BERICHTE UND KLEINE MITTEILUNGEN

A NOTE ON DEVELOPMENT OF THE KAFUE FLATS IN NORTHERN RHODESIA WITH PARTICULAR REFERENCE TO POLDER METHODS IN AGRICULTURE

with 3 figures and 4 photos

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Zusammenfassung: Die Landschaftsentwicklung der Kafue-Niederung in Nord-Rhodesien.

Die Kafue-Niederungen sind eine 5800 km² große Ebene oberhalb der Kafue Schlucht in Nord Rhodesien. Wie die Barotse-Ebene und die Bangweulu-Sümpfe ist es Grasland auf schweren tonigen Böden; ungleich jenen blieben sie jedoch unbesiedelt bis auf Viehhirten und Fischer, die weiterziehen, wenn die jährliche Flut zurückgeht. 1956 finanzierte eine rhodesische Bergwerksgesellschaft eine kleine Versuchspolderfarm in den Niederungen. Die Erfahrungen, die bisher beim Anbau von Weizen und Baumwolle bei planmäßiger Wasserwirtschaft gewonnen wurden, sollen zur Investierung in einem wirtschaftlich nutzbaren Polder von 115 km² und schließlich zur Ausdehnung der Anlage auf ein Drittel des Gesamtgebietes führen. Der Verfasser besuchte den Polder 1960 und 1961; er berichtet über die bedeutsame Einführung holländischer Methoden in ein Land, dem wirtschaftlich hochwertiges Ackerland fehlt und das als Gegengewicht zur Kupfer-Mono-Ökonomie dringend der landwirtschaftlichen Entwicklung im Sinne der Marktwirtschaft bedarf. Es werden Vergleiche mit Erfahrungen in Gezira im Sudan gezogen und die wahrscheinlichen sozialen Folgen des Unternehmens geprüft.

The Kafue river, a major tributary of the Zambezi, runs for 870 miles through Northern Rhodesia, rising within 20 miles of Elisabethville near the Congo watershed and eventually joining the Gwembe rift valley near Chirundu. Its profile demonstrates the various erosion levels characteristic of the Central African plateau; in particular there is an abrupt fall through the Kafue Gorge from a point about 3,200 feet on the plateau to the middle Zambezi at 1,200 feet, a drop of 2,000 feet in thirty miles. Upstream of this gorge are the Kafue Flats, a plain 150 miles in length along a west/east axis broadening to form a maximum width of 35 miles and occupying over 1.3 million acres (2,030 square miles). The Kafue Basin comprises an area of 54,540 square miles and lies wholly within the territory; it includes the area of most fertile soils, the main white settlement belt and the single railway line linking the Rhodesian Copperbelt with Beira its outlet on the Indian Ocean. In terms of future development in agriculture an experiment of great economic significance has been taking place on a relatively small parcel of land on the southern edge of the Kafue Flats and it is with this, the Kafue Pilot Polder and its geographical setting, that this note will deal.

The Kafue Flats: physical description.

The geomorphology of the territory has been described by several authors (see DIXEY 1942, 1944, 1955 and King 1963), and it is generally supposed that the present landscape derives from superimposition of

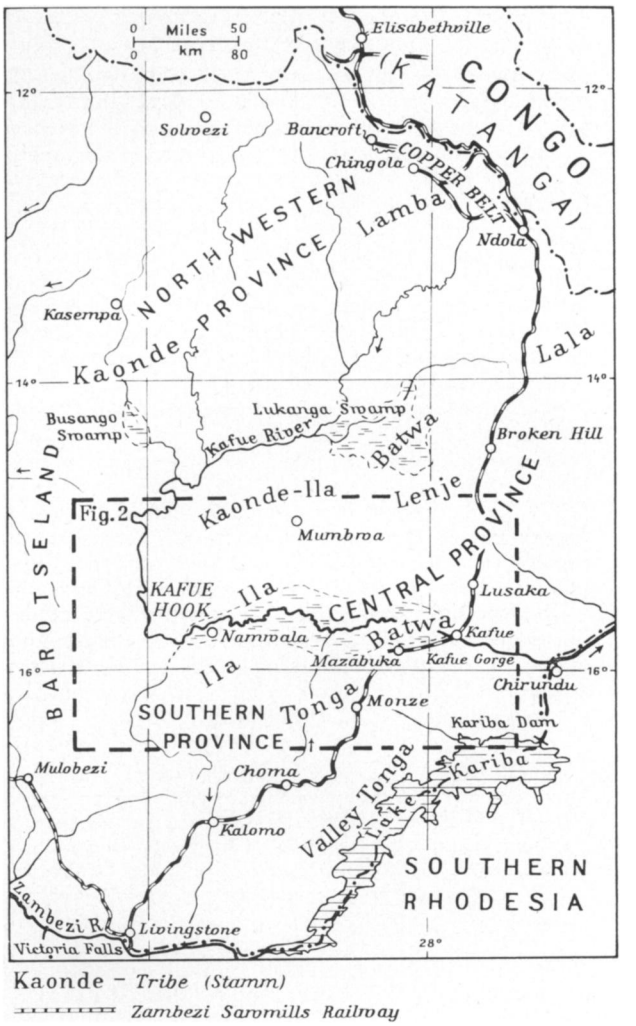

Fig. 1: Key Map

drainage upon the late-Karoo cover which led to the exposure of the more resistant rocks of the Archaean basement (see GUERNSEY 1950). Thus the Kafue encountered obstacles which created local temporary base-levels at the Meshi Teshi gap at the downstream section of the Kafue Hook where the river makes an abrupt change of direction, and again near the modern township of Kafue. A long period of deposition ensued until continental uplift probably caused the spillways to be eroded and in the process the Busango Plains and Kafue Flats were formed from the shallow lake floors. Margalitic clay soils on the Flats have been described as highly siliceous black clays subject to shrinkage and swelling according to season (TRAPNELL & CLOTHIER, 1957); elsewhere younger residual soils have formed on higher ground but these are limited in extent. The clayey soils are base-rich and despite their dark colour

appear to be deficient in organic matter as in nitrogen and, initially, in potassium but they are well suited to irrigation having a wilting point about 4 inches per foot, although drainage poses greater problems.

Climatically the region lies within Thornthwaite's moist sub-humid c_2 belt (HOWE 1953), the rains falling between November and April and yielding 35 inches at Namwala and 30 inches at Mazabuka. Rainfall over the Kafue headquarters rises to more than 50 inches and CHAPLIN (1955) has estimated that there is a much higher positive correlation (0.87) between rainfall in the Kafue Basin and rises in river level than is evident with the Zambezi; this is important in terms of irrigation particularly where polder dykes are constructed in terms of predictable flood levels and duration. Temperatures on the Flats vary between 59° F. (15° C.) and 77° F. (25° C.) at Namwala with absolute extremes of 103° F. (40° C.) and 30° F. (—1° C.), and between 62° F. (17° C.) and 80° F. (27° C.) at Mazabuka with absolute extremes of 101° F. (38° C.) and 40° F. (4° C.). A station on the Flats has been maintained since 1957; here the mean annual temperature varies between 61° F. (17° C.) and 78° F. (26° C.). The hottest month on the Flats is October/November when relative humidity falls to 43 %; the coolest is July. Evaporation records on the Flats suggest a figure of 98.2", i. e. on a par with Chirundu in the low, hot Zambezi valley and the table below illustrates recorded average monthly rainfall and open-pan evaporation taking 0.75 as coefficient; assuming effective rainfall as 50 % of the mean, the net water deficit is c. 61.3" annually.

Month	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.
Rainfall	0.29	3.01	10.24	9.16	8.45	1.96	0.26	—	—	—	—	—
Evaporation x 0.75	10.3	8.3	6.0	5.3	4.2	5.6	5.6	5.3	4.5	5.3	7.1	9.0
Deficit	10.3	6.8	1.4	1.0	0.4	4.6	5.6	5.3	4.5	5.3	7.1	9.0

(data: ROBERTS 1963)

Only in three months does rainfall exceed open-pan evaporation and in every month there is a theoretical deficit.

The soils on the Flats suggest formation in association with shallow creeping floods in the past (TRAPNELL 1957) and COLE (1963) has recently supplemented observations on the vegetation which characterizes them. The whole region is one of extremely shallow gradients and for 350 miles upstream of the Gorge the river is flowing down a gradient of 1 : 2,500 and large parts of the clay plains vary between 1 : 10,000 and 1 : 30,000. In cross-section the vegetation changes from permanently wet grassland along the river banks which carry occasional trees and such grasses as *Vossia cuspidata, Echinochloa* spp etc. to the seasonally flooded areas with taller grasses such as *Hyparrhenia rufa* and tussock grassland with *Setaria* spp. Parts of the Flats are surrounded by parkland vegetation of *Acacia-Combretum* and *Combretum-Afrormosia* associations marking the change to the loamy soils of Trapnell's 'upper valley' group. Beyond these the change to the poorer plateau soils is marked by the *Brachystegia* dry forest.

The hydrology is relatively well understood because of the decision made in 1951 to investigate the siting of a hydro-electricity dam in the Kafue Gorge. The scheme was shelved in favour of the Kariba Dam on the Zambezi but it is likely that a dam will eventually be built in the gorge together with another storage barrage 240 miles upstream at Meshi Teshi. Each year, like the better known Barotse Plain, floods develop as the river reaches its peak discharge. Usually this occurs between February and June, the level of the flood varying at different points on the plain and the peak moving slowly eastward with a two month time-lag between maxima at Namwala and Kafue. There appears to be a 25-year frequency of peak floods but high levels have been recorded in 1948, 1952, 1958 and 1963 in which year it reached an altitude of 3,215 feet, over 14 feet above some parts of the floodplain. For this reason there is no permanent settlement on the Flats and the only feasible scheme to bring them under commercial agriculture appears to be the creation of polders and the storage of water above Meshi Teshi.

Human geography

The human landscape in comparison with the fascinating quality of the Barotse floodplain only 200 miles to the west where an elaborate system of drainage canals was constructed until a white government terminated slave and tribute labour used by the Lozi aristocrats (see GLUCKMAN 1941, HELLEN 1963) in their construction, is at present of small interest. Livingstone visited the Flats and commented on the astonishing number of wild game there. Early travellers and administrators met the Ba-ila people who were cattle herders suffering from the raids of Ndebele and Lozi. They were remarkable for their curious, high headdresses (isusu) with which hunters and warriors kept in contact in tall grassland but they developed no skills comparable with the Lozi in working plains gardens. An early anthropological classic on the Ba-ila appeared in 1920 (SMITH & DALE) but remarkably little attention has since been paid to a group which numbers about 17,000 people at present (1963). Most live on the southern bank of the Kafue in Namwala district and only 4,000 Ila live in Mumbwa district to the north. Their homeland lies in a belt of thinly settled country extending northwards from Livingstone to the Congo border (see WILLIAMS 1962) and they have been menaced by the tsetse fly front which extends from the totally uninhabited Kafue National Park to the west. Traditionally the Flats have been the scene of dry season cattle camps whence large numbers of Tonga stock from the overcrowded reserves of this tribe are moved each dry season between June and December according to the flood.

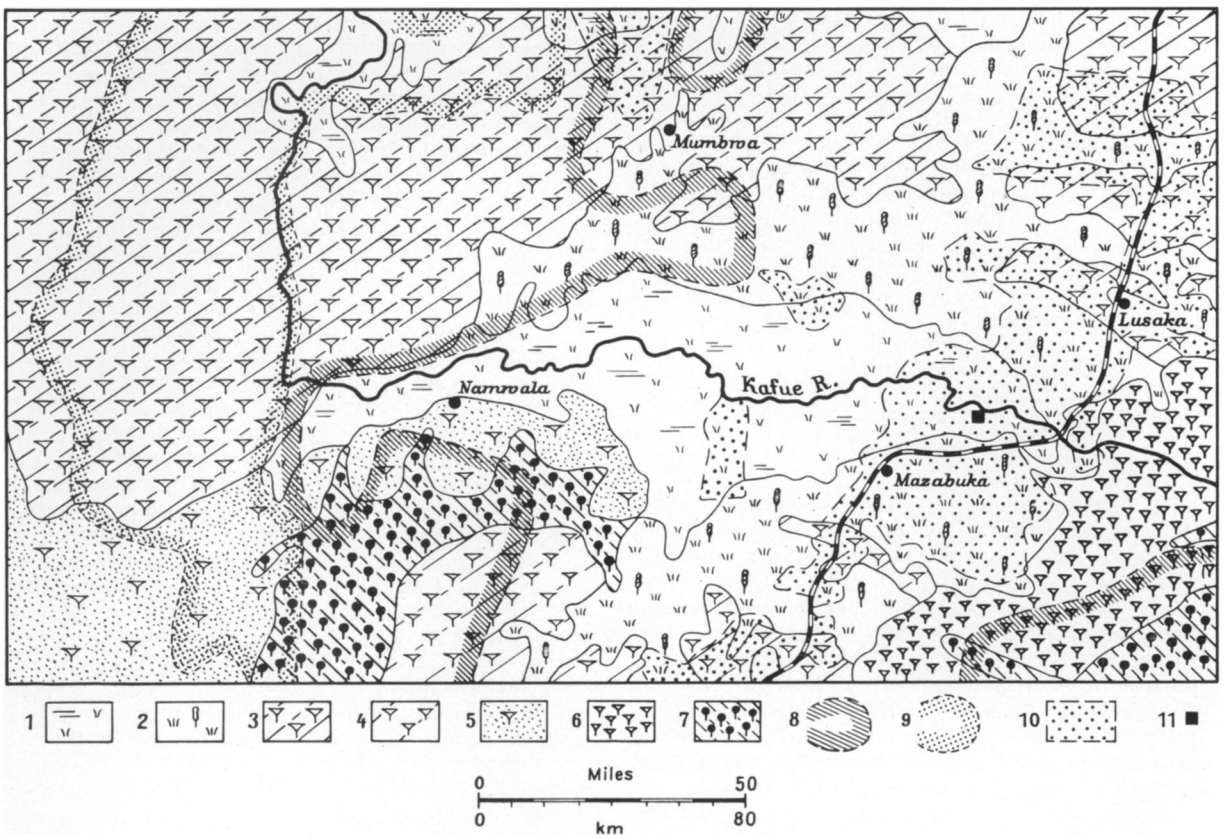

Fig. 2: Soil and Vegetation: (Vegetation-soil data after Trapnell).

1 *Savanna grassland* in permanently and seasonally flooded sites; 2 *Savanna parkland* typically with *Combretum-Afrormosia* and *Acacia-Combretum* associations over upper valley loams; 3. Northern plateau *savanna (miombo) woodland* typically with *Isoberlinia paniculata-Brachystegia* over infertile soils; 4 Southern plateau *savanna (miombo) woodland* typically with *I. globiflora-Brachystegia* over infertile soils; 5 Kalahari Sands transitional *savanna woodland* including *Pterocarpus angolensis, Erythrophloeum africanum* and *Burkea africana;* 6 Escarpment *savanna (miombo) woodland* over stony, infertile hill soils; 7 *Savanna (mupane) woodland* over dark clay soils south of Kafue Flats and lower valley soils along the Zambezi valley; 8 Tsetse fly boundary; 9 Kafue National Park; 10. Crown land; 11 Kafue Pilot Polder.

Here these herds mix with those of the Ila; some are managed by the Twa, another small local tribe and Colson (1951) has noted that the Tonga usually receive permission from the residents to build their own camps on the Flats with men from Tongaland taking turns to work there for short periods. It is interesting to note that under customary law the cattle are permitted to move freely from Tonga villages across intervening tribal land and, because there is no limitation in the grazing area for each individual owner, stock densities are extremely high and quality low. The Ila villages are usually on the margin between flood limit and bush; in 1950 it was estimated that local herds on the Flats had been reduced from 80,000 to 40,000 in 20 years by bovine trypanosomiasis but the errection of a game fence has swung the migrating herds of bovidae north and west to the Game Park.

The Kafue river and its lagoons are the scene of a diffuse but valuable (c. £ 1 mill. annually) fishery carried on from seasonal fish camps by gill and seine netters selling on the Copperbelt and other markets. Despite the reduction of game by annual hunts, recently prohibited, it is hoped to make the estimated 23,000 red lechwe antelope (*Onotragus leche*) the basis of a game farming industry. Apart from these activities a single European farm (the Lochinvar cattle ranch) of 101,000 acres marks the only major interest in commercial exploitation west of Mazabuka; the region is in short an area whose potential has largely yet to be tapped.

Economic Development Schemes

In 1953 Foster wrote a short paper on the potential utilization of the Flats in which he noted that "*irrigation could be provided by pumping from the river and some of the lagoons; large irrigation works would, of course, be necessary, but not of a magnitude out of reason with the area and its potentialities*". He suggested that by these methods rice and sugar cane cropping might be combined with stock raising, the poor grazing being supplemented by the introduction of Rhodes grass (*Chloris gayana*), molasses grass (*Melinis minutiflora*) or even American species like

carpet grass (*Axonopus compressus*) or Dallis grass (*Paspalum dilatatum*).

Fortunately one of the great Rhodesian mining companies (Rhodesian Selection Trust) had interested itself in agricultural development as a counter-balance to the remarkable dependence of Northern Rhodesia on copper exports[1]). It commissioned a Dutch firm in 1955 to undertake a survey on the possibility of large-scale irrigation on the Flats and in 1956, after consultation with the Government, the Kafue Pilot Polder was set up. Seven hundred acres were selected at a site near Mazabuka and two 150 acre farms were set up within the dykes. The polder was given to the nation in 1960 but the mining company continued to have financial responsibility for it until 1963, by which time £ 0.5 million had been invested.

The pilot polder 1956—1963

The argument which lay behind the financing of the polder was that in the Rhodesian Federation[2]) there is a serious lack of balance between mineral and agricultural production and in Northern Rhodesia two million Africans remain tied to a subsistence economy from which cash production valued at no more than £ 2.9 million (1962) emerges; secondly that if a hydro-electric scheme were to be built at Kafue, this would necessarily be integrated with flood control higher upstream and thus with any irrigation scheme on the Flats; thirdly that there is a great need to raise existing living standards among the rural population but this cannot be achieved by a mining industry which employs only 40,000 workers. Commercial farming alone suggested itself and as PRAIN (1958) has pointed out, the country is fortunate in possessing physical conditions on the Kafue similar to those on the Nile even if no comparable civilization has developed on its banks. Several factors determine the choice of the region for intensive development; its altitude is healthy, it is compact and easily accessible, and the Flats lend themselves to irrigation.

[1]) This fact is illustrated by the remarkable concentration of population on the Copperbelt; the seven urban districts there comprise 2,995 square miles but in 1963 housed 439,300 of the estimated 3.4 million Africans in a country of 290,586 square miles. Copper exports in 1962 were worth £ 111.5 million out of total merchandise exports from the entire Federation of Rhodesia and Nyasaland of £ 209.5 million. Agricultural production in N. R. was estimated to be worth only £ 25.6 million in 1962 and this included African subsistence production valued at £ 16.1 million; approximately 1,200 European farms accounted for cash sales of £ 6.6 million, more than double that of 400,000 African farming families.

[2]) The Federation of Rhodesia and Nyasaland was formed in 1953 and broken up in December, 1963; geographical aspects of this "experiment in multi-racialism" are discussed by the writer in „Das Schicksal der Zentralafrikanischen Föderation" in *Außenpolitik*, Zeitschrift für Internationale Fragen, July 1962 and „In die Rolle Nordrhodesiens in der Zentralafrikanischen Föderation" in *Afrika* (Bonn), March 1962. The lack of balance is likely to be aggravated in the early years of an independent *Zambia*, as Northern Rhodesia will become; much of industrial expansion under Federation has occured in Southern Rhodesia and there is at present world overproduction in copper.

Within the experimental polder are two large farms managed by Europeans and cultivated by a staff of 38 persons whose duties have been to collect and collate statistical data on the various crops which have been tried. The results of sprinkler and surface irrigation within the polder have been compared as have the physical reactions of heavy clay soils to prolonged watering and mechanical tilling.

Seven African families were established on smaller plots varying between 11 and 25 acres to observe their reaction to the new system of irrigation and summer and winter cropping — techniques generally unknown in the country. Despite the complete inundation of the pilot polder in 1963, sufficient data had been collected by that time to plan for the extension of irrigated farming to a commercial-sized polder. Wheat was found to be yielding 3,000 lbs an acre on mechanized farms and up to 2,500 lbs under African hoe cultivation. On this yield 100,000 acres of the Flats could produce the entire estimated requirement of the Federal area up to 1980 — current wheat imports are £2.6 million worth annually and only 1,890 tons of the 118,390 tons consumed in 1961 were locally grown. Experience shows that increasing African prosperity leads to a greatly increased consumption of wheaten products; African bakers and teashops are a familiar feature of this 'luxury' trade in the reserves and townships. Other yields have proved equally encouraging: examples are those of maize (3,600 lb), seed cotton (4,000 lb), paddy rice (5,000 lb), sunflower seed (5,000 lb), shelled groundnuts (1,800 lb) and potatoes (13 tons) per acre. In addition the water-grass areas have supported beef and dairy herds, the canal banks sheep, and the irrigation reservoirs fish.

The irrigation system on which the enterprise largely centres had had necessarily to proceed on an empirical basis. The Dutch consultants assumed that rice and water-meadow grasses, tolerant of stagnant water conditions, would permit a relatively slow water dispersal rate assuming a rainfall of 1 inch per day on large polders during the rainy season but it is probable that the optimum drainage rate will have to be twice as fast. Pumps which have fed the sprinklers from the irrigation canals have proved to be relatively expensive and it is probable that because the soils are relatively impervious to water and very little is lost by surface transmission under a basin system of irrigation that this method could be cheaply extended to areas shallower than 1 : 1,000 where furrows would be ineffective.

The projected major polder

In 1962 a firm of consulting engineers was instructed to make a study of the possibility of creating a commercial polder; their report appeared in 1963 and became known as the Roberts Report. It assumes that

Photo 1—4: (1) Aerial view of part of the Kafue Flats; pilot polder in foreground and Kafue River, with occasional palms, beyond. (2) The polder at height of 1962 flood. (3) Furrow-irrigated field of wheat with administrative settlement situated on higher ground beyond. (4) Peasant farmers' stilt houses designed to provide storage space beneath and to withstand complete inundation as in 1963.

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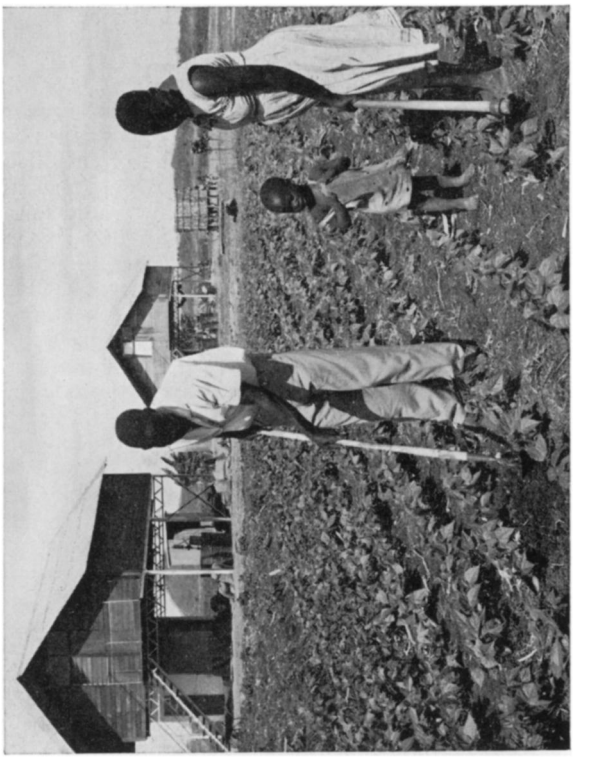

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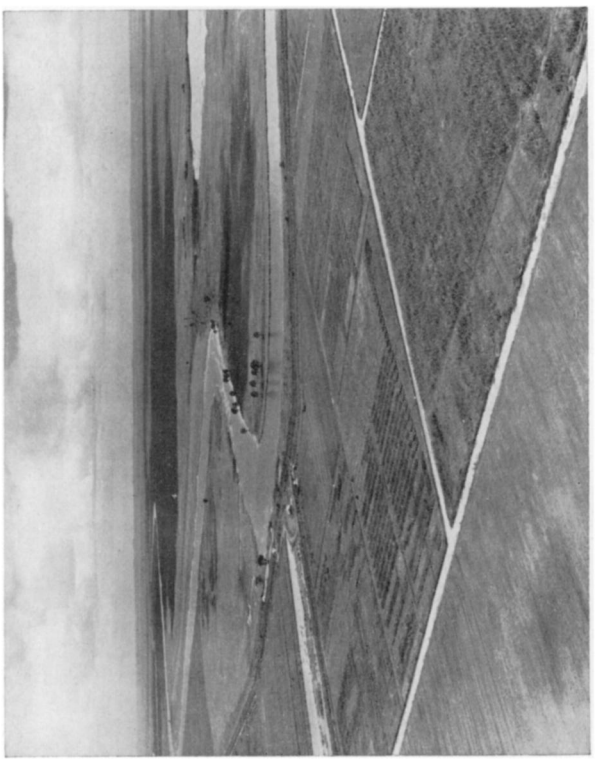

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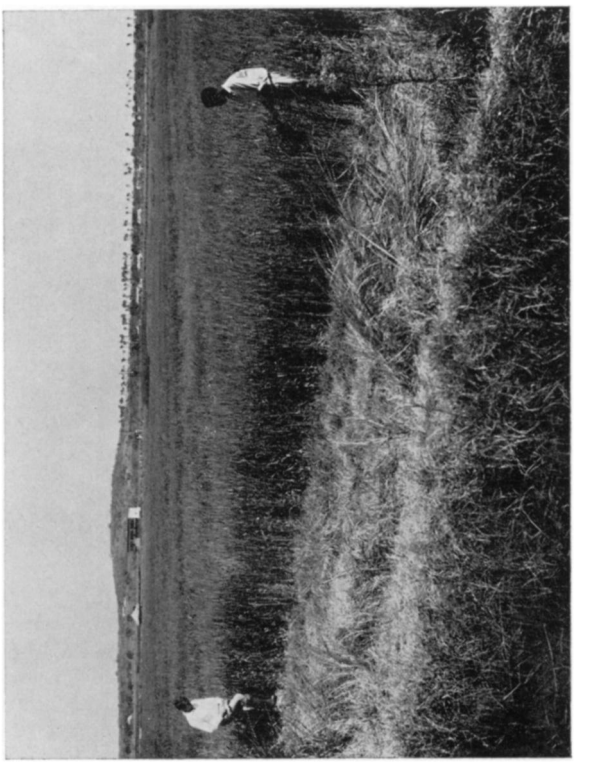

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a commercial-sized polder of 28,000 acres (44 square miles) would be established on the selected site and that 20,500 acres of clay soils would be divided up by seven main canals and by further cross canals into blocks of 135 acres each. The remaining 8,000 acres would be divided between the township area on slightly elevated colluvial soils and the pondage zone. Roads would follow the main canals and four villages situated centrally on the main canals would serve the 31 hamlets spaced along them. Holdings would consist of basic units of 6 acres made up of 300 six acre blocks, 1,050 twelve acre and 200 eighteen acre blocks in the main areas together with 100 twenty acre blocks in the pondage area in the south east corner of the polder. In all such a polder would support 14,000 people and require an investment of about £4.6 million yielding an estimated gross annual product of £1.44 million. Eventually this polder might become one of a series covering 450,000 acres with room for 20,000 African and 3,000 'European-type' farms and a combined production of £30 million annually. The construction of the first polder would involve the excavation of an estimated 3.6 million cubic yards of earth for dykes and a further 2.9 million for canals; 92 miles of access and service roads would have to be constructed. A township, villages and hamlets would have to be provided as would pumps and drainage equipment supported by electricity power lines. This would cost an estimated £3.5 million of the initial investment. If a statutory board were set up to manage the polder a further £1.1 million would be needed to provide farm services and short-term loans to Africans who would probably lack working capital. A further recurrent expenditure of £246,000 annually for loan redemption, interest, pumping charges and administration would occur.

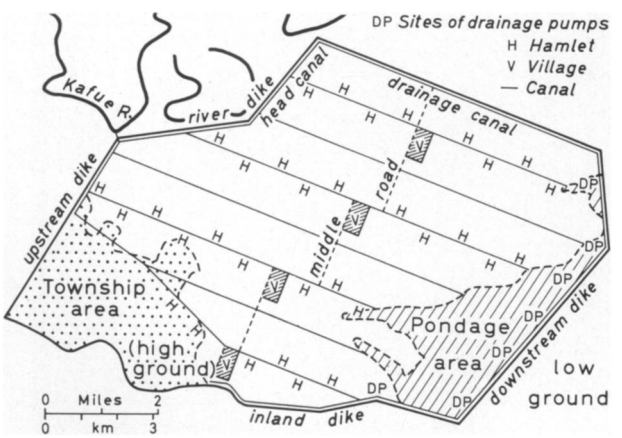

Fig. 3: The major polder (after Roberts, 1963).

Initially the polder could be constructed without the need for a barrage at Meshi Teshi for even if the outflow were reduced by 50 % in the critical months by impounding the Kafue upstream of the Flats it is estimated that this would only lower the waters by three feet on the plains. As already noted, a number of crops have given encouraging results on the pilot polder and gross profits per acre in terms of the value of African labour were £59 for potatoes, £34 for cotton, £20 for groundnuts and £19 for maize. Three principal rotations are suggested, in each of which cotton is the main (summer) crop. The labour requirement would vary considerably according to season. In May-June when the cotton would be picked, up to 12,000 workers might be needed where the polder was carrying a 50 % cotton, 50 % groundnut crop, whereas in July only 500 workers would be needed for the 20,000 acres. Estimates suggest that the tenants might expect an income of £112 annually from each 6 acre plot on clay soils and £ 150 from 20 acre wheat plots in the pondage area. These figures compare extremely well with existing returns for the 2,974 peasant and 2,383 improved farmers established under a Government scheme between 1948 and 1962 throughout the eight provinces of Northern Rhodesia. The capital investment per head would be over £300 compared with an average loan of £67 to existing peasant farmers in Mumbwa district near the Flats, at the lower end of a territorial breakdown which varied from £21 to £214 in 1959. On the Flats there is the clear advantage of a highly centralised and rationalised organisation if the plan is brought into operation, which would provide the services of an agrotown as well as schools, medical and other social services and the prospects of a far higher return on capital by large scale cropping, transport and marketing.

The economic and social consequences of the projected polder

There is an obvious comparison between the projected Kafue scheme and that at Gezira in the Sudan. Gezira lies to the east of the Nuba mountains on the central clay plains within a broadly similar climatic zone which is, however, far larger than the Rhodesian counterpart and displays a far wider range of rainfall. The soils are of lacustrine origin and like those on the Kafue Flats are clayey, contain gypsum and are highly alkaline (Tothill 1947). Similarly the marshy soils carry species of *Echinochloa* and *Hyparrhenia* grasses and the *Acacia* tree is common. The Sudanese flats vary in slope between 1 : 5,000 and 1 : 10,000 and the proposal to irrigate them was first made in 1904 although the Gezira scheme was not inaugurated until 1925. BARBOUR (1961) has traced the development of the scheme as more land has been brought under irrigation, first by a private company, the Sudan Plantations Syndicate, and since 1950, by the Sudan government (see also GAITSKELL 1959). Because the siting of hamlets along the main canals proved successful in the Sudan, the 'grid-iron' pattern may be repeated at Kafue as will the system of basin irrigation. The project will probably be in the hands of the government from the start and it is suggested that operations will be supervised by a statutory board; significantly the Gezira scheme has not become a co-operative because experience has shown that with high investment consistent profits must be made and these have not resulted from 'democratic' control in many colonial projects. BARBOUR (1959) has noted that "*the participation of private capital in irrigation*

schemes in the country is accepted as a normal arrangement, and tradition lays down the share of the crop appropriate to those who have contributed to produce it". In this case the person providing land and water received 60 % of the crop and the Sudan Government made a similar arrangement for tenants. Although the rendering of tribute labour or materials has long since been prohibited by the British, the middle Zambezi Bantu who only 'own' land in the sense of having usufructuary rights over it might quickly adapt to share cropping; in European farming areas the Nyasa tungati form of share cropping in return for land, particular in the Eastern Province, is well known.

At Gezira only 2.5 %, or slightly over 1.3 million acres, of the available plains has so far been brought under irrigation whereas if 450,000 acres were enpoldered on the Kafue Flats and 300,000 people settled there the landscape of over a third of the region would be transformed. Although the Namwala district (8,398 square miles) and Mumbwa district (8,148 square miles) comprised a de facto population of 33,000 and 54,000 persons respectively in 1963 and hence a combined density of 5.3 persons per square mile, there already exist congested areas just to the south and east along the railway-line and in particular the Plateau Tonga tribal reserves of Mazabuka and Choma district. Here de facto densities of 36.7 and 33.9 persons respectively per square mile are the highest district totals in Northern Rhodesia and locally, as is the case in the Ngoni reserves in the east and in the Luapula-Bangweulu region in the north, densities already reach 200 to 300 per square mile. Such densities have led to rapid destruction of the soil by erosion and impoverishment by over-cropping whereas on the Kafue Flats is would appear that densities of 400 per square mile could be maintained in perpetuity. Although, as noted, the total population of Northern Rhodesia is only 3.5 million including Europeans, only 5.6 % of the land is classified as of high potential and nearly 60 % as very poor on account of infertile plateau soils. Despite the fact that only 7,577 square miles are alienated crown land and 271,369 square miles are set aside as native reserve and native trust land, land hunger in certain reserves has become grave and resettlement schemes have become necessary since the 1940's; often these have been undertaken at great cost because of the need for tsetse fly clearance, provision of water supplies etc. and have proved only a temporary expedient. Irrigation and drainage on such soils as those of the Kafue Flats, the Barotse plain and parts of the Bangweulu swamps near the Lunga bank could be of great significance for future rural economic development which is essential to combat a distinct population explosion. A similarly urgent programme of land reclamation in Egypt has been described by HETZEL (1959); here in the delta of the Nile and parts of the western desert the problems of excessively high rural population/land pressures coupled with low productivity and the need to import foodstuffs have obliged the government to invest up to £E.800 per hectare in irrigation schemes and to pay more attention to balance between industrial and agricultural development of the national economy. This has its lessons for a nationalist Zambian government which will be faced with the need to offer reasonably high cash incomes or incentives to remote cultivating areas and to expand industry. Without artificial fertilizers the majority of areas reach a ceiling in carrying capacity of between 2 and 20 persons per square mile of land under normal shifting cultivation and ash fertilization of *Brachystegia* bushland. The grasslands undoubtedly offer the best and cheapest possibility of more intensive agriculture and resettlement.

Whether a mixed population could be created from several tribes — Northern Rhodesia numbers over 70 such groups — is open to doubt, for as BARBOUR (1961) has noted of Gezira "*from the begining villages tended to be inhabited by persons from the same tribe or region*". Initially resettlement could take place from the adjacent Tonga country but strains would inevitably arise if overspill population from such areas as Ngoniland, Bembaland or elsewhere was to be settled as part of commercialisation of the Kafue Flats. Similarly within the existing polder project difficulties may arise in many aspects of native custom because of the need for new concepts of land tenure, agricultural methods, individual as against communal initiative etc. The flow of migrant labour as far south as Capetown might be arrested if cotton picking or sugar harvesting provided sufficient work and incentive to attract unskilled Africans particularly from the Barotse and North Western provinces to the west and north of the Flats. At present the Witwatersrand Native Labour Association recruits up to 5,500 mine labourers in these provinces each year and in both under one quarter of males in wage employment can find work locally in them and are forced to leave their villages for long periods. By contrast with Barotseland where 33 % of employed males were working outside Northern Rhodesia in 1961 and in the North Western Province where 21 % were so absent, the Central and Southern Provinces which flank the Flats, provided employment locally within the provincial boundaries for 50 % and 62 % respectively of males in employment. Circumstances might prove similar to those noted by RICHARDS (1952) in Uganda where Ruanda (chiefly Hutu) migrant labourers have come to outnumber their Ganda hosts; what has been described as a 'black settler' problem has already arisen in Northern Rhodesia in cases where Southern Rhodesian Africans have moved in to the Southern, Central and Eastern Provinces to take part in peasant farming schemes sponsored by the Government. The unfavourable ratio of crown to reserve land in Southern Rhodesia — about 55 : 45 — and the superior agricultural and business ability of these farmers have given these immigrants the incentive to outstrip their hosts and in Broken Hill (Rural) district alone there are already an estimated 9,000 non-Lenje Africans in the Lenje tribal area. Underlying tribal rivalry has already led to a demand in the Ngoni and Chewa areas in the east for the eviction of successful Southern Rhodesian farmers.

It is certain that migrant labour has led to the disruption of tribal society and thus to a geographical unbalance where the reserves have been treated mainly as labour pools and African village and agricultural

life has collapsed with the removal of large numbers of adult males. A scheme such as that on the Kafue Flats could re-orientate rural society but it will require expert social handling if it is not to bring numerous secondary problems in its train. Fortunately the area lies in the heart of the Kafue Basin which is planned as the economic heartland of a developing Northern Rhodesia — the Copperbelt region based almost entirely on a mono-economy is part of a larger Katangan/Rhodesian frontier region — and the demands for food and other produce seems assured. A future annual output of £30 million seems feasible in relation to conservative crop estimates and the good transport and power facilities available. Currently the United Nations Organisation is conducting a survey into the potential of the entire Kafue Basin; ten years after Foster's observation on the high potential of the area it seems likely that the neglected Kafue Flats will soon surpass most other areas of the territory in agricultural importance.

Acknowledgement

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