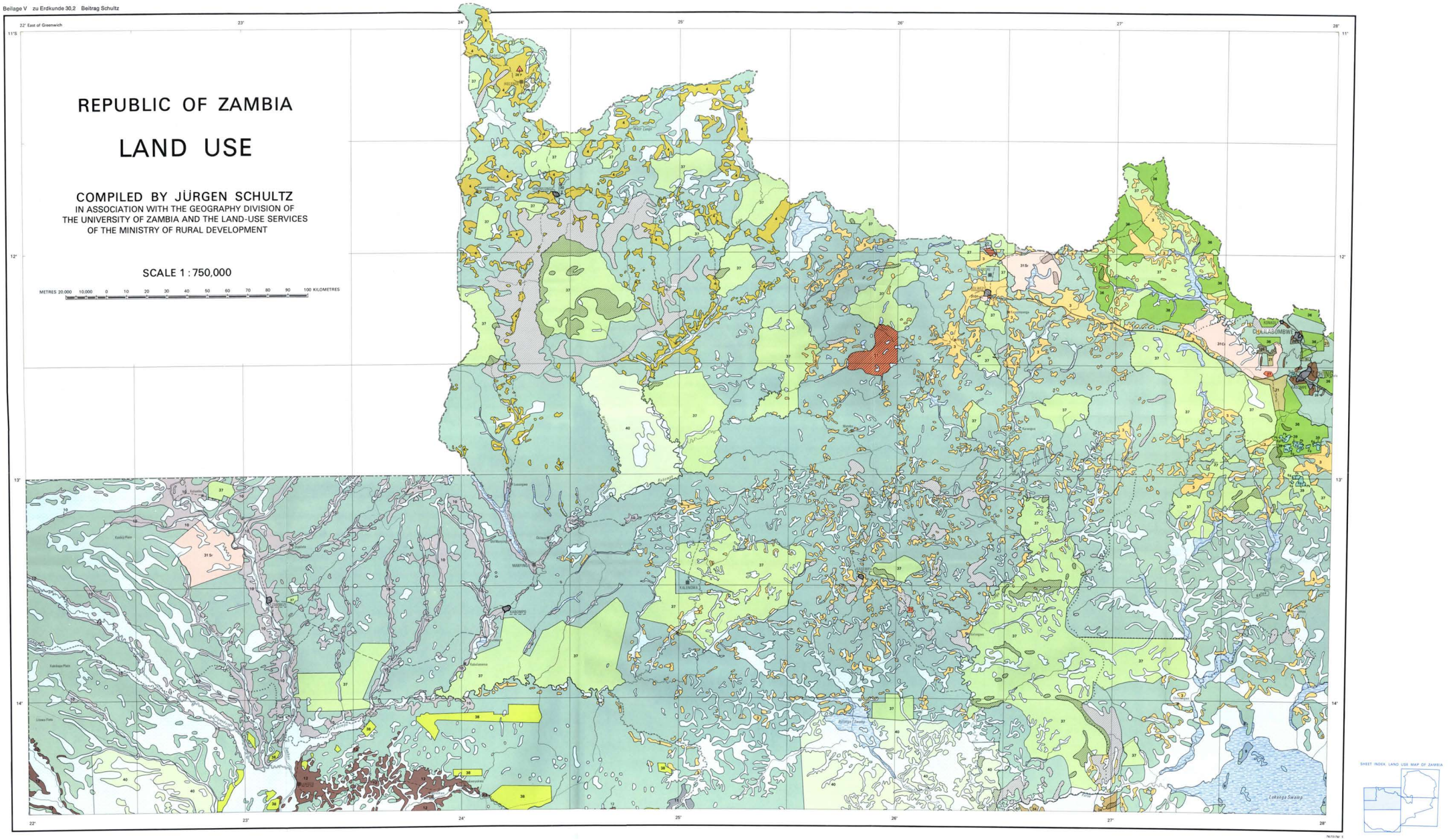
Mit 2 Abbildungen

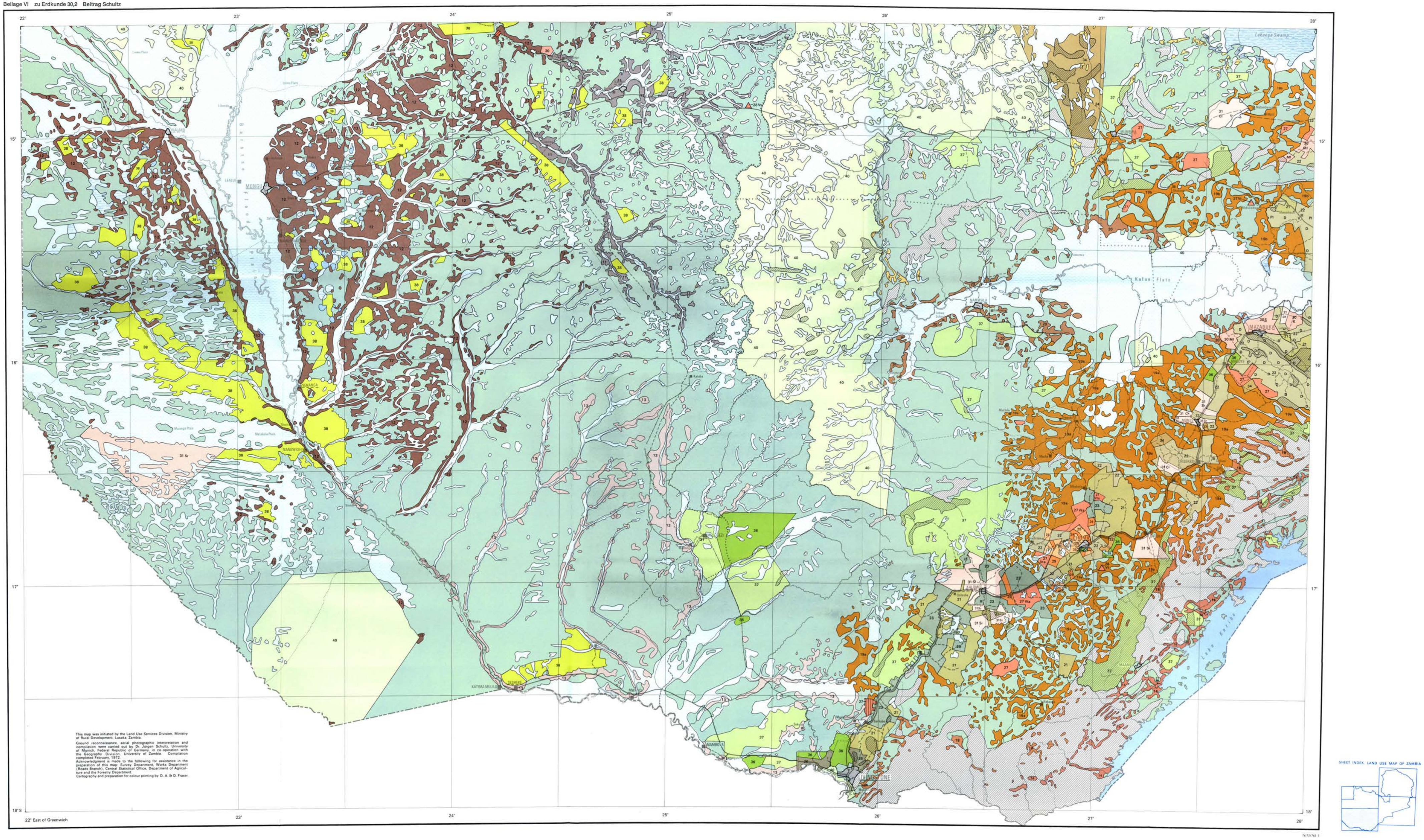
NORBERT STEIN

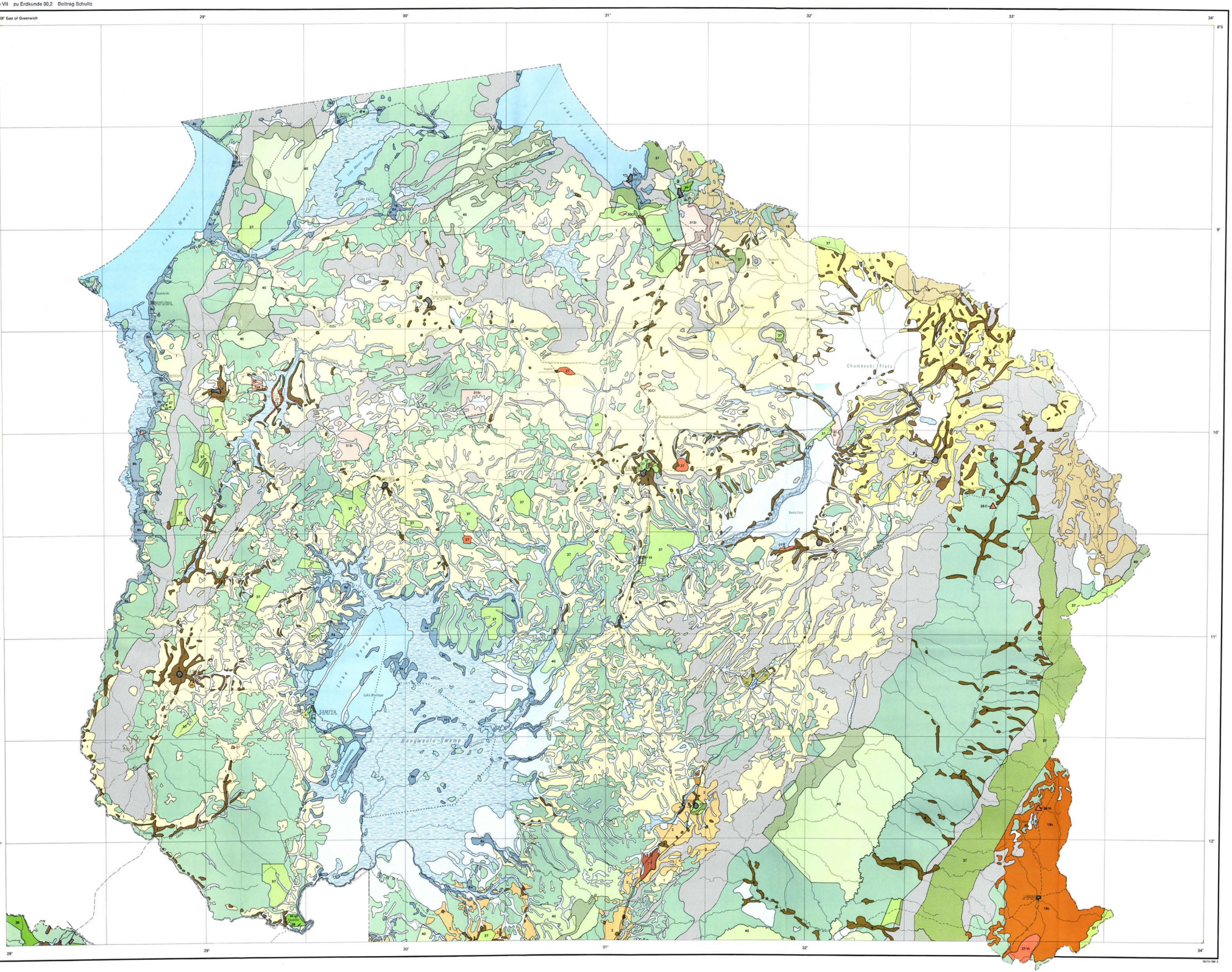
In der Zeit vom 18.–30. August 1975 fand in Vancouver (Kanada) der 13. Pacific Science Congress statt, als dessen Generalthema „Mankind's Future in the Pacific" gewählt wurde. Der Berichterstatter greift zwei Symposien heraus, welche sich mit der natürlichen Umwelt und deren Erhaltung im pazifischen Raum beschäftigten und deren Ziel es war, die Bestandsaufnahmen der biotischen Umwelt in praktikable Arbeitsgrundlagen – z. B. Karten – münden zu lassen. Es sind dies: Pacific Ecosystems: A geographical analysis (innerhalb der Sitzungsgruppe Botanik) und Man's Place in the Island Ecosystem Revisited. Die beiden Symposien gewinnen gerade auch im Zusammenhang mit einem in den letzten Jahren steigenden Bemühen um einen praxisbezogenen Problemkreis an Bedeutung, in welchem man der Gefährdung der natürlichen Umwelt im pazifischen Raum durch „conservation" von Ökosystemen – wie auch immer sie im einzelnen zu definieren sein mögen – entgegenzutreten versucht (COSTIN/GROVES 1973). Jeder, der die Entwicklung des Massentourismus in den letzten Jahren hier verfolgt hat, wird bestätigen müssen, daß bisher wenig berührte Inselwelten von unterschiedlichen Größenordnungen in zunehmendem Maße meist schwer berechenbaren Einwirkungen von außen ausgesetzt sind, wobei der möglichen Zerstörung von natürlichen terrestrischen und marinen (Korallenriffe!) Ökosystemen auf der sozio-kulturellen Ebene Probleme wie sozialer Wandel, „cultural change" u. a. gegenüberstehen.

Die Themen des von D. MUELLER-DOMBOIS organisierten und geleiteten Symposiums „Pacific Ecosystems: A geographical analysis" waren im einzelnen sehr weit gespannt. Es erwies sich daher als ein besonderer Vorteil, daß das Symposium in drei Themenkomplexe gegliedert worden war, welche in ihrer „hierarchischen" Anordnung einen sehr geschickten Zugang zur Problemstellung boten. Der erste Themenkomplex „Biogeographic subregions in the Pacific" gab einen breiten Überblick über die biogeographischen Gemeinsamkeiten und Unterschiede innerhalb des pazifischen Raumes. Das Ziel bestand darin, zu einer befriedigenden „biogeographischen Gliederung" des Pazifik in einem Maßstab zwischen 1:50 000 000 und 1:10 000 000 zu gelangen. Dies ist sicherlich nur zu erreichen, wenn sowohl die faunistischen als auch die floristischen Gemeinsamkeiten räumlich geordnet und „regionalisiert" werden können, d. h. wenn tier- und pflanzengeographisch einheitliche Regionen nach klar zu definierenden Kriterien gefunden werden können. Ein sehr bemerkenswerter Versuch war dabei in zoogeographischer Hinsicht das Referat von KAI CURRY-LINDAHL („Zoogeographic subregions of the Pacific as a background for Ecological Reserves in the Pacific"), in welchem eine Gliederung des Pazifik nach „faunal regions" vorgenommen wurde. Der Referent unterschied 22 Regionen, welche sich ausschließlich auf die pazifische Inselwelt im engeren Sinne konzentrierten und die Sunda-Inseln z. B. nicht einschlossen. Dennoch geht diese Gliederung recht erheblich über die bisher für den Pazifik häufig benutzte Gliederung der Notogäa von GRESSIT (1961) hinaus, da sie auch die Ryukyu-Inseln, die japanischen Inseln, den Aleuten-Bogen sowie die der nord-, mittel- und südamerikanischen Küste vorgelagerten Inseln umfaßt. Es mag hier freilich kritisch angemerkt werden, daß in den westlichen Randgebieten des Pazifischen Beckens – insbesondere Neuguinea, welches von C.-L. als eine „westpazifische Subregion" ausgegliedert wird – so viele Beziehungen nach W bestehen, daß eine räumliche Erweiterung wünschenswert wäre, wie dies auch in einer Gliederung von USINGER (1963; Abb. 1) zum Ausdruck kommt. Es ist z. B. seit langem bekannt, daß eine starke Einwanderungswelle orientalischer Arten im Quartär über den Sundabogen Neuguinea und die Bismarck-Inseln erreicht hat, wie auch umgekehrt papuanisch-australische Elemente zumindest bis nach Celebes vorgedrungen sind (GRESSIT 1961). Wenn man den Vorgang der Verbreitung der Fauna über die pazifische Inselwelt in seiner raum-zeitlichen Dimension verfolgt, könnte man daher sicherlich drei Großregionen unterscheiden: 1) die großen Inseln auf dem Kontinentalschelf (Java, Borneo, Japan, Taiwan), die erst in postglazialer Zeit durch Hebung des Meeresspiegels isoliert wurden; 2) Inseln mit kontinentalen Reliktelementen (z. B. Neuseeland, welches einen Kern von alten australischen Elementen vom früheren Gondwanaland erhielt, bevor es in der späten Kreidezeit hiervon getrennt wurde); 3) entlegene vulkanische Inseln und Atolle, deren Fauna nur durch solche Taxa vertreten ist, die zu einer Einwanderung über große Entfernungen befähigt waren, wodurch der relativ hohe Anteil der Avifauna und Insekten und der ge-

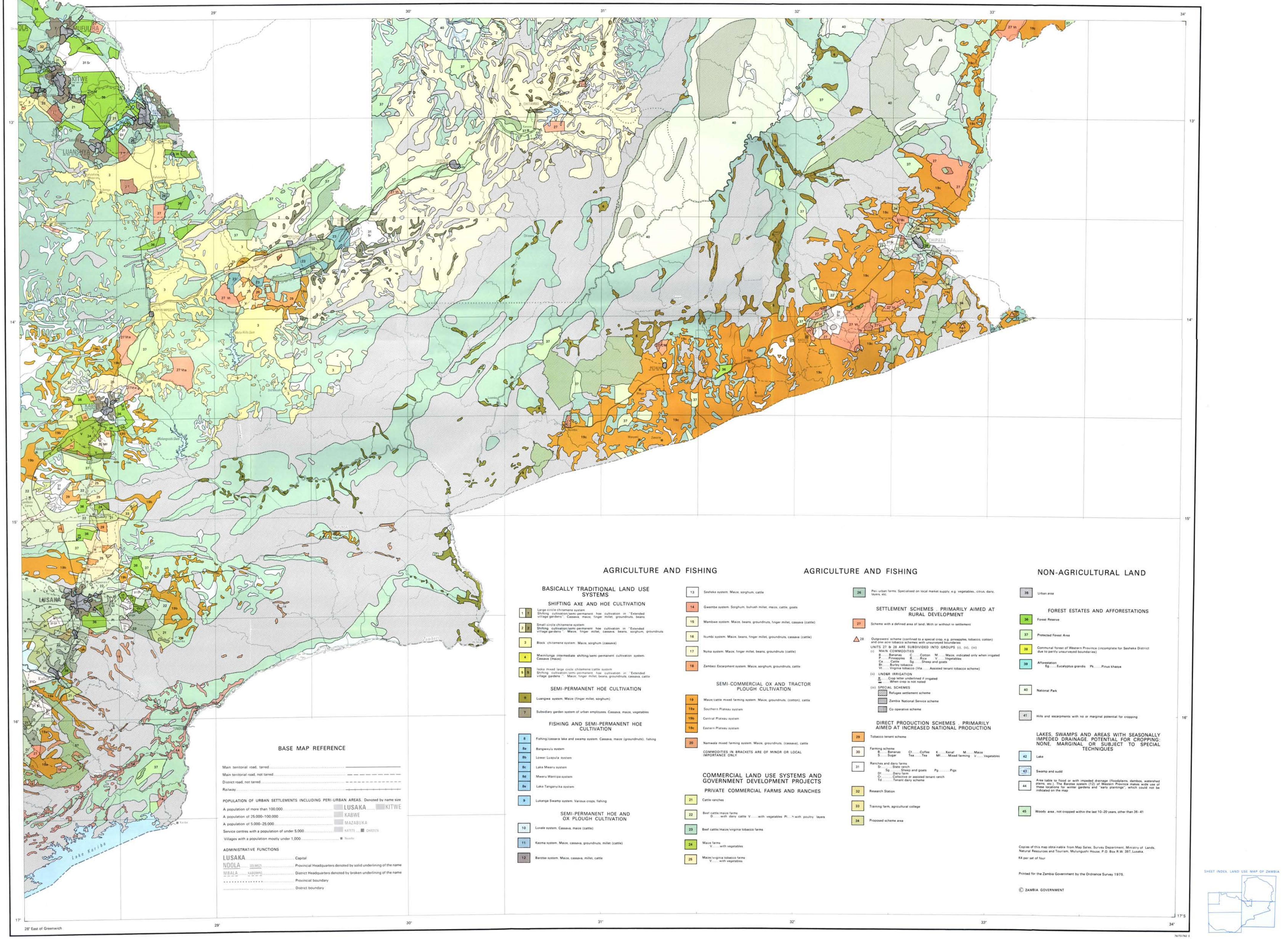
Beilage V zu Erdkunde 30,2 Beitrag Schultz




MONGU
SENANGA
NANGWESHI
KATIMA MULILO
LIVINGSTONE
MAZABUKA
Kafue Flats
Lukanga Swamp
Lake Kariba
22° East of Greenwich
This map was initiated by the Land Use Services Division, Ministry of Rural Development, Lusaka, Zambia.
Ground reconnaissance, aerial photographic interpretation and compilation were carried out by Dr. Jürgen Schultz, University of Munich, Federal Republic of Germany, in co-operation with the Geography Division, University of Zambia. Compilation completed February, 1972.
Acknowledgment is made to the following for assistance in the preparation of this map: Survey Department, Works Department (Roads Branch), Central Statistical Office, Department of Agriculture and the Forestry Department.
Cartography and preparation for colour printing by D. A. & D. Fraser
SHEET INDEX LAND USE MAP OF ZAMBIA



SHEET INDEX, LAND USE MAP OF ZAMBIA


AGRICULTURE AND FISHING
BASICALLY TRADITIONAL LAND USE SYSTEMS
SHIFTING AXE AND HOE CULTIVATION
1 Large circle chitemene system. Shifting cultivation/semi-permanent hoe cultivation in "Extended village gardens". Cassava, maize, finger millet, groundnuts, beans
2 Small circle chitemene system. Shifting cultivation/semi-permanent hoe cultivation in "Extended village gardens". Maize, finger millet, cassava, beans, sorghum, groundnuts
3 Block chitemene system. Maize, sorghum (cassava)
4 Mwinilunga intermediate shifting/semi-permanent cultivation system. Cassava (maize)
5 Isoka mixed large circle chitemene/cattle system. Shifting cultivation/semi-permanent hoe cultivation in "Extended village gardens". Maize, finger millet, beans, groundnuts, cassava, cattle
SEMI-PERMANENT HOE CULTIVATION
6 Luangwa system. Maize (finger millet, sorghum)
7 Subsidiary garden system of urban employees. Cassava, maize, vegetables
FISHING AND SEMI-PERMANENT HOE CULTIVATION
8 Fishing/cassava lake and swamp system. Cassava, maize (groundnuts), fishing
8a Bangweulu system
8b Lower Luapula system
8c Lake Mweru system
8d Mweru Wantipa system
8e Lake Tanganyika system
9 Lukanga Swamp system. Various crops, fishing
SEMI-PERMANENT HOE AND OX PLOUGH CULTIVATION
10 Luvale system. Cassava, maize (cattle)
11 Kaoma system. Maize, cassava, groundnuts, millet (cattle)
12 Barotse system. Maize, cassava, millet, cattle
13 Sesheke system. Maize, sorghum, cattle
14 Gwembe system. Sorghum, bulrush millet, maize, cattle, goats
15 Mambwe system. Maize, beans, groundnuts, finger millet, cassava (cattle)
16 Ikumbi system. Maize, beans, finger millet, groundnuts, cassava (cattle)
17 Nyika system. Maize, finger millet, beans, groundnuts (cattle)
18 Zambezi Escarpment system. Maize, sorghum, groundnuts, cattle
SEMI-COMMERCIAL OX AND TRACTOR PLOUGH CULTIVATION
19 Maize/cattle mixed farming system. Maize, groundnuts, (cotton), cattle
19a Southern Plateau system
19b Central Plateau system
19c Eastern Plateau system
20 Namwala mixed farming system. Maize, groundnuts, (cassava), cattle
COMMODITIES IN BRACKETS ARE OF MINOR OR LOCAL IMPORTANCE ONLY
COMMERCIAL LAND USE SYSTEMS AND GOVERNMENT DEVELOPMENT PROJECTS
PRIVATE COMMERCIAL FARMS AND RANCHES
21 Cattle ranches
22 Beef cattle/maize farms D......with dairy cattle V......with vegetables Pl......with poultry layers
23 Beef cattle/maize/virginia tobacco farms
24 Maize farms V......with vegetables
25 Maize/virginia tobacco farms V......with vegetables
AGRICULTURE AND FISHING
26 Peri-urban farms. Specialised on local market supply, e.g. vegetables, citrus, dairy, layers, etc.
SETTLEMENT SCHEMES . PRIMARILY AIMED AT RURAL DEVELOPMENT
27 Scheme with a defined area of land. With or without re-settlement
28 Outgrowers' scheme (confined to a special crop, e.g. pineapples, tobacco, cotton) and one-acre tobacco schemes with unsurveyed boundaries
UNITS 27 & 28 ARE SUBDIVIDED INTO GROUPS (i), (ii), (iii)
(i) MAIN COMMODITIES
B......Bananas C......Cotton M......Maize, indicated only when irrigated
P......Pineapples R......Rice V......Vegetables
Ca......Cattle Sg......Sheep and goats
Bt......Burley tobacco
Vt......Virginia tobacco (Vta......Assisted tenant tobacco scheme)
(ii) UNDER IRRIGATION
R......Crop letter underlined if irrigated
......When crop is not noted
(iii) SPECIAL SCHEMES
Refugee settlement scheme
Zambia National Service scheme
Co-operative scheme
DIRECT PRODUCTION SCHEMES . PRIMARILY AIMED AT INCREASED NATIONAL PRODUCTION
29 Tobacco tenant scheme
30 Farming scheme B......Bananas Cf......Coffee K......Kenaf M......Maize S......Sugar Tea......Tea Mf......Mixed farming V......Vegetables
31 Ranches and dairy farms Sr......State ranch Sg......Sheep and goats Pg......Pigs Df......Dairy farm Cr......Collective or assisted tenant ranch Td......Tenant dairy scheme
32 Research Station
33 Training farm, agricultural college
34 Proposed scheme area
NON-AGRICULTURAL LAND
35 Urban area
FOREST ESTATES AND AFFORESTATIONS
36 Forest Reserve
37 Protected Forest Area
38 Communal forest of Western Province (incomplete for Sesheke District due to partly unsurveyed boundaries)
39 Afforestation Eg......Eucalyptus grandis Pk......Pinus khasya
40 National Park
41 Hills and escarpments with no or marginal potential for cropping
LAKES, SWAMPS AND AREAS WITH SEASONALLY IMPEDED DRAINAGE. POTENTIAL FOR CROPPING: NONE, MARGINAL OR SUBJECT TO SPECIAL TECHNIQUES
42 Lake
43 Swamp and sudd
44 Area liable to flood or with impeded drainage (floodplains, dambos, watershed plains, etc.). The Barotse system (12) of Western Province makes wide use of these locations for winter gardens and "early plantings", which could not be indicated on the map
45 Woody area, not cropped within the last 10–20 years, other than 36–41
BASE MAP REFERENCE
Main territorial road, tarred
Main territorial road, not tarred
District road, not tarred
Railway
POPULATION OF URBAN SETTLEMENTS INCLUDING PERI-URBAN AREAS. Denoted by name size
A population of more than 100,000 LUSAKA KITWE
A population of 25,000–100,000 KABWE
A population of 5,000–25,000 MAZABUKA
Service centres with a population of under 5,000 KATETE CHADIZA
Villages with a population mostly under 1,000
ADMINISTRATIVE FUNCTIONS
LUSAKA Capital
NDOLA SOLWEZI Provincial Headquarters denoted by solid underlining of the name
MBALA KABOMPO District Headquarters denoted by broken underlining of the name
Provincial boundary
District boundary
Copies of this map obtainable from Map Sales, Survey Department, Ministry of Lands, Natural Resources and Tourism, Mulungushi House, P.O. Box R.W. 397, Lusaka.
K4 per set of four
Printed for the Zambia Government by the Ordnance Survey 1975.
© ZAMBIA GOVERNMENT
SHEET INDEX LAND USE MAP OF ZAMBIA
28° East of Greenwich
LUSAKA
KITWE
KABWE
LUANSHYA
MUFULIRA
CHIPATA
PETAUKE
Lake Kariba