wohl dieser Teil des Taff-Tals noch innerhalb der geologischen Grenzen des Kohlenreviers liegt, gehört er wegen seiner Sonderstellung zum südlich anschließenden Wirtschaftsbereich des Vale of Glamorgan, in dem die neueingeführte Fertigwarenindustrie neben der schon vorhandenen Schwerindustrie ihren optimalen Standort im östlichen Südwales fand. So tritt die Polarität zwischen dem jungen, dynamischen Industriegebiet an der Küste und dem alten seiner Existenzgrundlage weitgehend beraubten Bergbaurevier im Norden gerade im Einflußbereich des Treforest Industrial Estate deutlich zutage.

Literatur

Advance. Industrial Estates Management Corporation for Wales (Hrsg.) Cheltenham and London, ca. 1960.
Adventure. Welsh Industrial Estates Corporation (Hrsg.) Cheltenham und London, o. J. (1967).
Census 1961. England and Wales, County Report, Glamorgan. – H.M.S.O. 1963.
Corbin, E. G. (Hrsg.): Guide to the Coalfields 1965. – Colliery Guardian, London, o. J.
Dahlke, J.: Das Bergbaurevier am Taff und seinen rechten Nebenflüssen. – Tübingen, 1964.
Griffiths, I. L.: The Daily Movement to Work of Anthracite Miners in South Wales. – T.E.S.G. 1962, S. 184–190.
Koppelmann, O.: Das östliche Südwales. – Geogr. Rundschau, Bd. 8, 1956, S. 385–392.
Lewis, E. D.: The Rhondda Valleys: a study in industrial development, 1800 to the present day. – London 1959.
Manners, G. (Hrsg.): South Wales in the Sixties. – Oxford, 1964.
Pringle, J., George, T. N.: South Wales. – H.M.S.O., 2. Aufl., London, 1948.
Report of the Royal Commission on Merthyr Tydfil. – London, H.M.S.O., 1935.
Sölch, J.: Die Landschaften der Britischen Inseln, Bd. 1: England und Wales. – Wien, 1951.
Thomas, B.: The Welsh Economy. Studies in Expansion. – Cardiff, 1962.
Thomas, G. M.: Land of Mines and Quarries. – Geogr. Rev., Bd. 46, 1956, S. 59–81.
Ders.: The Mineral Wealth of Wales and its Exploitation. – Edinburgh, 1961.
Uhlig, H.: Wandlungen der industriellen Standortbildung und des Kohlenbergbaus in Großbritannien. – Erdkunde, Bd. VI, 1952, S. 270–277.
Valleys of Decision. – Economist, 30. Okt. 1965, S. 505.
Wales – Land of Opportunity. – Development Corporation for Wales (Hrsg.), Cardiff, 1960.
Außerdem wurde unveröffentlichtes Material von folgenden Behörden und Verbänden herangezogen:
Board of Trade, Office for Wales, Gabalfa, Cardiff.
Development Corporation for Wales, Cardiff.
Glamorgan County Council, County Council Offices, Cardiff.
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TOBACCO PRODUCTION IN THE EASTERN-PROVINCE OF ZAMBIA

With 6 figures, 8 photos and 3 tables

G. Whittington

Zusammenfassung: Tabakanbau im östlichen Zambia.

Im Gebiet um Fort Jameson, im Osten Zambias gelegen und von Europäern besiedelt, wurde nach 1910 in Heißluft getrockneter (flue-cured) Virginia-Tabak wichtigstes Handelsgewächs (cash crop). Von 1910–1928 stieg die Produktion bis 1,35 Mill. kg an; von 1929–1937 fielen die Preise, und viele Plantagen wurden aufgegeben und verödeten. Von 1938–1946 bewirkte der Krieg eine Produktionssteigerung: die Ernte betrug 0,9 Mill. kg pro Jahr. Von 1947–1953 herrschten günstige Konjunkturbedingungen; neue Siedler legten neue Plantagen an, und die Produktion erhöhte sich auf 2 Mill. kg. Seit 1953 werden die Plantagen wieder verlassen. Da die europäischen Siedler aus diesem Gebiet emigrierten, kam die Produktion von Virginia-Tabak fast völlig zum Erliegen. Dieser Zusammenbruch ergab sich aus den Absatz- und Transportschwierigkeiten und der unzulänglichen Bewirtschaftung. Das von den Europäern verlassene Land (genannt Crown Land) wird jetzt für die afrikanische Feldbestellung aufbereitet. Interessant dabei ist, daß in einem der Gebiete versucht wird, Einzelfarmen (system of individual tenure) anzulegen.

> "Tobacco should, in time, come to be a feature of the country"
> (Gouldsbury and Sheane, 1911)

The southeastwards thrust of Katanga towards the northern border of Moçambique virtually divides Zambia into two wings, shaping the territory like a butterfly. In the early colonial period the position of its two wings led to their having a different settlement history and for a time a different administration. The western wing was colonised by whites from the south whereas the eastern wing received its earliest settlers from the east as a result of white influence advancing inland from the Indian Ocean via Lake Malawi.

The first white settlement in the eastern wing took

place around Fort Jameson which had come into being in 1899 as a military strongpoint similar to those of Fort Manning, Fort Hill and Fort Johnston in the then territory of Nyasaland. The existence of a centre of authority and military power led to white settlement and a small development of farms took place. Cattle raising and trading provided the main occupations and links were with the Southern Rhodesian markets rather than those of North Western Rhodesia. The outbreak of cattle diseases however proved a setback to the farmers for their cattle were barred from the Southern Rhodesian markets. Some farmers became professional hunters while others attempted to replace cattle rearing by cotton growing but this too was foiled by disease.

The search for a staple crop ended with the planting of tobacco. That this crop should succeed was no surprise. Many of the native tribes grew it, both for local consumption and for trade with east coast merchants, the crop grown by the Asenga having a fine reputation. The crop had been grown by white settlers since 1900 but it took another ten years before it became the farmers' mainstay. Since that time it has, in its different varieties, been intimately linked with the fortunes of the white settlers of the Eastern Province and with attempts to raise the living standards of the African farmer.

The Production of Flue-cured Virginia Tobacco

Figure 1 shows the production of flue-cured Virginia tobacco in the Eastern Province of Zambia from 1925 to 1960. It reveals that this crop has suffered mixed fortunes during this period, there being wide fluctuations in the amount produced. It will be easiest to examine these fluctuations by dividing the period into its separate parts.

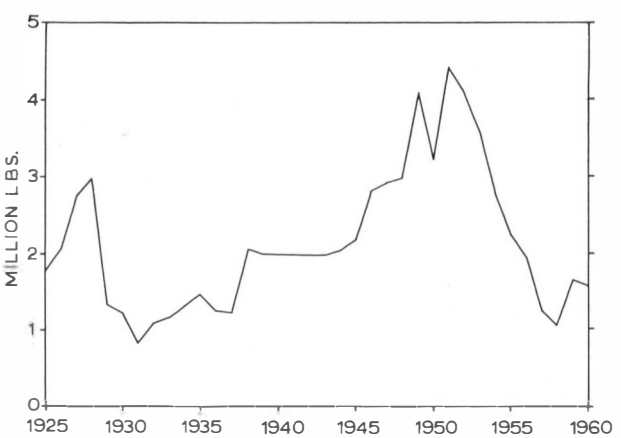


Fig. 1: The production of flue-cured Virginia tobacco in the Crown Lands of Eastern Zambia, 1925–60. Note that the figures for the period 1939 to 1944 are an estimate only of the actual amounts produced.

The first period runs from the time of the widespread acceptance of the crop until 1928. From 1911 onwards the land granted around Fort Jameson to white settlers increased only slowly until after the end of the first world war. Then a large influx of settlers led to a great increase in the acreage of freehold farms, upon which tobacco became the major crop. The figures for land under tobacco and the amount of tobacco produced are not recorded until nearly midway through the nineteen twenties. By the season 1923–24 there were 3462 acres in the Fort Jameson area under tobacco. Each season until 1928 saw a steady expansion in this acreage – 4323 acres in 1924–25, 4939 in 1925–26, 6719 in 1926–27 and 7339 in 1927–28. The tobacco produced, a flue-cured Virginia in variety, also increased in amount, the 1928 crop yielding 2,983,683 lbs. This success was largely due to two factors – the regranting of Imperial Preference and the continuous introduction of virgin land to tobacco planting. This record production of 1928, not to be equalled again until 1948, was matched by a crop of unparalleled size in Southern Rhodesia with a result that the market was glutted. Thus 1928 marked the end of the first period in tobacco production in the Eastern Province.

The second period runs from 1928–29 until 1936–37. This was a time of despair and abandoned and derelict farms. Only fifty planters continued, less than half the peak total, and all the buyers left the area, being able to secure their supplies more conveniently in the railway line zone of Southern Rhodesia. Thus the acreage under tobacco fell from its peak in 1927–28 of 7339 acres to 2954 acres in 1928–29 and to its lowest of 2336 acres in 1932–33. At no time during this second period did the total rise above 3500 acres. It is the acreage figures and even more important the prices achieved for the tobacco which reveal the depressed nature of agriculture in this period. Production figures were not very low. Despite a very low one in 1930–31, on an average, production figures were over the one million pounds mark. The failure of the farmers was due to the poor price they achieved for the majority of their crop. The farmers were aided in 1931 by the agreement of a quota with the South African Government which allowed 350,000 lbs of tobacco into the Union. The best of the leaf was taken and the remnant was either sold at prices (4 or 5 pence per lb) which were less than production cost or burned by the farmers to make way for the next season's crop. This second period is best described as a period of decline and one which saw a fumbling for markets, steady prices and a production policy.

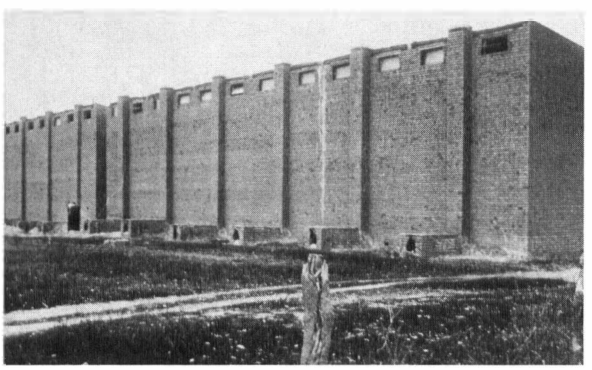
The third period runs from 1937–38 until 1946–47. This, virtually the period of the war, is one for which production figures are not entirely known. From 1938–39 until 1942–43 about two

million pounds of tobacco were produced each year but the exact figure is not recorded. This was a period which helped the tobacco farmers to consolidate their position and which also saw the introduction of compulsory auctions and a free market in the Eastern Province. Despite the shortage of manpower, which held down the volume of production, this was a steady period in the industry's history. Prices under the stimulation of wartime conditions were good. In 1942 75,000 acres in the Nsadzu-Mpangwe area (in the Katete Block) were earmarked for further white settlement and thus an extension of the cash crop production of the Eastern Province.

The next period discernable runs from 1947–48 until 1952–53. The first years after the end of the second world war saw, for a variety of socio-economic reasons, a great influx of white settlers into Southern Africa. The Eastern Province shared in this influx. The Crown Lands had been increased in acreage, large estates were subdivided, new farm houses were built and land that had never before known the plough was put into cultivation. The shortage of dollar currency gave a great stimulus to tobacco production in the sterling area of Southern Africa. Thus the Crown Lands near Fort Jameson became a boom area, epitomised by the large number of new tobacco curing barns that were built (Photo 1). The production of tobacco from the Eastern Province increased from the two million pounds totals of the war years to figures that fluctuated between three and four million pounds until 1952–53.

As in the season 1927–28, the next period saw calamity once more overtake the white farmers. Slowly it became obvious that the flue-cured Virginia tobacco industry of the Eastern Province was doomed. Production totals, prices achieved and the acreage under tobacco all fell. From a total of nearly four million pounds in 1952–53, the production fell to one and a half million pounds in 1959–60 [1]). From

[1]) This is the last season for which tobacco production figures from the Eastern Province are available. From that time all production figures were grouped with those from Nyasaland (Malawi).



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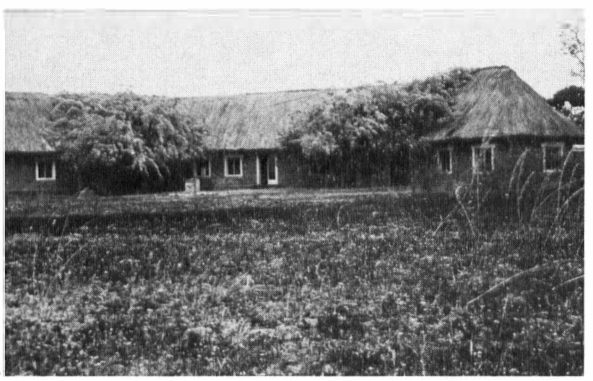

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Photo 1: Barns for the curing of Virginia tobacco. These are on an abandoned farm in the Katete Block and are only one example among many that can be seen. They are now entirely useless and worthless in the new economy being developed in the Crown Lands.

Photo 2: A farmhouse in the Katete Block deserted in 1963. This house remains intact unlike many others which have been denuded of useful building material or destroyed when their thatched roofs burned in the dry season fires.

Photo 3: Burley tobacco, seen here on a demonstration farm which forms part of the programme to advance African farming.

Photo 4: A barn for the curing of Burley tobacco. A simple construction but often so badly built that the leaf produced is of a poor quality.

a total of 385 white tobacco growers in the Crown Lands in 1948, there were only 96 left in 1955, 33 in 1958 and 4 in 1964. Thus the overall decline was far more serious in this last period than that which occurred in 1928. After that year there was a slow recovery but this will not occur again. The farms, held on a 999 years lease, were abandoned and became derelict while the farmhouses were often burned down in dry season fires (Photo 2). The farmers moved out of the Province, leaving their lands to African tenant farmers or to revert to woodland. The fate of the white farmers and the future of the lands will be discussed later.

The collapse of the white farming community and the end of production of flue-cured Virginia tobacco did not mean that the tobacco industry of the Eastern Province was dead. As was pointed out above, tobacco growing had long held an important place among some of the African cultivators. From 1939 onwards their agricultural advisers had tried to get them to produce air-cured tobacco for the European market. This was done in an attempt to raise rural living standards by introducing a cash crop while not interfering with the production of enough food crops for self sufficiency. Such a development was very important where, as in most of the Eastern Province, mixed farming is ruled out by tsetse fly and where maize cannot be developed as a cash crop. Especially important was the position of tobacco as a crop with a low weight/high price ratio in this rather remote area. A first trial was attempted in lands near the Mvuvye River in Petauke District. As a result of its succes it became obvious that many of the soils in the

Photo 5: Turkish tobacco on a holding in the Petauke District.

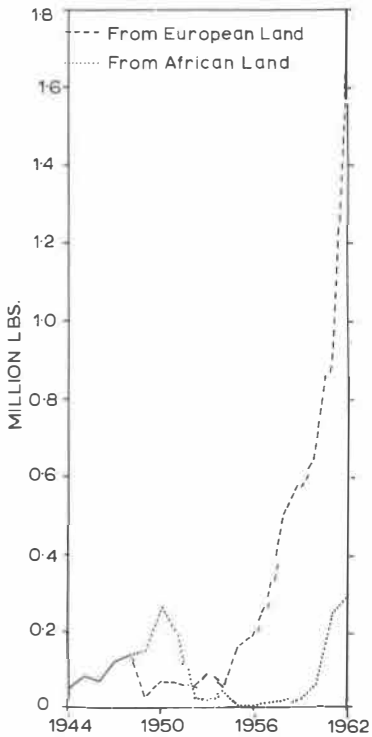

Fig. 2: The production of Burley tobacco in the Eastern Province of Zambia, 1944–1962. Most of this crop was grown by African farmers, even that on European owned land where African tenants were responsible for the majority grown.

Native Areas were suitable for the production of air-cured tobacco. Since that time both Burley (Photo 3) and Turkish tobacco (Photo 5) have been grown although the former has proved to be the more popular. The most successful production has been by co-operatives in the Petauke District, at Kalichero and Katapola and a great amount has been grown by African tenant farmers on European estates.

As with the European farmers' production of flue-cured tobacco, African production of Burley and Turkish tobacco has shown great fluctuations. Poor seed bed preparation, lack of fertiliser application and poor cultivation and curing methods have all had a part to play in this. But a most important reason is that the African cultivator can also produce other cash crops which in many years are likely to realise higher prices. The reaping of Turkish tobacco occurs at the same time as the lifting and shelling of groundnuts – a more profitable and less troublesome crop. Therefore tobacco growing tends to be abandoned. Further it has proved difficult on many occasions for African farmers to understand the return achieved by their tobacco. In 1959 23,144 pounds of Turkish tobacco were sold at 34 pence per pound so in 1960 a total of 123,283 pounds were grown but only

achieved 22.22 pence per pound. Low prices have also been returned for Burley tobacco – largely caused by poor quality leaf resulting from inefficient curing barn construction (Photo 4) or from high rainfall and humidity in March and April which causes pole-sweat or house-burn in the barns.

In recent years however the production of Burley tobacco has increased (Fig. 2) due to greater help in obtaining good seed and fertilisers and closer attention to cultivation and curing methods. Tobacco is now playing a proved part in the rotations suggested to the African cultivator and provides a valuable cash crop. The Burley tobacco is sold on the Limbe floors but the Turkish tobacco is sold by private treaty by the co-operatives to two tobacco concerns in the United States of America.

The Crown Lands

At this stage it is necessary to discuss the disposition and character of the territory occupied by the Crown Lands. At the height of white farming in the Eastern province there were 203 estates on these lands, many of which were subdivided. The estates lay in two main blocks in the vicinity of Fort Jameson, a town which owed its periods of success and vitality as much to the white farming population as to the location there of the Provincial administration offices. Of the two blocks, the northern lay around the town of Fort Jameson and athwart the Great East Road, while the southern was situated to the south west of the town and adjacent to the southern side of the road. The Great East Road is the lifeline of this area, connecting it with Lilongwe in Malawi, about 80 miles to the east and to Lusaka, nearly 300 miles to the west.

The Crown Lands lie to the east of the Luangwa River and in the south of the Plateau of eastern Zambia. This area is part of a peneplane lying at an altitude of between 3000 feet and 3600 feet (914–1097 metres). It has higher ridges along the border with Malawi and is being actively dissected in the south west in Petauke District by the action of some of the tributaries of the Luangwa River. This whole area is floored with rocks of a varied nature but which belong in general to the basement complex. Above the general level of the peneplane lie kopjes of various igneous rocks but mainly of granite and syenite.

The climate of this area is of great importance in this study of the tobacco industry and will be discussed in greater detail at a later stage. It is sufficient here to state the nature of the climate which belongs to the zone dominated by the interaction of the pressure systems and winds of the tropics and the high pressure zones of the horse latitudes. It has well defined wet and dry seasons. Rainfall totals within the area can vary widely from year to year, e.g. at Fort Jameson 58.04 inches (148 cms) fell in 1962–63 while in 1952–53 the total was only 38.79 inches (91 cms). During the wet season rain falls in heavy storms and 85% of the rain days have between 1 and 1.99 inches (2.54–5.05 cms) of rain. Temperatures are high throughout the year being depressed during the wet season.

Table 1: Growing Season Temperature Characteristics at Fort Jameson

°C	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
MeanMax.	31.8	31.5	29.6	27.5	26.6	27.9	27.9	27.9
MeanMin.	20.1	19.8	19.4	18.7	17.7	18.2	17.6	14.5
Absolute Max.	35.0	37.2	36.6	33.3	31.3	31.1	31.1	30.5
Absolute Min.	10.0	13.2	14.4	16.5	13.2	15.0	11.6	11.6

Together with the climate, the vegetation and the soils of the Eastern Province have had a large part to play in the story of tobacco growing. The Eastern Plateau of Zambia has a variety of soils which is unmatched in the Main Plateau. This is especially so in the south of the Province in Fort Jameson and Petauke Districts due to the great variation in the rock types where areas of intrusive granites, syenites and dolerites alternate with areas of both acid and basic schists and gneisses. The soils developed from these rocks are the supporters of various groups of woodland among which are the several forms which go under the general term of *Brachystegia-Julbernardia*. This is not a natural vegetation but is the present culmination of repeated clearing for agriculture which has involved the use of fire. The woodlands are however associated with the major group of Plateau soils allowing a broad correlation to be made between the major regional soils and types of vegetation.

For our purpose the most important vegetation group is the *Brachystegia-Julbernardia* which can be separated into four main groups in the Eastern Province.

i) *Julbernardia paniculata-Brachystegia*. This group is made up of *Julbernardia paniculata*, *Brachystegia stipulata* and *Uapaca kirkiana*. It is found throughout the area on the flat watersheds and is associated with leached, greyish, sandy soils which suffer from waterlogging, when *Brachystegia stipulata* becomes more important, and with the weak sandy soils of the main group of Plateau soils.

ii) *Brachystegia burtii-Julbernardia*. This group contains *Brachystegia burtii* and *Julbernardia paniculata* or *Julbernardia globiflora* where it is drier. It occupies a variety of soils included within the main group of Plateau soils, the local red loams and skeletal or immature soils. Where clearing, cultivation and regeneration have taken place, *Bauhinia petersiana* provides an understorey.

iii) *Julbernardia globiflora-Brachystegia.* These woodlands occupy the brownish and skeletal soils of the lower escarpments and also occur in Petauke District on some of the main Plateau soils.

iv) *Brachystegia hockii.* Associated with this group as an understorey are *Julbernardia globiflora* and *Brachystegia stipulata* on poorer soils, whereas on richer soils *Bauhinia petersiana* and *Afrormosia,* elements of the separate *Combretum-Acacia-Piliostigma* group occur. These elements are especially associated with the brownish loams which occur as an intermediary between the Plateau and Upper Valley soils.

The significance of the climate, soils and vegetation in the development and failure of the European tobacco industry will be discussed below.

Reasons for the Failure of the White Branch of the Industry

The eventual collapse of white farming in the Crown Lands of the Eastern Province is bound up with the failure to maintain tobacco as an economic crop. Involved in this failure were many factors, some of them recurring throughout the story of tobacco production in this area while some were the result of particular events over which the farmers could exert no control or influence.

Climate: Tobacco is a very adaptable crop being able to survive in a wide range of temperature and rainfall conditions but it cannot stand extremes. One of the main problems to be faced in its cultivation is the sheer difficulty of dealing with the diseases of and the demands made by the crop itself and these are problems which are aggravated by the climate. The Virginia tobacco crop in the Eastern Province starts life in seed beds in early August and is then transplanted into the fields from early November through to late December. The crop is cultivated up to four times during its early growth period in order to prevent weed growth. In the sixth or seventh week after planting the crop is topped to allow optimum leaf growth – this occurs during the months of January, February and March at the height of the rainy season. The first reaping begins in late December for some varieties and continues until early April.

The crop needs at least 25 inches of water during its growth cycle but it is the distribution of the rainfall [2]) rather than its total amount that is critical. The seed beds are planted in the dry season and therefore need artificial watering. If the previous rainy season has been poor then the availability of water for this purpose in August is also poor with the result that the seed beds produce only low quality plants. This is a condition which often occurred in the Eastern Province. It is vital that the rains should break at transplanting time. If this does not occur this operation is made difficult. Furthermore without a good water supply early in the growth period both yield and quality are reduced. The hazard experienced by the farmers in this matter can be seen from the high coefficients of variation in rainfall that occur, especially in October and November.

Table 2: Coefficients of Variation in Monthly Rainfall in the Tobacco Area[3])

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
Fort Jameson	134	63	34	31	29	54	76	249
Katete	70	72	25	27	32	59	105	216
Petauke	129	53	35	27	30	62	135	294

$$\frac{\text{Standard Deviation}}{\text{Average}} \times 100\ \%$$

The crop makes its main growth, depending upon its planting time, in January, February and March and during this period it is essential to have sunshine and a steady water supply. The coefficients of variation of rainfall show that for January and February but not so much for March, rainfall reliability is quite good. There were years however when the Agricultural Reports observed that "heavy rain without sunshine was bad in February and made growth slow". More serious than the occasional years when very high or very low rainfall occurs in these months is the fact that the rainy season, as in all areas deriving their rain from the Inter-Tropical Convergence Zone, is accompanied by a heavy cover of stratus cloud. In periods when rain does not actually fall the sky is obscured and thus the tobacco plants do not obtain the necessary sunlight for growth – this is especially so in January and February and in many years caused a strong reduction in both quality and yield. During the harvest period it is advantageous if the rainfall is not heavy or prolonged. During March and April however the coefficients of variation in rainfall are almost at their highest. In addition to these rainfall problems, day temperatures in excess of 28.8° C when accompanied by dry weather causes the leaf to scorch in the field and thus reduces its quality.

Disease: A great problem for the tobacco farmers is the great number of diseases to which the crop in its several varieties is prone. Frogeye, alternaria, anthracnose, coppering, mosaic, rosette and bushy top are the most common. Such diseases are

[2]) For a discussion of the availability of water see F. E. Kanthack, op. cit.

[3]) The coefficient of variation of rainfall has been calculated from the monthly rainfall totals for the period 1950/51 to 1962/63. The formula used for this calculation is

at their worst in years of heavy rainfall and with totals of up to 60 inches (152 cm) falling virtually in 6 months it is not surprising that the Eastern Province crop frequently suffered a reduction in quality due to disease.

Farming Deficiencies: "Few crops call for greater attention to detail than tobacco which in Northern Rhodesia demands horticultural precision upon a field scale. All stages from the seed bed to the auction floor call for the utmost skill and judgement" (COLLINS, 1956). Such advice was more often than not ignored. In the early period of tobacco growing in this area the depredations caused by climate and disease were largely unavoidable. In the later period, however, although the climate still remained a difficult problem, the introduction of chemical sprays and disinfectants meant that diseases were preventable. That they were not on many farms points to one of the reasons why eventual failure of the industry was likely – the farmers were too often unskilled and inefficient [4]). Many of the farmers were of course complete newcomers not only to the local climatic conditions but also to farming of any nature – this was especially the case in the boom period up to 1928 and again from 1947 to 1952 when new immigrants went straight into tobacco growing. There were many other features too which point to the farmers' overall inexperience and inefficiency.

One of the essentials of tobacco growing is an understanding of the soil. Tobacco will grow on most soils but its response to them varies greatly, especially with regard to its final taste quality. It is best grown on light, sandy soils with a low nitrogen content if it is to be of the popular mild nature. Reference has already been made to the soils of the Eastern province and it was pointed out that although they are very varied their type can in many instances be detected from the vegetation they support. If grown on heavy soils tobacco needs great cultivation care and so the heavy, rich loams were at first avoided by the farmers who recognised them by the stands of the *Combretum-Acacia-Piliostigma* complex which they supported. Thus the farmers sought the *Brachystegia-Julbernardia* vegetation complex which ocupies poorer sandy soils. Within this complex there are various groups which respond to the many differences which occur in the soils of the Fort Jameson area. Many of the farmers, and especially the inexperienced ones, were unable to distinguish these differences with the result that soils of the wrong type were put under tobacco. A very good example of this is provided by the soils occupied by the *Julbernardia paniculata-Brachystegia* group. This group has an affinity for weak sandy soils which appear to be well suited to tobacco. These soils however have a strong pan developed and thus become waterlogged, especially during February and March – a condition which tobacco cannot survive. In some instances too the soil-vegetation agreement is not so clear due to local climatic variations and the effect of past citemene activity in which case the former *Brachystegia hockii* woods are often replaced by elements of the *Combretum-Acacia-Piliostigma* group. In short the vegetation of the area is of a complex nature and it is not surprising that the new tobacco farmers often chose the wrong soils.

The different types of soil used by the farmer also needed careful treatment. The lighter sandy soils, deficient in humus were seriously affected by sheet erosion, accelerated by the need for the four clean cultivations undertaken in the period just before the onset of the really heavy rains. Where the richer red loams were used these were susceptible to donga erosion. For the production of good tobacco it is necessary to have the correct nutrient balance in the soil. The lighter soils are however poor in this respect being especially deficient in boron and phosphate. The farmers either could not obtain fertilisers due to difficulties of capital or communications or they were totally unversed or uncaring in their application. The agricultural reports continually refer to the "poor fertiliser use" which was "inadequate and applied all at once". To avoid the difficulties of the use and buying of fertilisers many growers used the richer red soils which could be cultivated for considerable periods without fertilisers but which as Trapnell says produced "a type of leaf having a market of its own" (TRAPNELL, 1953). This qualification is one of great importance in understanding the difficulties faced by the growers and reference will be made to it again.

Many farmers paid insufficient attention to the planning of their land use and did not employ a policy of crop rotation. It is essential that land should not be allowed to remain untended during the recovery period following a tobacco crop. This however did occur and some farmers were forced into bankruptcy by the invasions of *Eleusina indica* (rapoko grass) which made their land virtually unworkable.

A further indictment of the growers is in their lack of care in curing and handling the crop. Year after year the agricultural reports speak of such deficiencies: "grading and handling were poor"; "in many cases larger acreages were planted than they (the

[4]) There was little excuse for inefficiency and uneducated farming for not only was a Government tobacco growing advisory service available but also "Tobacco Extension Officers". These latter had intimate knowledge of the needs and demands of tobacco based upon work done in the Government Experimental Farming Station at Msekere in the Fort Jameson Block. Furthermore from 1951 onwards many clearly written bulletins on local tobacco growing conditions were produced by the Government "Extension Officers".

farmers) had facilities to handle"; "much leaf deteriorated further in storage due to bad construction of storage barns and the fact that they were in a poor condition of repair"; "atmospheric humidity in many stores was too high and the leaf deteriorated while in storage". Lack of care not only affected the quality of the crop but also entered into the actual husbandry by allowing infestations of eelworm to occur by growing tobacco on the same land for two years in succesion.

Marketing

Very much at the heart of the tobacco growers' problems, in addition to those of climate and those created by their own inefficiency, was one of marketing. Inherent in this problem is the actual location of the tobacco producing lands in relation to the marketing centres. At first the tobacco was either sold in Salisbury or, by private agreement in Fort Jameson, to overseas buyers whereupon it was shipped out via Beira. The route taken to Salisbury or to Beira was of the utmost difficulty in the early period. The tobacco was taken by road to Limbe and thence by rail to Mutarara where it was offloaded and taken by barge to Chindio and then by rail to Beira. From Beira after this series of damaging handlings it went to Liverpool, to Cape Town or to Salisbury (Fig. 3). This system of movement to the marketing centres continued for many years with the percentage being sold in Salisbury increasing year by year especially after the organisation of the auction floors there. In 1926 the Great East Road from Lusaka to Fort Jameson was commenced and after a series of difficulties with floods and unsound bridges it was opened in 1930. The difficult crossing of the Luangwa and the steep gradients between Rufunsa and Nyimba did not encourage the use of this road for tobacco shipment, especially as a long journey to Salisbury from Lusaka still followed. This situation remained even after 1933 when Beit Bridge over the Luangwa was opened. In 1931 however the movement of tobacco to Salisbury had been eased by the opening of a road from Dedza to Tete which provided a shorter approach to Beira. Then in 1934 the Lower Zambesi bridge was opened and this reduced by four the number of handlings the crop underwent en route for Beira and Salisbury. In 1937 the road distance was lowered further by the opening of a road to Tete via Vila Gamito which removed the necessity of going via Dedza.

The problems faced in getting tobacco to the auction floors in Salisbury and the prejudice it met there were removed to a large extent in 1938 when auction floors were opened in Fort Jameson. The crop continued to be sold there until 1952 when the floors were closed and once more the crop was sold on the Salisbury floors. This arrangement continued until 1960 when the much reduced production was marketed on the floors at Limbe.

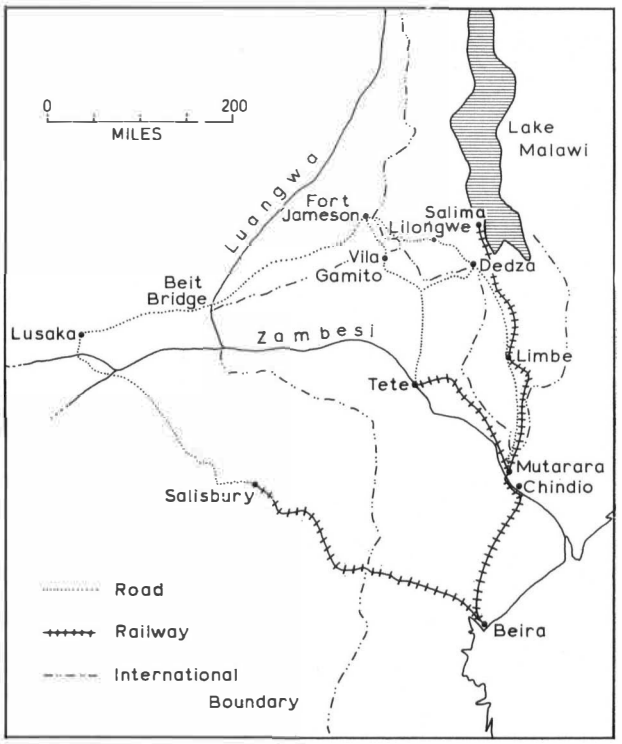

Fig. 3: Transport routes from Fort Jameson to Beira and Salisbury.

Throughout the story of marketing there is not only the difficulty of communications but also the problem of overproduction, of poor quality leaf and of alleged discrimination against the crop from the Eastern Province. The booms of 1928 and 1952 were brought to a halt by, amongst other things, serious overproduction. Despite the introduction of quotas for the Eastern Province crop there was still too much leaf, and of poor quality, being produced with the result that many farmers were unable to sell much of their crop. In the years following 1928 the Government had to pay the farmers to stay on their land to prevent white farming from dying out in the Fort Jameson area. In fact only fifty farmers did stay and many received "government rations" which permitted them to draw up to £4–10 s. worth of goods per month from a local store.

In the period following the closing of the Fort Jameson floors in 1953 the eastern Province growers met further marketing difficulties. Their tobacco was allowed to be marketed in Salisbury, going by road to Salima and thence by rail, but their right to an annual quota of 350,000 lbs of duty free production was forfeited in return. This alone led to a fall in the number of growers and to an abandonment of farms. But more serious were the allegations that

Eastern Province tobacco had a tang. Reference has already been made to the use of the red loams and their production of a distinctively flavoured leaf and it is significant that while it was sold on the Fort Jameson floors it was European rather than United Kingdom buyers who took most of the crop. Thus the tobacco was never allowed to be sold in Salisbury undifferentiated from the Southern Rhodesian crop as was that from the line of rail in Northern Rhodesia. This further harmed the growers for although their production continued at a high level the price achieved by their crop was always much less than that achieved by the other producing areas. The price differential was made good by the Government

Table 3: Average Price Paid on the Salisbury Tobacco Floors for Flue-cured Virginia

	South. Rhodesia	N. W. Rhodesia	East. Rhodesia
1953	39.7	34.92	27.37
1954	38.35	34.88	27.47
1955	40.46	37.83	27.21
1956	32.96		23.76
1957	39.37		30.73
1958	36.45		27.72
1959	34.63		25.37

From 1956 leaf from Southern Rhodesia and North Western Rhodesia was sold undifferentiated. Figures in pence per pound.

so that the growers did not lose financially. However the continuing poor quality of most of the leaf and its dryness due to the distance it travelled caused the Eastern Province crop to get a bad reputation. This led to more of it being sold in the lower grades at prices which continued to fall.

The difficulties of the growers were further exacerbated by the scarcity of labour. During the 1950s the Africans, by selling their own produce, became less dependent upon wage-earning. This change occurred largely as a result of the increased price paid for agricultural produce, the improvement in marketing facilities provided by the co-operatives and the better methods and new crops introduced by the Agricultural Department. There was also competition for the available labour from the employers on the line of rail who paid higher wages. Thus at the peak time of labour need on the tobacco farms the demand could not be met. As a result of the poorer prices achieved by their crop the farmers were unable to meet the high capital costs of the industry. Slowly but surely during the late 1950s and early 1960s the farms were abandoned and the flue-cured branch of the tobacco industry in the Eastern Province virtually died.

The growers that remained into the recent years became more and more dissatisfied and further and further in debt. They were also a small isolated minority in an area where the fires of African nationalism were burning bright. Thus the Government arranged for their removal. All of those farmers who wished to remain in agriculture were given generous terms of sale for their farmland. The land that was cleared was sold to the Government at £10 per acre and that which had been cleared but which hat reverted to scrub was sold at £2 per acre. In return, at similar prices, the Government made land available to the farmers in the tobacco lands on the line of rail. Thus the tobacco farmers moved and were settled in two areas – to the north of Broken Hill at M'Kushi and to the south of Lusaka near Choma and Kalomo.

The Problems Left Behind

With the departure of the farmers whether by abandonment of the farm or by sale to the Government many problems were left in the area of the Crown Lands. First and foremost in the early period of abandonment was the existence of unoccupied farms adjacent to African reserves which were badly overcrowded (HELLEN, 1962) – a position which

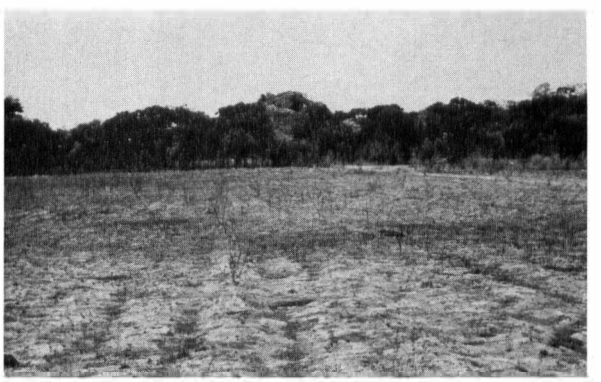

Photo 6: Former tobacco land in the Katete Block. Note its bareness which makes it a ready victim to sheet erosion.

Photo 7: Regeneration of scrub and invasion of *Eleusina Indica* on former tobacco land. Note the windbreak in the background.

Photo 8: All that remains of one of the stores and petrol stations which once served the white farmers and their large labour force.

obviously had political potentialities. The land still belonged to Europeans and thus African encroachment was illegal. Further there was the problem of what to do with the lands obtained by the Government following the resettling of the Europeans on the line of the rail. Land had become available in a heavily populated area and furthermore, although in some cases badly eroded, it was land that had been cleared, worked and even fertilised (Photos 6 and 7). Another problem to be faced was the loss of employment in the area – one farm alone had employed 1000 Africans at the height of the tobacco season. The removal of the white farmers also brought a decline to Fort Jameson which had been their economic and social centre. It led to a fall in the number of houses occupied and in the expectation of any real development which the town might gain apart from its function as an administrative centre.

The Crown Lands Today

At the present time the majority of the Crown Lands of the Eastern Province present a dismal sight (Photo 8). Abandoned and deteriorating tobacco barns and farmhouses, where they have not been

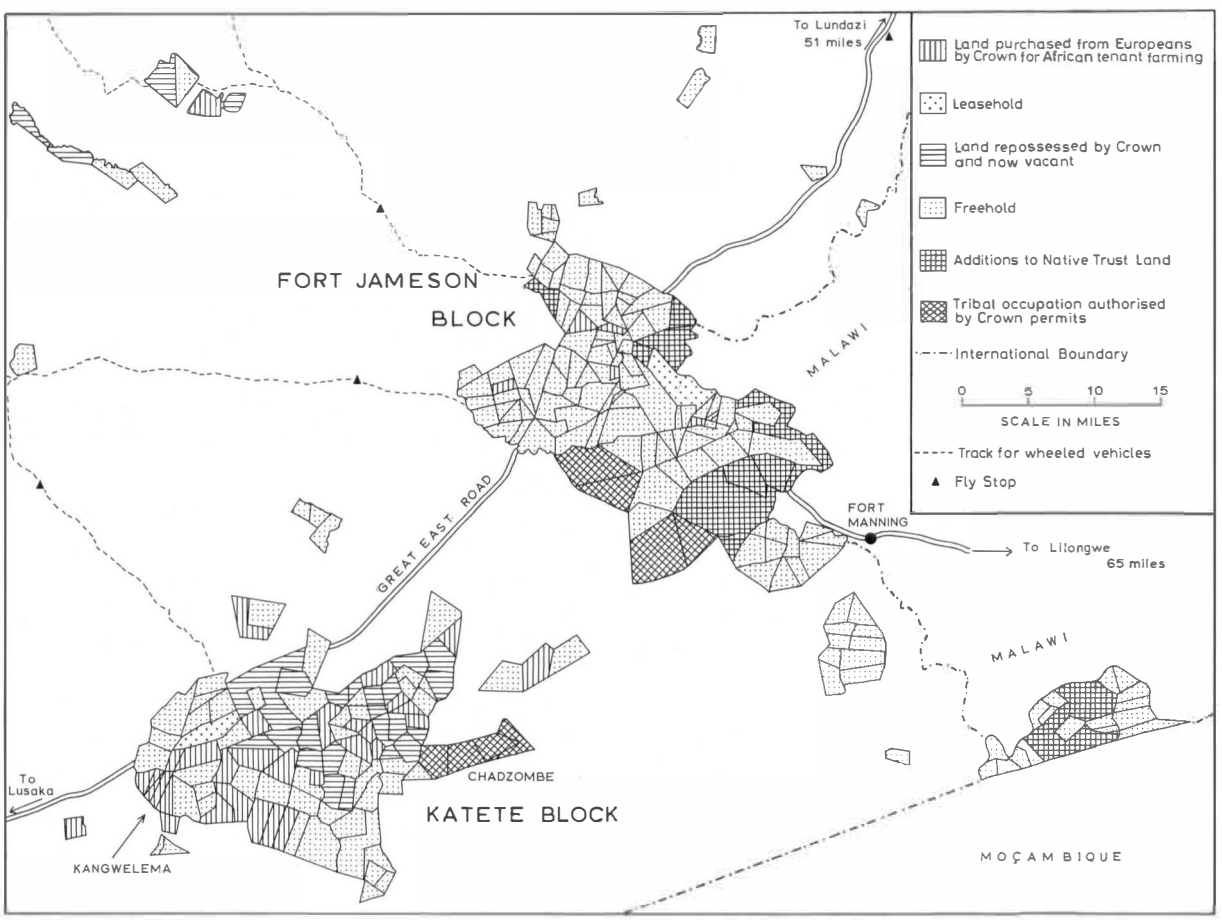

Fig. 4: The main Crown Lands of the Eastern Province of Zambia. This figure shows the status of the lands in 1966. The only farms being worked by Europeans at that time, some six in number, lie in the Fort Jameson Block and in the small block in the south east adjacent to the Moçambique and Malawi borders. Cattle and maize are the main products.

burned down, stand in lands that are rapidly being invaded by scrub (Photo 7). The overcrowding that exists in the Ngoni and Chewa Reserves however has led to plans being made for the use of this land (Fig. 4). Thus on the Katete Block (175,000 acres) plans have been made for the occupation of this land by African cultivators. In order to effect this two groups of farms are being exploited experimentally at present using two different methods.

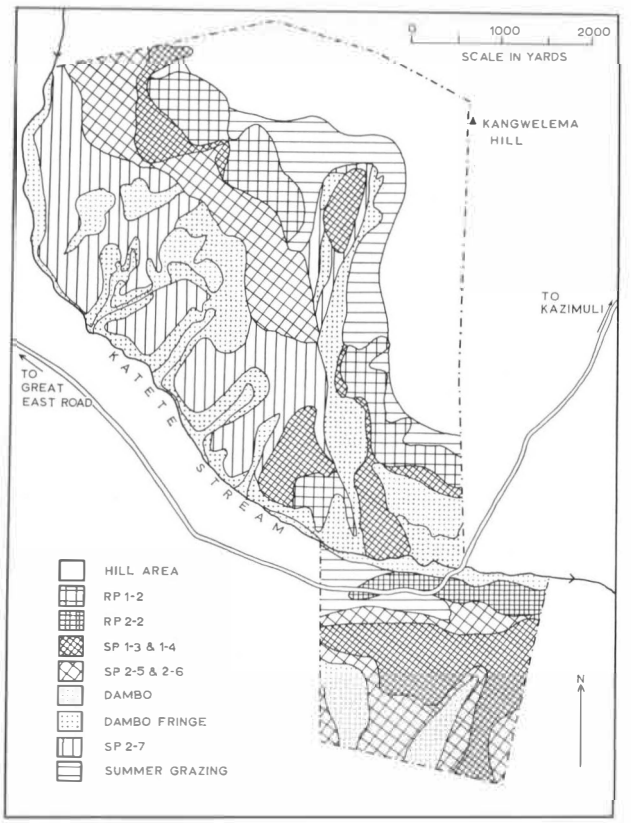

Fig. 5: Soil map of the Kangwelema farms which are now being developed for African farming. The soils of this area are of two basic kinds: the red earths and red loams (RP) with a high inherent fertility and resistant to leaching; and the sandveld soils (SP), the most extensive in the Eastern Province. The High Potential Arable Soils are RP 1–2, RP 2–2, SP 1–3 and SP 1–4. RP 1–2 is a sandy clay loam with a depth of 3 feet down to the parent material and free draining. RP 2–2 has a top soil of eight inches of sandy clay loam; on slopes of 5 % or more it has a tendency to waterlogging. SP 1–3 is a sandy loam with a depth of 3 feet down to the parent material. SP 1–4 has a six inch topsoil of loamy sand with a subsoil which becomes more loamy at a depth of twenty inches. SP 2–5 and SP 2–6 are Low Potential Arable Soils. SP 2–5 has fifteen inch topsoil of loamy sand and then becomes clay. SP 2–6 is sand right down to the parent material. SP 2–7 is a non-arable soil and lies between a sand and a sandy loam. It has iron mottling and suffers from waterlogging. The dambo is a drainage line in the plateau being perennially wet and flooded in the rainy season. The soils are hydromorphic and support a cover of shorter grasses which at the dambo fringe are interspersed with trees. The moisture holding capacity of the soil is exploited in the dry season by the development of dimba gardens in which vegetables are grown.

In the east of the Katete Block four former white farms are being reorganised at Chadzombe. Much of this land is poor sandveld and therefore the density of settlement has to be low. Two villages are being laid out, divided from each other by a zone of poorly drained land which will provide communal grazing. 130 families are in process of being settled and each will receive 15 acres of land for cultivation in a three year rotation. Because erosion has been bad on these weak soils each family has to put in contour bunds and fifteen foot windbreaks are being established between the individual gardens. The Government is building supplementary access roads, twelve wells and six small weirs, the latter to provide watering points for cattle.

On the Kangwelema group of farms the settlement is not of the village type used in Chadzombe. Here on four former white farms individual cultivators are being settled. The land lies between the Mphangue Hills and the Katete Stream. 5624 acres of this land were formerly under intensive cultivation and have suffered from compaction of the soil which is also on the whole low in fertility and damaged by erosion. The soil is in catenary series (Fig. 5) from red-yellow down to dambo soils.

Each farm has to keep a balance between arable and grazing land and is of 60 acres if on red soil or high potential sandveld but 100 acres if on low potential sandveld. Again anti-erosion action is being taken in the form of planting windbreaks and building bunds. Equally important is the construction of storm drains at the head of each farm so as to prevent erosion by the quick run-off which takes place on the bare granite kopjes of the Mphangue Hills.

A mixed farming economy is being undertaken. Cattle are kept at one beast per twelve acres and several cash crops are being grown. Air-cured tobacco, Burley on the heavier red soils and Turkish on the lighter sandveld soils, is to be grown one year in five. The other cash crops will be cotton and maize. Grass leys must be put down for four years on at least eight plots of land on each farm. This will remove the danger of eelworm infestation after the growing of tobacco. The crop emphasis will depend upon the soils on each of the farms for each soil has crops more suited to it – on RP soils maize, cotton and Burley tobacco; on SP1 soils maize, cotton, Burley tobacco and groundnuts; on SP2 soils groundnuts and Turkish tobacco. Each farm will also have non-arable land. The hill land is either bare rock and thus unproductive or wooded and used for summer grazing. The dambo land is however much more

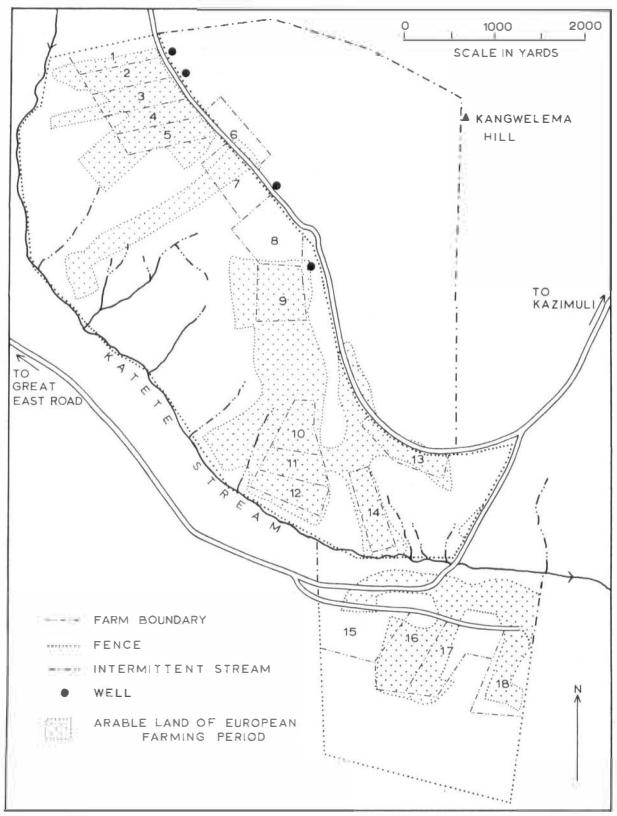

Fig. 6: The eighteen individual tenure farms of the Kangwelema area. Note that the farms are restricted to the areas occupied by RP 1–2 and 2–2 and SP 1–3, 1–4, 2–5 and 2–6 solis. The rest of the area within the fence will be used for carefully controlled grazing. It is interesting to note that the European farmers also used the poor SP 2–7 soils for arable farming.

important. The fringe supports light woodland which can be used for grazing but which more importantly aids in water level conservation. The dambo itself will provide grazing in winter and dimba gardens which use the moisture from the hydromorphic soils. During the summer when flooding takes place it will not be utilised due to the danger of treading and consequent damage to the extremely important water conservation properties of this zone (Fig. 6).

Conclusion

Thus is being achieved a drastic change in this part of the landscape of the former Crown Lands of Zambia's Eastern Province. The large estates, devoted to a virtual monoculture of Virginia and in later years of Burley tobacco, with their fine farmhouses are a thing of the past. Tobacco will continue to be grown but with an entirely different emphasis (KAY, 1965). The two new farming systems are largely experimental either with regard to the crop rotation or the tenure system. Of greater interest is the work done in Kangwelema where the eighteen farms in individual tenure exist. With the expert advice now available to the farmers they are flourishing but the major problem of efficient and adequate marketing still remains. There is hope that the railway line will be extended from Salima to Lilongwe and eventually to Fort Jameson. Until then it is worth quoting the statement made in 1911 – "Our exports do not swell the markets of the world ... One day the railway will reach us; one day prosperity, long denied, will come to us like the Prince in the story-book, and kiss us into life. But the day is not yet" (GOULDSBURY and SHEANE, 1911).

Literature

Official Publications

Northern Rhodesia:

A ten year development plan. 1947.

Annual Report of the Ministry of African Agriculture, 1956–1962.

Annual Report, 1910–1964.

Blue Book, 1939–1945.

CARR, A., 1950: The production of flue-cured Virginia tobacco in Northern Rhodesia. Department of Agriculture, Bulletin No. 2.

COLLINS, J. C., 1951: Harvesting, curing, grading and baling of flue-cured Virginia tobacco. Department of Agriculture, Bulletin No. 1.

– 1952: The production of Turkish tobacco in Northern Rhodesia. Department of Agriculture, Bulletin No. 6.

– 1955: Tobacco nurseries. Department of Agriculture, Bulletin No. 9.

– 1956: Review of research on flue-cured tobacco in Northern Rhodesia. Department of Agriculture, Bulletin No. 12.

COLLINS, J. C., and WATSON, W. J. D., 1955: Crop rotation in the production of tobacco. Department of Agriculture, Bulletin No. 8.

COSTER, R. N., 1958: Peasant farming in the Petauke and Katete areas of the Eastern Province of Northern Rhodesia. Department of Agriculture, Bulletin No. 15.

EMSLIE, G. B., 1958: Turkish tobacco. A cash crop for the African farmer. Department of Agriculture, Bulletin No. 13.

HOBDAY, J., 1956: A report of the agro-economic recovery and development of the Eastern Province.

Report of a commission of inquiry into the future of the European farming industry in Northern Rhodesia. 1954.

Review of a ten year development plan. 1948.

Central African Federation:

Annual Report of the Ministry of Agriculture, Department of Conservation and Extension, 1956–1962.

General:

British East Africa Meteorological Service. Survey of Rainfall in Northern Rhodesia, Nairobi, 1931–33.

Rhodesia and Nyasaland Meteorological Service, Climatological Summaries. Northern Rhodesia, July 1939–June 1948. Salisbury 1949.

Non-Government Publications

CHAPLIN, J. H., 1954–1955: On some aspects of rainfall in Northern Rhodesia. Northern Rhodesia Journal, 2. nos. 4 and 6.

COLE, M., 1963: Vegetation and geomorphology in Northern Rhodesia: an aspect of the distribution of the savanna of central Africa. Geog. Journ. 129, pt. 3.

GOULDSBURY, C. and SHEANE, H., 1911: The Great Plateau of Northern Rhodesia. , p. 338 and p. XII.

HELLEN, A. J., 1962: Some aspects of land use and over population in the Ngoni Reserves of Northern Rhodesia. Erdkunde, 16, no. 3.

KANTHACK, F. E., 1945: Relationship between rainfall and runoff in Central Southern Africa. Minutes Proc. South African Soc. Civil Engineers, 43.

KAY, G., 1965: Changing patterns of settlement and land-use in the Eastern Province of Northern Rhodesia. University of Hull Publications, Occasional Papers in Geography No. 2. pp. 71–82.

TRAPNELL, G. C., 1953: The soils, vegetation and agriculture of north eastern Rhodesia. Lusaka.

BERICHTE UND KLEINE MITTEILUNGEN

NEUERE ENTWICKLUNGEN IM LUFTBILDWESEN

Bericht über die Tagungen der Amerikanischen Gesellschaft für Photogrammetrie in Washington (5.–10. 3. 1967), der Kanadischen Landesaufnahme (13.–15. 3. 1967) und der Kommission Luftbildinterpretation in der Internationalen Geographischen Union (16.–17. 3. 1967) in Ottawa.

SIGFRID SCHNEIDER

Wenn auf den Tagungen der Luftbildfachleute Amerikas und Kanadas in diesem Frühjahr Stimmen laut wurden, daß man vielleicht das letzte Mal unter dem Leitwort „Luftbild-Interpretation" zusammenkomme, weil man in Zukunft mehr und mehr auch nicht auf dem Luftbild beruhende Erkundungsverfahren aus der Luft diskutieren werde, mag das überspitzt, jedoch bezeichnend für die Entwicklung sein. Und wenn kanadische Geographen von Forschern und Lehrern erwarten, daß diese sich auch über den jeweiligen technischen Stand von Aufnahme- und Auswertegeräten unterrichten, um alle Informationsmöglichkeiten auszuschöpfen und um geographische Landeserforschung mit Erfolg zu betreiben, wird nochmals klar, daß auf diesen Tagungen die Diskussion und das Interesse an den technologischen Entwicklungen einen breiten Raum einnahm.

Deutlich zeichneten sich in den über 60 Vorträgen auf der Tagung der Amerikanischen Photogrammetrischen Gesellschaft, nach Zahl und Thema der Vorträge, mehrere Schwerpunkte ab. Die Auswertung von Photographien aus Raumfahrzeugen verschiedener Höhe beschäftigte mehrere Vortragende, wobei besonders die Farbaufnahmen aus der Gemini-Serie in Technik und Bilddeckung große Fortschritte gegenüber früheren Serien zeigten und man mit Spannung die speziell für die Erdwissenschaften vorgesehenen Aufnahmen der für die nächste Zeit geplanten EROS-Satellitenserie erwarten darf. Bereits heute bestehen in wenigen Exemplaren Atlanten der Gemini-Serie („Earth Resource Surveys from Spacecraft"), deren Farbaufnahmen z. T. geologische, morphologische und vegetationskundliche Auswertungen erfuhren. Ebenso wurden Aufnahmen durch Fernsehkameras und Infrarotaufnahmen aus Satelliten diskutiert.

Ein zweiter Schwerpunkt in Vorträgen und Diskussionen lag bei den Aufnahmemethoden und Geräten, die Informationen aus den nichtsichtbaren Spektralbereichen gaben. Hier war vor allem die in den letzten Jahren erreichte Qualität des von der Beleuchtung unabhängigen Radarbildes bemerkenswert, so daß z. B. geologische Auswertungen aus den Appalachen von Aufnahmen mit dem sogenannten „Side-Looking-Radar" vorgelegt werden konnten.

Von besonderer Bedeutung für die zivile Nutzung der Aufnahme von Infrarot-Wärmestrahlung mit dem Flugzeug scheint die Tatsache zu sein, daß der sogenannte „Thermal Mapper" nunmehr im Handel erhältlich ist; er wird z. Z. von der Bendix-Aerospace Systems Division, Ann Arbor/Mich. angeboten. Allein fünf Vorträge beschäftigten sich mit dieser zum konventionellen Luftbild zusätzlichen Informationsquelle (vgl. dazu die jüngste Veröffentlichung der American Society of Photogrammetry „Selected Papers on Remote Sensing" Washington 1966, 291 S.), die eine Serie von Anwendungsmöglichkeiten außerhalb des militärischen Bereichs aufzählten, insbesondere für die Land- und Forstwirtschaft (V. I. MYERS), die Geologie (R. S. WILLIAMS, A. N. COVER), Vulkanologie (S. J. GAWARECKI), Hydrologie (E. KURATH), Meeresforschung (R. A. BRADIE) und Geographie (F. HOLLMES, D. S. SIMONETT).

Das Ziel, alle aus dem Flugzeug erreichbaren Informationen aus verschiedenen Spektralbereichen für bestimmte Fragestellungen mit Ergebnissen der Geländebegehung zu vereinen und je nach der Aufgabenstellung zu kombinieren, wie es z. B. mit Hilfe der Datenverarbeitung möglich ist, wird von den Spezialisten der Firma „TAGS" Garland/Texas als neues Konzept der „Airborne data collection" angeboten.

Schließlich war der Entwicklung und Anwendung der Farbluftaufnahme eine Plenarsitzung mit allein 13 Vorträgen gewidmet. Immer noch herrscht die Auffassung vor, daß die Benutzung von Fliegerfarbfilm trotz der zugegebenen höheren und schnelleren Informationsfähigkeit Nachteile habe, weil Belichtung und Entwicklung schwieriger seien, weil die Materialkosten gegenüber dem Schwarzweiß-Film wesentlich höher seien und weil die Anforderungen an Zeit und Geräten größer seien. In den Vorträgen wurde auf die technische Fortentwicklung zu