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MAPPING FOR THE 1966 CENSUS OF SWAZILAND

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Introduction

1. Swaziland, a small country some 6,700 square miles (17,300 square kilometres) in extent in south-eastern Africa, has a comparatively long history of census taking, the first being conducted in 1898 and followed by a further six censuses before 1966. Unfortunately, however, the data which they provided were suspect primarily because they were administrative censuses for which the 'census by assembly' technique was used. This method was emphatically rejected in favour of the household canvasser method when initial plans for the 1966 census were made, but its adoption specifically implied the division of the country into enumeration areas, which, with one possible exception in 1904, did not appear to have been attempted previously. Thus, whilst there were no precedents upon which to base preliminary proposals, a fresh approach to the problem was possible.

2. Unlike Kenya with its sub-locations, Uganda with its parishes or the Sudanese omodias, Swaziland has no small administrative units which could have been readily adapted for use as enumeration areas. Nor are there easily identifiable localities on which to base such units. The Swazi do not live in nucleated settlements but in homesteads (imiti, sg. umuti) which are residential units of territorially distinct collections of huts, varying in number from one to several hundred with the status of the homestead head (umnumzane), scattered across the country side. Although the individual was the ultimate enumeration unit, the homestead was chosen as the operational unit of identification. The homestead is the basic unit of the Swazi traditional system of administration with economic, political and social significance and may comprise one or more households belonging to the family of the umnumzane together with other dependants not directly related to him. Even the names which the Swazi give to areas of land do not encompass readily definable boundaries and frequently one area is known by a variety of names. Nor do tax lists permit spatial analysis, except by administrative districts, and they are notoriously

inaccurate. A further factor which made the division of the country into enumeration areas difficult was the complex tenurial pattern. There are three types of tenure in Swaziland which present a fragmented spatial pattern and comprise:

a) urbanized areas, which cover legally defined urban areas and their peri-urban precincts,

b) land held by individuals and companies in freehold or on long leases, and

c) rural areas, comprising land held in trust for the Swazi Nation by the Ngwenyama (King) and on which a traditional semi-communal type of tenure obtains.

It was important at all stages of the census to recognise these types of tenure and observe their boundaries as far as administrative convenience allowed.

3. The ultimate factors which determine the size and shape of an enumeration area, however, are the size and distribution of the population. But the uncertain basis of enumeration of the previous census in 1956 and the unreliable nature of the data which were collected gave little idea of how many people would probably be counted and even less as to how they were distributed throughout the country. As an essential planning preliminary, therefore, it was necessary to discover the size of the problem before enumeration areas could be delineated.

The use of Maps

4. Whilst cartographic techniques are essential for the successful planning and execution of any census, for the 1966 Swaziland census they were vital in providing solutions to the two twin problems outlined above. It was decided that the best way to obtain a quick and reasonably accurate idea of the size and distribution of the population in the urban and rural areas where the bulk of the population lived was to plot and map the position of every homestead in these two tenurial types. In parallel with this, another exercise using simple questionnaires sent

out to each owner or occupier was designed to discover how many people might be expected to be enumerated on freehold and leasehold properties. From the resultant data the delineation of enumeration areas would be possible.

5. Thus maps of varying types and scales would be required not only for plotting homesteads and subsequently mapping them but also for delineating enumeration areas, for planning and for administrative control. The importance of maps in analyzing the spatial patterns presented by the data was also realized and the cartographic programme was therefore planned as a complete operation from the stage of providing preliminary data through the use of maps in the enumeration phase to the analysis and illustration of the final results.

Existing Map Coverage

6. A report on cartography was, in fact, the first document to issue from the census office and its main purpose was to list all the available maps which might be of use. It covered three main classes, the first of which comprised township diagrams, both the official plans of the Surveyor General as well as maps of urban areas and their precincts compiled from aerial photographs and showing a variety of detail at scales of about 1:2,500. Secondly there were large-scale territorial maps of which the 1:50,000 topographic map of the country in 31 sheets prepared by the Directorate of Overseas Surveys was the most important. Although the relief and hypsometric detail was of the highest accuracy, these maps carried misleading locality information, no cadastral detail and out-dated road alignments. The Department (now Ministry) of Agriculture had, however, annotated a set of these maps with cadastral detail, recent road re-alignments, the line of secondary roads and tracks, the boundaries of a variety of agricultural service areas as well as many locality and feature names. They were ideal for census purposes and had been photographically reproduced so that further reproduction at suitable scales was possible. The third class then available comprised a variety of territorial maps, mostly at a scale of

1:250,000, illustrating the distribution of medical, education and administrative services, land tenure, physiographic features and communications. In addition, the territory was covered by sets of aerial photographs, the most recent flight having been made in 1961.

Plotting and Mapping

7. It was then for decision as to which types of map and scale were the most suitable for each particular purpose. Foroverall planning and administrative control the annotated topo-cadastral maps were used at a scale of 1:76,000. In urban and peri-urban areas the township maps derived from aerial photographs were used and these proved suitable with the exception of two densely populated areas of uncontrolled settlement; here aerial photography was planned but the warren-like nature of the settlement pattern would probably have defied adequate definition, even had this solution not been prohibitively expensive. In these two areas the boundaries of enumeration areas were pointed out to enumerators and a closer degree of supervision introduced.

8. After early suggestions to enlarge the topo-cadastral maps to field scale had been rejected for a variety of reasons, principally time and labour, it was decided to use aerial photographs as photographic maps for plotting homesteads in the field and for this purpose a section of maps covering rural areas were enlarged to 1:10,000. It may be considered that sufficiently accurate results could have been obtained by plotting directly from photographs but there were two main reasons why this method would not have been completely reliable. Firstly, there were good reasons for presuming that there is a continual and significant movement of homesteads from place to place and the interval of five years between photography and enumeration would have produced an incorrect settlement pattern. Secondly it has been found difficult to identify all homesteads from photographs because the huts blend well with the landscape. Particularly in areas characterized by granitic outcrops in the form of exfoliated boulders and in the Lowveld where the bush is dense, the beehive shape of the traditional Swazi hut defies ready identification, even using

the most modern photogrammetric equipment. And whatever the interpretive difficulties, it is never possible to determine with absolute certainty whether a homestead is occupied or abandoned because in many cases homesteads are left as they stood, the roofs collapsing straight down and the well trodden courtyards resisting the encroachment of grass for many years. For these reasons some ground control would have been necessary and it was decided to use photographic maps and annotate them with up to date settlement information. For mapping homesteads and delineating enumeration areas outside the urban areas a twice linear enlargement of the 1:50,000 annotated topo-cadastral maps was made and photographic positives of the enlargements obtained so that copies could be run off quickly and easily.

9. Apart from the photographic maps, which because of their size (27½" square), comulative weight and the need to keep them as clean as possible, had to be kept at district headquarters and issued as required, each supervisor was issued with a hard-board, covered in strong polythene to keep materials clean, and pens with felt or bamboo nibs which were found superior to any other type. Instructions for homestead plotting indicated the symbols to be used and the type of information to be collected for planning purposes. Existing homesteads still in position as on the map were ringed, abandoned homesteads were crossed out and new homesteads indicated by a square. The maps were also annotated with the sites of stores, schools, churches and any other information which might eventually be of assistance to enumerators. The instructions advised that in hilly country where the enumerator could see long distances and was accompanied by a guide there was no need to visit each homestead personally but in areas where visibility was restricted, in the thickly bushed Lowveld, for example, a call had to be made at each one. In transferring this information to the 1:25,000 maps, conventional dots were used for homesteads and other symbols for churches, schools and stores etc.

Timing

10. Census moment had been set as midnight on the 24th May, 1966, and the enumeration planned in two stages; the preliminary enumeration was to start on 10th May and final enumeration was to be done on 25th May. In order to allow the maximum possible time for ordering stores, recruiting enumerators and training, tasks which depended upon the provision of satisfactorily accurate preliminary data, homestead plotting was timed to begin in mid-December, 1965, and mapping the first available photographic maps early in January. The 1st March was set as the date by which enumeration areas had to be delineated but this was put back first by eighteen days, allowing a full seventy days, and then again deferred to 15th April. The reasons for the setbacks were various and cumulative in their effect; they included:

a) The short period allowed for planning and preparation which allowed little latitude in a tight schedule,

b) Serious delays in sanctioning advance expenditure which delayed recruitment of staff and the ordering of materials until a period which very inconveniently for the logistics of the operation coincided with a National Festival,

c) Inclement weather which included a severe cyclone,

d) An initial mis-appreciation of the speed at which the homesteads could be plotted, and

e) A lack of a sense of urgency about preliminary census operations by district administration staff responsible for field operations.

In the event, by mounting a crash programme of mapping and working long hours in the field the final dateline was met with only one serious effect. It was by this time too late to distribute maps to schools, so that the school children who were being trained as enumerators could not be taught to use the enumeration area maps.

This reduced their usefulness during the enumeration period and for post enumeration analysis because it was impossible to insist that the instruction to number homesteads on the maps in the order in which they were enumerated should be followed. Many enumerators were able to use their maps without training, however, but it did mean that supervisors were doubly careful in pointing out the boundaries of enumeration areas; the maps were valuable in that checks on coverage could be made on the spot by supervisors well versed in map reading, using enumerators' maps. With the checks which were introduced, the six boundary transgrassions which did occur were quickly spotted and corrected.

Staff

11. The plotting of homesteads onto the photographic maps was done by twenty census supervisors, semi-permanent staff recruited for a variety of field jobs of which this was the most important. One of the main objects of the first training course for census staff was to provide instruction in the use of photographic maps and the simple techniques of homestead plotting. In addition to lectures, a minimum of four hours was set aside for practical work and once the formal course was completed supervisors were split into two groups to plot homesteads in Manzini and Mbabane Urban Areas, a shake-down exercise under field conditions which provided additional plotting practice under close control. Instructions for plotting homesteads were also issued. The country was divided for preliminary census work into twenty areas, one supervisor being allocated to each, with District Commissioners responsible for those areas which fell within their districts. Transport specifically for census work was provided for each district.

12. It had been hoped to recruit a draughtsman for the cartographic programme but this proved impossible and it was therefore necessary for this work to be undertaken by an existing government drawing office. The Director of Geological Survey and Mines co-operated and the senior draughtsman in his departmental drawing office was appointed to supervise census cartographic work. From January until early March a trainee

draughtsman worked alone on mapping and was then assisted by a trained draughtsman whom it had been possible to recruit. Because of the serious delays in the field and failure to maintain an even supply of photographic maps to the cartographic office, a serious backlog piled up and to meet the final deadline a crash mapping programme was organized. In addition to six trained draughtsmen and tracers from government drawing offices, nine students were also employed for short periods during April to help to complete the mapping programme and produce enumeration area maps.

Cost

13. As in all census operations there is a hidden cost element of expenditure and the following mapping costs represent only those directly attributable to the scheme. It is not possible, for example, to cost the time of census supervisors on plotting because they were at the same time undertaking publicity and other preliminary work.

Additional Cartographic Staff	R840.00
Photographic Positives of AA maps	R370.00
Enlargement of Aerial Photographs	R2100.00
Freight Charges	R16.00
Drawing materials (say)	R100.00
Total	R3426.00

This figure represents some 5 per cent of the total expenditure directly credited to the census scheme.

Delineation of Enumeration Areas

14. The delineation of enumeration areas in rural tenure areas was done by the central census office and in other tenure areas by district administration. Amongst the factors used to determine the boundaries of enumeration areas were:

a) the need to analyze data by tenure,

b) the need to analyze data by geographical region

c) the need for clarity - boundaries had to be features clearly recognizable by enumerators; there was insufficient time to provide written descriptions and boundaries had to be identifiable from cartographic records; arbitrary lines drawn on maps which could not be translated into reality on the ground had to be avoided,

d) some enumerators had to be housed in camps and for economy the fewer the camps which would serve enumeration areas the better,

e) the need for boundaries to make sense in the future as well as for the 1966 census, and

f) the need to relate boundaries to those of rural development areas in which crash agricultural programmes were proceeding.

15. Amongst the determinants which governed the size of enumeration areas were:

a) the density of homesteads,

b) the type of terrain,

c) transport facilities,

d) shape, and

e) future use.

16. Once delineated each enumeration area was given a code number and name although the latter was of use only at local level. Each census supervisor's area had been given a code letter and within this area enumeration areas were numbered in sequence. This was done by district administration staff and when the schedules were being edited and batched before processing a new five-digit code number was assigned to each. This was to join certain enumeration areas on freehold farms which had very small populations, to renumber others to conform with the area of administrative districts, certain adjustments having been made for census purposes, to sort out sequences with numbers missing and generally correct the mistakes made in numbering in the field prior to tabulation.

17. In all 885 enumeration areas were delineated, 550 in rural areas, 278 on freehold and leasehold farms and 57 in urban areas. The average size was 7.5 square miles and the average population enumerated in each was 423 persons. The size of enumeration areas varied with tenurial type and with geographical region. In rural areas the average size was 6.4 square miles and the average number of persons enumerated was 477.

Analytical Mapping

18. Mapping the characteristics of the population to determine the spatial pattern was regarded as an essential analytical operation and also of importance in illustrating census data for administrative and planning purposes. The following maps were produced using a very accurate and detailed territorial topo-cadastral map at a scale of 1:250,000 as a base. They were compiled and draughted by the Census Commissioner and drawn for reproduction by draughtsmen in the Geological Survey drawing office.

a) a dot distribution map using one 0.8 mm dot for twenty persons and proportionate circles for heavy rural and all urban concentrations,
b) a choropleth density map based on enumeration areas,
c) An isarithmic density map using enumeration area densities at a scale of 1:500,000,
d) an isarithmic density map using the dot distribution map as a base and plotting values for every four square miles, at a scale of 1:250,000, and
e) a map of the distribution of the areas of origin of temporary absentees from the country.

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